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SELECTED CONDITIONS OF A CHANGING ROLE OF NATURAL GAS IN A LONGTERM ENERGY POLICY OF POLAND

1. INTRODUCTION

The process of transformation into a market-oriented economy and the numerous adaptation problems of companies has led to a situation where an under-developed gas market has been unable to increase gas consumption for many years. This resulted from the concessions of the national authorities in favour of the coal lobby, defending its dominant position in the energy sector. In 2003 gas accounted for 11% of the domestic structure of primary energy sources in comparison to a 24.3% share in the structure of energy sources in the EU-15 countries indicating that the level of development of the gas market in Poland is rather low. It needs to be emphasised that the pace at which gas consumption in Poland increased in the years 2002–2006 is slower than in some EU countries.

This is the consequence of a rather slow development of the gas market in Poland, which is characterized as follows:

- traditional energy sources are very slowly being substituted by gas – an increase in gas use in the years 2002–2006 (approx. 30%) is lower than in the economically developed EU countries;
- dominance of major gas users;
- gas deliveries to Poland are based on long-term contracts leading to a strong dependence of the domestic gas market on Russia;
- lack of developed infrastructure for gas storage;
- lack of natural gas exchange, the fact that the TPA rule (Third Party Access) is not followed, lack of access to underground gas storage facilities, signing short-term contracts for gas delivery with contractors of undetermined credibility;
- gas exploitation from domestic resources is stable despite an increased domestic demand for gas.

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The relatively insignificant changes in natural gas consumption in Poland contradict the official objectives of government energy policy, such as: ensuring the energy security of the state[1)], increasing competitiveness and energy effectiveness of the economy and protection of the natural environment from the negative effects of energy activities. The energy policy implemented in our Poland contributes to the achievement of these aims, but to a very small degree.

It could be confirmed by the following factors:

- dominant position of coal, only a small share of natural gas and oil and a lack of nuclear power in the domestic energy balance;
- high level of emissions in the atmosphere;
- dominant role of coal power stations generating more than 90% of electricity produced in Poland, which is an exception in comparison with EU countries;
- relatively low efficiency of the energy sector- energy sources of the EU-15 countries are characterized by 41–42% efficiency, in Poland it is only 35% [14];
- the infrastructure of the energy sector is significantly worn out – in 2003, 62.5% of power generators in the Polish energy system were more than 30 years old [2].

At the same time it needs to be emphasised that:

- In forthcoming years the demand for energy in Poland will increase, which will be related to catching up with the development of EU countries as well as the swiftness of expected economic growth.
- In accordance with the priorities of *Polityka energetyczna*...(*Energy policy*...[13]), the direction of changes in the energy policy of the state will be determined by the market mechanisms and by the efficiency of regulatory mechanisms connected with the activities in the energy sector. The statement that it is the market that shapes energy policy is not confirmed by official government documents related to this policy because:
  - there is a risk of extraction problems relating to domestic coal deposits, which is not included in *Polityka energetyczna*… [13] and which will necessitate higher costs of coal exploitation;
  - despite adopted assumptions, the dominant role of the state in the sector is maintained;
  - the consequences of coal subsidies are neglected;
  - domestic limits of greenhouse gases emissions are violated.
- According to *Długoterminowa prognoza*… (*Long-term forecast*...[3]) the increase in demand for electric energy will be accompanied by the change in the structure of fuels used for production of this energy. The change will be related to:
  - decrease in the share of coal from 96% in 2003 to 74% in Treaty Variant and 67% in Effectiveness Variant in 2025;
  - increase in gas consumption – it is anticipated that by 2025 the gas share in electrical energy production will rise from approx. 2% in 2003 to 9% in the Treaty Variant and to 18% in the Effectiveness Variant.

[1)] The issue of energy security in Poland is discussed by M. Kaliski and D. Staśko [7].

– Government energy policy involves, to a very small degree, raising the environmental awareness of society, which, consequently, would lead to promoting environmentally-friendly energy sources.

The factors above indicate the necessity to diagnose the conditions, which could significantly affect a change in the role of natural gas in the domestic energy sector. This estimation has to be related to the change in the role of other energy sources.

2. EVALUATION OF THE POSSIBILITIES FOR COAL USE

While estimating the prospects of coal use it needs to be emphasised that:

– There is a high potential for coal burning power plants in Poland, which will lead to high levels of emissions in the atmosphere and decrease the flexibility and safety of the domestic energy system.
– Because new hard coal deposits have not been prepared for exploitation, domestic resources may turn out to be insufficient to meet the demand for the fuel. It will necessitate a significant rise in extraction costs, which will be related to outlays for preparing new extraction capacities for exploitation.
– It is estimated that brown coal deposits currently exploited will support existing power stations supplied by this fuel to continue operating until at least 2025.
– In order to boost the effectiveness of the energy sector and reduce the emissions of the contaminants to the atmosphere, the introduction of modern technology for coal burning seems to be necessary. This idea however is not very popular or effective, private investors are not interested and some negative environmental consequences are predicted in the aftermath of such a solution. Therefore, it cannot be expected that the gasification of coal will provide a financially competitive gas source in Poland.

These factors have contributed to the fact that according to *Długoterminowa prognoza…* the demand for hard and brown coal in 2025 will remain similar to the current level. The main recipient of such fuels will be the power industry, currently using more than 60% of hard coal and all the brown coal extracted.

To sum up, it may be claimed that:

– according to the plans, reduction in the consumption of coal is not anticipated in Poland, which would help in the modernization of the domestic structure of energy sources;
– the degree of coal use in the domestic energy sector will depend mainly on the policy related to subsidizing the mining industry as well as the pace and scale of building new installations, which will utilise other energy sources;
– EU competition policy will bring the subsidizing of the mining industry in Poland to an end, which will lead to changes in the structure of primary energy sources in this country.

3. THE PROSPECTS OF OIL USE

The use of natural gas, despite its ecological effectiveness, will be limited because of the greater advantages of oil and nuclear energy.

The following factors will determine the future use of oil:

- a change in the standard of living in Poland resulting in a greater demand for motor fuels;
- the scale of fuel oil used by household recipients – such a solution is not currently competitive in terms of price in comparison with the price of natural gas;
- government policy connected with the excise duty on fuel oil, making the fuel attractive in terms of price;
- eventual diversification of oil deliveries to Poland.

It is expected that the rise in demand for oil will be covered by a further increase in importation realized through the pipeline "Friendship" and/or alternatively by Naftoport in Gdańsk, to which oil is transported by sea and then delivered through pipelines to oil refineries in Gdańsk and Płock. The diversification of oil deliveries to Poland could be achieved by the exploitation of the Odessa-Brody pipeline, which, after ITS planned lengthening from Ukraine to Poland, could make it possible to deliver oil from deposits bordering the Caspian Sea area to serve domestic needs as well as the needs of other EU countries. In order to reduce the risk of oil supplies to Poland being interrupted, it is also necessary to increase storage farms and for state institutions to ensure that Polish oil companies store sufficient reserves of these fuels.

4. EVALUATION OF THE POSSIBILITIES FOR NUCLEAR ENERGY USE AND RENEWABLE ENERGY SOURCES USE IN POLAND

Nuclear energy may be a financially competitive energy source in Poland. Building a nuclear power plant may be one of the basic activities contributing to the increase of energy independence of the country. There is also a fear that without a nuclear power station our country will not be able to meet the increasing demand for energy. Therefore, it is expected in *Polityka energetyczna*... that such a project will be realized in Poland after 2020. According to the authors, the postponement of the construction of a nuclear power plant indicates a lack of will of the decision-makers to modernize the domestic energy sector. The decision-makers have retreated under pressure from the mining industry lobby but at the same time do not take into account the future needs of the economy and world standards of conduct in such situations.

This statement may be supported by the following factors:

- social support for building such installations in the country, indicated by the results of surveys conducted [9],
- price competitiveness of energy from nuclear power plants and the ecological attractions of such a solution (*The cost*…)[2)],
- stability of energy production costs in nuclear power plants resulting from the possibility of obtaining fuel for such plants from numerous sources,
- great dependability of fuel deliveries to the power plant,
- high security of nuclear technology due to the use of reliable procedures guaranteeing safety of installation.

[2)] *cf.* P. Frączek and M. Kaliski [4].

Forecasts included in *Polityka energetyczna*... emphasise the growing role of renewable energy sources in the domestic energy balance. Operations carried out according to *Strategy for renewable energy industry development* – adopted in Poland – will lead to 7.5% of renewable energy sources share in the structure of primary energy sources being achieved by 2010 and 14% by 2020. The high cost of energy from renewable energy sources suggests that their development should only be connected to the fulfilment of EU directives concerning this issue. The low level of renewable energy sources growth and use together with forecasts indicate that it will be impossible to achieve the presumed targets.

5. EVALUATION OF THE FUTURE ROLE OF NATURAL GAS IN THE DOMESTIC ENERGY SECTOR

According to *Długoterminowa prognoza*…, the stabilisation of coal demand will be accompanied by the rise in demand for natural gas. This rise will result from a greater use of natural gas for electrical energy production. If the uninterrupted flow of gas may be maintained[3] it can be expected that in the years 2003–2025 consumption will grow substantially, in comparison with 2003 (depending on the variant, between 110–176.9%). This increase in natural gas consumption will cause a change in the structure of the domestic energy balance creating one that is more environmentally-friendly. Previous versions of the energy policy assumed a substantial growth in gas consumption. No steps however, aimed at increasing natural gas consumption in Poland have been taken. It should be emphasised that the government has a wide range of tools at its disposal, which enables it to boost natural gas consumption in Poland.

Such tools are as follows:

- a change in the price relationship between coal and other energy sources, which require a reduction or cessation of subsidies for the coal mining industry;
- governmental corporate supervision of PGNiG SA, which may necessitate an increase in effectiveness and the amount of investment in gas infrastructure, which is an indispensable condition for the development of the gas market in Poland;
- reducing the profitability of PGNiG SA operations, which will lead to reductions in the price of gas;
- more emphasis put on the regulation of PGNiG SA and GAZ-SYSTEM Sp. z o. o. in order to boost their effectiveness and thus lower gas prices for consumers;
- introduction of a programme of gas return by PGNiG SA – current government policy indicates that its position is protected, which means the postponement of such activities until the European Commission forces their realization[4];
- forming the norms of contaminants emissions and the charge rates for environment protection necessitating the use of ecological fuels;
- granting tax relief to the subjects investing in clean technologies;

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[3] *cf.* J. Siemek [16], S. Rychlicki and J. Siemek [15].

[4] The programme of gas return in Great Britain is broadly discussed by P. Jasinski *et al.*[5].

– a chance to adopt more profitable amortization charges in respect of the installations run by natural gas, compared with coal installations;
– making society aware of the shortcomings of the current energy policy pointing to its consequences for the environment and the quality of life in Poland.

A significant increase in gas consumption in Poland will arise from the entire country becoming connected to a mains gas supply. The current, rather low level of mains supply[5)] does not enable many households and industrial recipients to use gas fuel as they are unable to connect to the gas network. The development of infrastructure will be related to the operational activities of PGNiG SA, gas transmission and distribution operators as well as the activities of new market participants. Such activities will help to supply the so-called white areas on the gas map of Poland. Further development in the country will boost the significance of natural gas in the structure of primary energy sources and will facilitate the reduction of harmful emissions to the atmosphere.

The rise in gas consumption in Poland may be influenced by its use in electricity generating industry thanks to the widespread co-generative production of electricity and heat based on burning natural gas. Such installations are used when there is a demand for both types of energy[6)].

The ecological and economic benefits may be related to the widespread use of compressed natural gas (CNG) to drive vehicles. This way of gas use is not connected with the radical growth of its use on a national scale but it may contribute to the reduction of harmful emissions and noise levels in cities. The attraction of using natural gas for driving vehicles is connected with its competitive price, in comparison with fuel or diesel oil[7)]. Using gas for driving buses would make it possible to reduce exhaust fume emissions and reduce the amount of noise in city centres. Such a solution is used on a large scale in highly industrialized countries[8)]. The development of such applications of gas entails the necessity to build capital-consuming installations for refuelling vehicles. It is forecast that in the next 10 years, the creation of 50 CNG gas stations will allow approximately 2.3 thousand buses to be fuelled by natural gas (on a national level there were only 150 gas powered vehicles in 2003.) Municipal vehicles and lorries will also be the recipients of CNG.

The great possibilities of gas use are connected to the building of coal blocks powered by gas motors or gas turbines. Such a solution will contribute to improved economic effectiveness of their work, increase in efficiency of electrical energy production and the reduction of pollutants being released into the natural environment [8]. Analyses of the projects using coal blocks powered by gas motors or gas turbines. indicate that there is now little chance in Poland of such solutions becoming widespread [1]. Their attraction will depend on the relationship between the price of natural gas, coal and thermal energy.

To summarise, it may be pointed out that:

– lowering political risk of interrupted gas supplies and the liberalisation of the energy market will provide the basis for the development of the gas market in Poland;

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5) In Poland 58% of places are gasified, in Hungary 87%. *cf.* Z. Łucki and M. Wiernek [10, p. 3].
6) The advantages of cogeneration installations are discussed by A. Matkowski and Z. Budziński [11].
7) Price competitiveness of CNG is discussed by A. Podziamska [12].
8) 450 000 vehicles in Western Europe burn CNG.

– the development of the natural gas market will improve the economic effectiveness of the gas used and will lead to ecological benefits;
– a condition necessary to use gas in Poland on a larger scale is to abandon the energy policy which currently focuses on coal promotion, in favour of using other, more environmentally-friendly fuels such as natural gas;
– increased consumption of natural gas will ensure the levels of SO_2, NO_x and CO_2 reduced to an acceptable level, specified by the international commitments of Poland;
– there are technical solutions in Poland for the effective and ecological use of gas.

6. CONCLUSIONS

To conclude, it may be said that:

– a condition necessary to increase gas deliveries to Poland is to have a guarantee for deliveries of this fuel and to boost the effectiveness of PGNiG SA, which will help to achieve a competitive level of natural gas prices;
– because of the effectiveness of its use and its ecological benefits, natural gas is a competitive energy source (not taking into account the competition of subsidized coal);
– tax policy of the state related to the rate of duty levied will determine the price competitiveness of natural gas in comparison with fuel oil and renewable energy sources;
– there are chances for diversification of oil deliveries to Poland;
– diversification of oil deliveries to Poland is threatened by Russia taking measures aimed at blocking the delivery of resources from Asian countries to Europe;
– it will be necessary to build a nuclear power plant in Poland which will generate cheap electrical energy by means of ecologically clean technology;
– the consumption of ecological fuels is growing very slowly in Poland – this growth is connected with the realisation of the requirements included in EU directives about promoting renewable energy sources;
– there are great chances of renewable energy sources development related to the topography of Poland, but because of high costs, the development of RES should be limited only to fulfilling the requirements imposed by EU directives;
– it is expected that the achievement of the assumed level of renewable energy sources share in the domestic energy balance will not be possible.

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