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THE STATE POLICY FOR NATURAL GAS SECTOR**SEKTOR GAZU ZIEMNEGO W POLITYCE PAŃSTWA**

This article reviews the state policy for natural gas sector. A particular attention has been given to how the assumptions of gas demand, import volumes and gas production from domestic reserves have developed in strategic documents. The restructuring of natural gas sector has been brought closer on the example of PGNiG S.A. (Polish Oil and Gas Company), and changes in the domestic gas market resulting from the implementation of EU law have been discussed as well. Major changes in the domestic gas market in the period of 1990-2011 have been presented along with the cooperation between Poland and Russia regarding the natural gas supply for the Polish market.

Keywords: natural gas, energy policy, energy security, natural gas reserves, unconventional gas, gas production

W artykule dokonano przeglądu polityki państwa wobec sektora gazu ziemnego. W sposób szczególny przeanalizowano jak kształtowały się w dokumentach strategicznych prognozy w zakresie zapotrzebowania na gaz, wielkości importu i wydobycia gazu ze złóż krajowych. Przybliżono także restrukturyzację sektora gazu ziemnego na przykładzie PGNiG oraz zmiany na krajowym rynku gazu wynikające z implementacji prawa UE. Wskazano najważniejsze zmiany na krajowym rynku gazu ziemnego w latach 1990-2011 oraz scharakteryzowano współpracę polsko – rosyjską w zakresie dostaw gazu do Polski.

Słowa kluczowe: gaz ziemny, polityka energetyczna, bezpieczeństwo energetyczne, zasoby gazu, niekonwencjonalne złoża gazu, wydobycie gazu

1. Introduction

Changes in the natural gas sector over the past twenty years have been largely determined by the state policy. The state has affected the gas sector both by acting as a regulator and through corporate governance of major firms in the industry. Despite having the necessary tools one may

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notice that for more than twenty years the state has not been able to consistently develop and implement a comprehensive and long-term strategy for the natural gas sector, which on the one hand would ensure the development of companies in the industry and affect greater energy security, on the other hand, mindful of the interests of both household and industrial customers, the emergence of real competition in the gas market is considered to be essential (Paczewski, 2011).

Changes in the domestic natural gas sector may be analysed on the example of the main company in the sector – the Polish Oil and Gas Company (PGNiG). The PGNiG restructuring process, which began in the 1960's has changed several times; its completion can be the unbundling of transmission networks from PGNiG structures – under the national legislation adjustment to EU law – and the emergence of PGNiG – Przesył Sp. z o.o. (April, 2004), then converted to Gas Transmission Operator GAZ-SYSTEM S.A. (June, 2005). When assessing the natural gas sector through the participation of the leading company in the mining, trade or gas storage segment, over the last two decades one can see that little has changed in practice. However, it seems that new regulations being finalised for natural gas will contribute to boost competition in the domestic gas market. The renegotiation of price conditions in the Yamal contract, further liberalisation of the gas market, increasing extraction of natural gas from domestic deposits and start-up of LNG deliveries through a terminal in Świnoujście should translate into a faster development of the domestic gas market. The emergence of new suppliers of natural gas will enable the development of a competitive gas market, which should translate into lower gas prices for end customers (Frączek & Kaliski, 2009).

In terms of diversification of gas deliveries to Poland, in principle, only in the last few years there have been significant changes: an interconnector with the Czech Republic was implemented in the Cieszyn area (September, 2011) and an interconnector with Germany in Lasów was developed (end of 2011). These investments, and the ability to supply gas under the so-called virtual reverse gas flow on the Polish section of the Yamal pipeline since November 2011, translate into greater Poland's energy security. By implementing these solutions in 2011, greater technical possibilities appear to import gas to the country from new directions, which are alternatives to the eastern source, by ca. 3.3 bn m³/year, which totals approx. 30% of realised natural gas imports to the Polish market. Currently, the most important project aimed at diversifying gas supplies to Poland is the construction of LNG terminal in Świnoujście. The completion of this project is planned for mid-2014 (Ministry of Economy, 2012; Siemek et al., 2011).

2. Main determinants of the Polish natural gas sector

In the years 1990-2011 natural gas consumption increased from 9.9 bn m³ to 15.1 bn m³, and the extraction of natural gas from domestic reserves has increased from 2.6 bn m³ to 4.3 bn m³ (before the economic transition the extraction level was higher – 4.2 bn m³ in 1988, and at the highest level in 1978 – 6.6 bn m³ – these amounts of gas covered 71% of domestic demand). In the analysed period gas imports were achieved mainly from the east. The share of gas in the structure of primary energy consumption increased from 8.5% (1990) to 13.4% (2011). During this period the structure of natural gas consumption also changed; while in 1990 households received 2.87 bn m³, then in 2011 the consumption of gas by these recipients amounted to 3.73 bn m³. This increase was mainly due to the connection of new customers to the gas network. In 2011, PGNiG S.A. held 96.4% share in the sales of natural gas in the domestic market (about 6.7 million customers). It is worth noting that in the first half of the 1990s households

received town gas and coke oven gas, in addition to natural gas, and the number of recipients of these gaseous fuels was approximately 0.9 million in 1990, while the number of natural gas consumers including nitrogen-rich gas – 4.8 million. Finally, in an effort to rationalise energy management and having regard to ecological factors, in 1996, the supply of town gas to the gas system was discontinued – the last urban gasworks in Bystrzyca Kłodzka was closed. As for industrial recipients, the greatest part of gas is being used by chemical industry, including the production of fertilisers. The demand for gas in electricity and heat generation is steadily growing. In 2011 the supply of gas to electricity-only plants, CHP plants and heat-only plants amounted to 1.4 bn m³. It is estimated that in the next few years the use of natural gas for energy will increase (Kaliski et al., 2012).

In 1996, as a result of exploration work carried out by PGNiG within the Sudetic Monocline, an oil and gas deposit ‘Barnówka-Mostno-Buszewo’ was discovered, the biggest since the Second World War (PGNiG, 1997). The current level of proved natural gas reserves is ca. 100 bn m³. When analysing changes in the natural gas underground storage segment an improvement is noticeable in this area; if, for example, in 1996 the domestic working volume was too small to secure the system (4 underground gas storage facilities with a total capacity of 0.66 bn m³) and the need to lease storage capacity in Ukraine and Belarus appeared, then before the winter season 2012/2013 the national UGS (underground gas storage facilities) stockpiled about 1.9 bn m³ (6 UGS). This capacity enables the proper functioning of the gas system without having to book capacity in other countries (PGNiG, 2012).

3. Natural gas sector in strategy papers

3.1. Assumptions for the Republic of Poland’s Energy Policy from 1990 to 2010, of August 1990

Table 1 presents the Polish natural gas supply scenarios in accordance with the Assumptions for Energy Policy of the Republic of Poland for the years 1990-2010, by the Ministry of Industry, of August 1990. This document projected a dynamic growth in gas demand, and to balance the domestic need a significant import increase was essential – about 20 bn m³ in 2010. This document provided a significant increase in the share of natural gas in Poland’s primary energy consumption structure, from 6.7% in 1990 to 11.1-14.8% in 2000, and 13.0-14.5% in 2010, depending on the scenario.

TABLE 1

Extraction and import of natural gas by scenarios [bn m³]

| No. | Description | 1988 | 1990 | L | | A | | H | |
|-----|-------------|------|------|------|------|------|------|------|------|
| | | | | 2000 | 2010 | 2000 | 2010 | 2000 | 2010 |
| 1. | Extraction | 4.6 | 4.1 | 6.3 | 6.9 | 6.4 | 6.8 | 6.3 | 6.8 |
| 2. | Import | 7.4 | 7.8 | 10.5 | 15.9 | 14.5 | 20.9 | 19.8 | 25.5 |

It was emphasised that obtaining gas from directions other than east will strengthen the bargaining position in negotiations with the dominant gas importer; it was also noted that energy

security requires intensive efforts when it comes to additional imports from a direction other than the USSR. Also the Parliament, in 1990, included import sources diversification, increased domestic gas production and expansion of the transmission network to the basic national energy policy guidelines (*Resolution...*, 1990).

The lower scenario (L) assumed average economic growth in the years 1991-2010 at ca. 3% per year, the average scenario (A) – ca. 5% per year, and the higher scenario (H) – ca. 8% per year, and the next decade 5% per year.

In December 1992, the Economic Committee of the Council of Ministers approved the *Programme of Polish supply of natural gas till 2010*. This document, as well as government document of 1990 foresaw the natural gas consumption in Poland at 27-35 bn m³ in the year 2010. Furthermore, the document provided for:

- diversification of gas imports sources, including the extraction of natural gas from reserves in the North Sea and its transportation through a pipeline built for this purpose (Polpipe), through the territory of Denmark, and the Baltic Sea to Poland;
- extension of storage capacity;
- increase in gas production from demethanation of coal deposits.

The Document of 1992 committed the Ministry of Industry and Trade to take action aiming at the construction of a gas pipeline from Russia and the conclusion of a long-term gas supply contract for the Polish market.

3.2. Intergovernmental Agreement between the Russian Federation and Poland – 1993 and 1995

On 25 August 1993, the *Agreement between the government of the Republic of Poland and the government of the Russian Federation on construction of a transit gas pipeline system for transportation of Russian natural gas through the territory of the Republic of Poland and on deliveries of Russian gas to the Republic of Poland* was signed in Warsaw by Henryk Goryszewski, Deputy Prime Minister of the Republic of Poland, and Oleg Łobow, Deputy Prime Minister of Russia. This intergovernmental agreement of 1993 provided, i.a. for:

- the increase of Russian gas supply to Poland up to 14 bn m³/y from 2010 through the conclusion of relevant contracts;
- the building of a transit gas pipeline system with a target transport capacity up to 67 bn m³;
- the establishing of the companies: PGNiG, and Gazprom for the construction and operation of gas pipeline network.

Although the agreement of 1993 stipulated the establishment of a special purpose vehicle where shares were to be held by PGNiG and Gazprom at 50% each, yet, due to the then applicable requirements of the Commercial Code, the formation of a limited company required the involvement of at least three parties. The third shareholder became Gas Trading company with 4% share, PGNiG and Gazprom shared 48% each.

Subsequently, mainly in order to agree on technical details of the implementation of agreement of 1993, the *Protocol between the Government of the Republic of Poland and the Government of the Russian Federation on organisational projects aimed at ensuring the implementation of the Agreement between the Government of the Republic of Poland and the Government of the*

Russian Federation to build a transit pipeline system for transportation of Russian natural gas through the territory of the Republic of Poland and on deliveries of Russian gas to the Republic of Poland, of 25 August 1993 was signed in Warsaw on 18 February 1995. The protocol of 1995 was signed by Marek Pol, the Polish Minister of Industry and by Oleg Dawidow, Russia's representative. The result of intergovernmental agreements with the Russia was the conclusion of a sale agreement of Russian natural gas to the Republic of Poland, of 25 September 1996 with "Gazprom export" (the so-called Yamal contract.) This contract provided for deliveries starting in 1997 and for their gradual increase to 13 bn m³/per year in 2010. On the whole, Poland was to receive 250 bn m³ of gas over the period of 25 years. It is worth noting that in the 1990s Russian gas was supplied under other contracts, i.a. the Orenburg supply contract which finally expired in 1999. The Yamal contract, like most long-term contracts, contained i.a. a clause to prohibit re-export of gas and the 'take or pay' rule – in the event PGNiG received less than 85% of the ordered gas it was forced to pay the 85% of gas, and the remaining 15% could be received within the next 10 years (Zawisza, 2011).

3.3. Poland's Guidelines for Energy Policy till 2010, of 1995

According to the *Poland's Guidelines for Energy Policy till 2010*, a governmental document adopted by the Council of Ministers on 17 October 1995, the most important tasks in the supply of natural gas were (Ministry of Industry and Trade, 1995):

- maximum possible and economically viable increase in the domestic gas production, including volumes obtained from the demethanation of coal deposits;
- increase in supply of gas from Russia, i.a. through the construction of a new gas pipeline from Russia to Western Europe; the gas supply is based on long-term contracts;
- building of gas tanks on the Polish territory and the creation of gas reserves and stockpiles;
- seeking to ensure gas supplies from other geographical directions.

Futhermore, the document stipulated that the government would accept the PGNiG's restructuring programme, under which it was assumed to spin-off companies into a separate oil and gas company, transmission and wholesale trading company, and gaseous fuels distribution company. As for gas supply the document projected domestic production at (bn m³): 5.0-5.9 in 2000, and 4.6-5.7 in 2010, and imports of natural gas (bn m³): 7.9-10.0 in 2000, and 12.6-24.4 in 2010. The expected significant increase in gas demand up to 22-27 bn m³ in 2010 (PGNiG forecast) was associated with the rapid growth of natural gas use in power generation – about 7.5 bn m³ in 2010. For comparison, domestic demand for natural gas in 1994 amounted to ca. 9 bn m³. It was pointed out that the actual demand for gas would depend on the outcome of negotiations on Russian gas prices in long-term contracts and fees for environment pollution while coal burning. As for investment, the paper showed the need for expanding underground gas storage facilities and the development of transmission and distribution networks. In terms of natural gas prices it was shown that to ensure self-financing of PGNiG it would require a real growth for households and industry by some 18%.

3.4. Restructuring programme of PGNiG

Consequently to what was announced in the *Polish Guidelines for Energy Policy till 2010* on PGNiG restructuring process, the Council of Ministers approved on 2 April 1996 *The Organizational Restructuring Programme of the Public Utility PGNiG*. This programme provided for:

- PGNiG transformation into a state-owned company;
- creation of companies: Polskie Górnictwo Naftowe SA (Polish Oil Company) and Polskie Gazownictwo SA (Polish Gas Company), included in the PGNiG Group;
- unbundling and conversion of technical and service facilities into a commercial company.

The PGNiG's organisational restructuring was necessary to bring the company into line with the requirements of the market economy, and economic and structural solutions of foreign companies working with the firm (Chancellery of the Prime Minister, 1996).

The main objective of the restructuring programme of 1996 had not been achieved – the Polish Oil Company and the Polish Gas Company had not been created. However, at the end of October 1996, PGNiG was transformed into a company wholly owned by the Treasury, and technical facilities were unbundled and partially privatised (Kaliski et al., 2007). In the years 1999-2000, PGNiG carried out an internal restructuring process, the so-called small restructuring which distinguished three types of activities (Paczewski, 2011):

- exploration and production,
- transport and storage,
- distribution.

As a result of these changes, various activities were provided with separate billing and this solution brought the functioning of PGNiG into line with the requirements of the Gas Directive 98/30/EC. In May 2000, the Council of Ministers approved the change of the restructuring programme of 1996. Following the government's decision, in December 2000 four gas distributors and the Polish Oil Ltd. dealing with exploration and production were unbundled from PGNiG. They failed to take effect, however, from 1 January 2001 due to serious problems with transferring their assets (Kubacka, 2001; PGNiG, 2001). Then on 13 August 2003 the government adopted the *Restructuring and privatisation programme for PGNiG SA*, which assumed i.a.:

- that the number of companies operating in the gas distribution would be increased from four to six, unbundled from PGNiG (a decision was to be taken by the Council of Ministers on the possible privatisation of distribution companies at a later date);
- functional separation of marketing from network within distribution companies;
- disposal through a public offering of a minority stake of PGNiG on the Warsaw Stock Exchange and/or in foreign capital markets;
- that at least 51% of PGNiG capital stock would be held by Treasury;
- PGNiG action aimed at gasification of non-gasified areas.

The restructuring programme of 2003 aimed at adequate preparation of PGNiG to the liberalisation of the natural gas market under international competition after the implementation of the Third Party Access rule. Distribution companies (100% owned by PGNiG) commenced operations on 1 January 2003.

Further changes in the domestic gas market were mainly dictated under bringing national regulations into line with EU changed regulations. In 2003, the Gas Directive 2003/55/EC was adopted, aiming at accelerating the liberalisation of the gas sector. In accordance with this

Directive, by 1 July 2007 the right to choose a gas supplier under TPA rule was to be given to households, and distribution system operators were to be legally unbundled from other activities. In Poland, according to the Decree of the Minister of Economy, Labour and Social Policy of 20 January 2003 on the *Schedule for Getting the Public the Right to use Gas Transmission Services*, larger recipients (with consumption of more than 15 million m³ in 2003) became entitled to use TPA rule from 1 January 2004, and all the others, including households, from 1 January 2006. The Council of Ministers, on 27 April 2004, also adopted the *Programme for Establishing a Competitive Natural Gas Market and its Schedule*, in line with the requirements of the Directive. The purpose of this programme was to introduce market mechanisms, while maintaining the reliability and the development of natural gas transmission systems, as well as compliance with the requirements of EU on functioning of the natural gas market. It was assumed that as a result of this programme a competitive gas market would be created where network services would remain a regulated activity, while gas prices for customers eligible to choose their supplier would become contractual prices, excluded from the regulation. This programme assumed i.a. the unbundling of transmission activities concerning infrastructure and investment activity – a distribution network operator was to be unbundled from PGNiG in the 2Q of 2004, and the legal unbundling of distribution system operators was planned for the 4Q of 2005. The programme also projected investments in the development of gas networks by calling on the *Operational Programme Infrastructure and Environment* resources.

Adopted by the Council of Ministers on 5 October 2004 the *Programme for Restructuring and Privatisation of PGNiG SA* projected continued efforts to spin-off a transmission system operator and distribution system operators. On 28 April 2005 the Annual General Shareholders Meeting of PGNiG SA agreed to free disposal of 100% of Gas Transmission Operator Gaz-System Sp. z o.o. to the Treasury, then on 13 May 2005, the shares of Gaz-System Sp. z o.o. were transferred to the State Treasury, and on 18 September 2006, the Extraordinary General Meeting of Shareholders of Gas Transmission Operator Gaz-System Sp. z o.o. passed a resolution to transform the Company into a public company. On 6 July 2005 an operational leasing agreement of system components (such as pipelines, compressor stations, pressure reducing and survey stations) was concluded between PGNiG SA and *Operator Systemu Przesyłowego* (Transmission System Operator). The agreement was concluded for 17 years, and in 2005-2006, Gas Transmission Operator Gaz-System SA acquired transmission assets worth a total of PLN 1.18 bn through a contribution from the State Treasury, in the form of a non-pecuniary dividend due to the State Treasury from the profit generated by PGNiG SA. The agreement was formally terminated on 7 October 2011. The value of the share capital of Gas Transmission Operator Gaz-System S.A. at the end of 2011 amounted to PLN 3,772 bn (Ministry of Economy, 2012).

3.5. Poland's Guidelines for Energy Policy till 2020, of 22 February 2000

According to the Act adopted on 10 April 1997 – *The Energy Law*, the Minister of Economy was obliged to prepare, at the agreement of relevant ministries, the state energy policy assumptions presenting a long-term forecast of the development of fuel and energy economy for a period not shorter than 15 years, and a long-term state action programme to implement conclusions resulting from the forecasts formulated on the basis of national energy security assessment. The document *Poland's Guidelines for Energy Policy till 2020* prepared by the Ministry of Economy

was approved by the Council of Ministers on 22 February 2000. In this document the projected demand for fuels and energy was analysed as three scenarios:

- SURVIVAL SCENARIO – implemented in low global growth, moderated by political upheavals; the average GDP growth rate is established at ca. 2.3%;
- REFERENCE SCENARIO – takes place in conditions of political stability and development of the international environment without shocks and sudden changes; Poland's GDP growth rate established at ca. 4.0%;
- PROGRESS-PLUS SCENARIO – carried out in a favourable international environment, positive economic changes are following; the GDP growth rate established at 5.5%.

Table 2 shows the projection of demand for natural gas in different scenarios. A significant increase in demand for natural gas is noticeable, mainly due to projected demand from the power sector (co-generation plants with medium and small power) and district heating. The document stressed that natural gas will be competitive against coal due to higher conversion efficiency, lower CO₂ emission per unit and NO_x, as well as virtual lack of SO₂ and dust emissions. The document assumed that the share of natural gas in the primary energy consumption in 2020 will be at 18.6% to 20.7%, depending on the scenario, which is much increase, as compared with 1997 where this share was at 9.1%.

TABLE 2

Projection of demand for natural gas in the years 2005-2020

| Scenario | Description | Unit | 2005 | 2010 | 2015 | 2020 |
|---------------|----------------------|------|------|------|------|------|
| SURVIVAL | natural gas | bcm | 16.4 | 19.7 | 22.9 | 26.0 |
| | share of natural gas | % | 15.4 | 18.1 | 20.7 | 23.2 |
| REFERENCE | natural gas | bcm | 17.9 | 22.0 | 25.0 | 29.3 |
| | share of natural gas | % | 16.8 | 20.2 | 22.2 | 25.2 |
| PROGRESS-PLUS | natural gas | bcm | 15.7 | 18.4 | 22.1 | 27.6 |
| | share of natural gas | % | 14.8 | 16.9 | 19.7 | 23.8 |

In the document of 2000 the projected gas import for 2020 amounted, depending on the scenario to approx. 22 bn m³, 24 bn m³ and 26 bn m³. It was assumed that in 2010 the possibility of ongoing supply would amount to 14.5-16.0 bn m³; therefore it was necessary to seek for sources of additional supply from import, ca. 3-6.5 bn m³. It was stressed that the diversification of import sources meant a direct infrastructure connection with at least two foreign deposits of natural gas through pipelines crossing the state borders and required gas imports from Western Europe. It was mentioned that the alternative option for natural gas supply by sea (LNG), was in the very initial stages of design and it was necessary for its implementation to examine possible restrictions of fuel transport through the Danish Straits.

It is worth noting that at the time other predictions were also made, i.a. a model of gas consumption in Poland in the years 2002-2070 was proposed following Hubbert and Startzman works (Nagy et al., 2002). Poland's projection of demand for natural gas foresaw some 15 bn m³ in 2010, in 2020 some 22 bn m³ and today it is clear that it was much closer to reality than the government projection.

The Evaluation of the Implementation and Revision of the Poland's Guidelines for Energy Policy till 2020, adopted by the Council of Ministers on 2 February 2002, assumed domestic

demand for natural gas in 2005 at 13.7 bn m³ (Base Option) and 12.7 bn m³ (Efficiency Option). Furthermore, the document provided approx. 50% increase in storage capacity in 2005 with respect to 2000.

3.6. Energy Policy of Poland until 2025, of 4 January 2005

On 4 January 2005 the Council of Ministers adopted the *Energy Policy of Poland until 2025*. The document emphasizes that to ensure the security and continuity of natural gas supply it is essential for the state to influence diversification of gas supply directions to domestic recipients. The development of technology enables the use of other means of transport apart from domestic road networks for natural gas deliveries, but this requires the building of an appropriate technical infrastructure, including storage and network infrastructures, allowing imports of liquefied natural gas LNG or compressed natural gas CNG by sea, from sources unavailable to transport via pipelines. The document provided for the reduced emissions of air pollutants, including greenhouse gases, by increasing the share of renewable energy sources and hydrocarbon fuels in the overall primary energy balance.

The document of 2005 does not provide detailed forecasts of development of the energy balances for individual energy carriers. This document is limited to the projected increase in primary energy consumption at 41-50% level, and electricity at 80-93% in the next 20 years. Four variants were assumed: Treaty Variant, Basic Coal Variant, Basic Gas Variant and High-Efficiency Variant. Projections of demand for natural gas as defined in the working material (dated 2 December 2004) assumed that the domestic gas demand would be balanced primarily through imports, which had to be at 12.5 bn m³ in 2010, 18-25 bn m³ in 2020 and 21-29,5 bn m³ in 2025, with domestic production at ca. 5-6 bn m³/year. The Basic Gas Variant assumed that the supply of hard coal for electricity generation would be maintained at the current level, and that the additional fuel needed to produce the necessary amount of electricity would be primarily natural gas. In view of this, the total demand for gas in the perspective of 2025 stood at ca. 35 bn m³ (Kaliski & Staško, 2005).

3.7. Intergovernmental Agreement with the Russian Federation – 2003

On the conclusion of negotiations, on 12 February 2003, with the Russian party, on the *Additional Protocol to the Agreement between the Government of the Republic of Poland and the Government of the Russian Federation to build a pipeline system for the transit of Russian gas through the territory of the Republic of Poland and Russian gas supplies to the Republic of Poland on August 25, 1993* the needed amount of natural gas purchase was reduced from 218.8 bn m³ to 161.3 bn m³, while the Yamal contract was extended by two years, that is until 2022 (Fig. 1).

While the projected total gas supply under the Yamal contract of 1996 created a dangerous situation in which Poland would be forced to pay for amounts of gas the country could not receive, the amended formula of deliveries, of 2003, provided for the volume of supply under the Yamal contract which prevented domestic needs from being properly balanced. Therefore, in 2003 contracts were signed for the supply of 2 bn m³ of gas per year and 1 bn m³ of gas by 2006, with companies such as NAK Naftogaz and EuralTransGas. Then, in October 2004 an

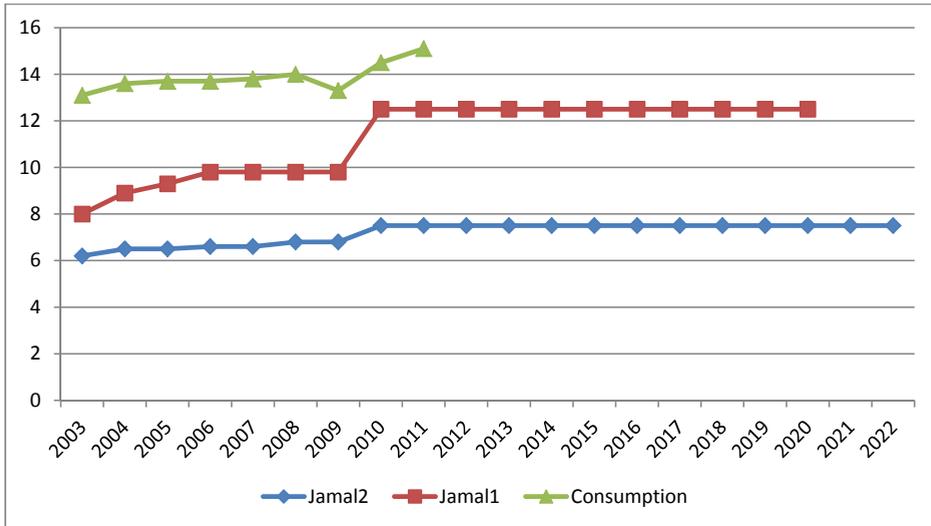


Fig. 1. The changed supply formula of Russian natural gas to Poland resulting from intergovernmental agreement of 2003 against the domestic demand for gas in 2003-2011

agreement with NAK Naftogaz was extended until the end of June 2005, and the gas supply intermediary remained EuralTG. In March 2005, the intermediary company EuralTG was replaced by RosUkrEnerg, in August of the same year, the company RosUkrEnerg won the tender for the supply of 3.16 bn m³ till the end of December 2006 (Zawisza, 2011).

Contracts for additional gas supplies helped meet quantitative targets set out in the Regulation of the Council of Ministers of 24 October 2000 *on the minimum level of diversification of gas supplies from abroad*. The regulation defined the maximum share of natural gas imported from one country of origin, in relation to the total volume of imported gas in a given year and these shares were as follows: 88% in 2001-2002, 78% in 2003-2004, 72% in 2005-2009, 70% in 2010-2014, 59% in 2015-2018 and 49% in the years 2019-2020 (Regulation..., 2000).

3.8. Policy for Natural Gas Industry of 2007

On 20 March 2007, the Council of Ministers adopted *The Policy for Natural Gas Industry*. The purpose of this document was to identify measures to improve Poland's energy security and the development of its gas market. The supporting objectives of the document were (Minister of Economy, 2007):

- providing long-term contracts aimed at meeting domestic demand for natural gas;
- constructing and extending the infrastructure so as to enable the diversification of sources and routes of gas supply to Poland along with securing uninterrupted supplies to customers;
- creating a mechanism for responding to crisis type situations;
- protecting the interests of the State in strategic companies of the natural gas sector.

The document of 2007 indicated key tasks improving Poland's energy security in terms of natural gas, which are i.a.:

- direct connection by a pipeline with Scandinavian gas deposits;
- construction of a terminal for receiving liquefied natural gas on the Polish coast;
- ensuring long-term contracts for the supply of natural gas from sources other than the eastern direction;
- extending the natural gas transmission system;
- increasing the working capacities of underground gas storage facilities;
- increasing the potential for domestic gas extraction,
- obtaining by the PGNiG Group access to crude oil and natural gas deposits, also through their acquisition abroad.

This document requires the Minister responsible for energy security to present the Council of Ministers, every two years up to 2015, with a report on its implementation. When submitting a report for the years 2007-2009 the Minister of Economy applied to the Council of Ministers to recognise the document *Policy for natural gas industry* as not mandatory. The recognition of this document as not mandatory was supported by the adoption of the *Poland's Energy Policy till 2030* by the Council of Ministers on 10 November 2009, which contains a detailed schedule of activities planned to be implemented in natural gas sector, with an indication of how to implement them, and the entities responsible for each action and measures. The Council of Ministers on 8 July 2010 endorsed the proposal of the Minister of Economy and recognised the document *Policy for natural gas industry* as not mandatory.

3.9. Poland's Energy Policy till 2030

The document was adopted by the Council of Ministers on 10 November 2009. The main objective of this document in the field of natural gas is to ensure national energy security through diversification of sources and directions of supplies of natural gas, and one of the main activities is the construction of an LNG terminal. The specific objectives of improving the security of natural gas supply document include, among others (Ministry of Economy, 2009):

- increasing production capacity of natural gas within Poland's territory;
- providing alternative sources and directions of gas supplies to Poland;
- expanding transmission and distribution systems of natural gas and increasing storage capacity;
- increasing natural gas resources remaining at the disposal of Polish undertakings as well as gaining access to natural gas deposits outside the country;
- using methane through surface drilling operations and recovering gas from coal gasification technology.

Figure 2 shows the projected demand for natural gas in Poland and the maximum and minimum volumes of gas supplies, resulting from the 'take or pay' principle, under the existing contract between PGNiG and Gazprom. The 2030 forecast from the current policy assumes gas consumption at 20.2 bn m³.

Figure 2 shows that in the years 2010-2011 gas consumption was slightly higher than forecast. The biggest impact on gas consumption in the coming years will depend on the implementation of the plans and intentions of energy companies in relation to the construction of combined gas

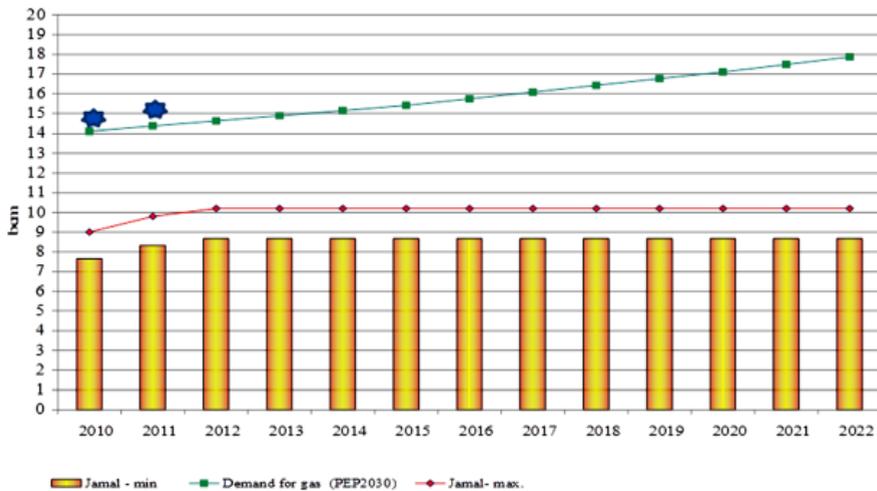


Fig. 2. Projection of natural gas demand in Poland against projected supplies under the Yamal contract

and steam plants. The current use of natural gas in power generation is relatively low compared to most EU countries. In Poland, in recent years, natural gas produced about 3% of electricity, and in some EU countries it is the most important source of energy used in the production of electricity, i.e. in the Netherlands and Italy, the share of gas exceeds 50% (Kaliski et al., 2009, 2012a, 2012b).

3.10. Intergovernmental Agreement with the Russian Federation, of 2010

As already mentioned, the intergovernmental agreement of 2003 with the Russian party resulted in reduced volume of supplies of natural gas imported under the Yamal contract and it was necessary for supply balance to conclude other contracts to import gas from eastern sources, including RosUkrEnergo. On 18 January 2009 an agreement was concluded between Gazprom and Naftogaz of Ukraine, putting an end to Russia-Ukraine gas conflict started in 2009, which eliminated RosUkrEnergo as an intermediary in the supply of Central Asian gas to the Ukrainian market, and prevented the entity from the possibility to export gas to foreign markets. Poland, despite the existing agreement, ceased to receive gas from RosUkrEnergo from 1 January 2009 (Kaliski et al., 2009). In this case, PGNiG undertook discussions with other potential suppliers of natural gas (such as E.ON Ruhrgas and Gas Terra BV), the effect of which was to be signing a contract for the supply of natural gas in quantities allowing to balance domestic consumption, but foreign companies made the supply of raw material subject to the consent the Russian party, which was not obtained. Therefore, given the existing transmission infrastructure, that is lack of adequate interconnections along the western and southern borders, the inability to obtain alternative supplies and the fact that Poland expected the conclusion of a direct gas supply contract with a company having a strong position in the European gas market, PGNiG SA adopted talks

with the Russian company Gazprom. On the conclusion of the negotiated intergovernmental agreement with the Russian Federation on 29 October 2010 the relevant protocols were signed in Warsaw (*Protocol of Amendment to the Agreement...*, 2010; *Protocol of Amendment to the Additional Protocol...*, 2010). According to these protocols, the amount of natural gas supply from the Russian Federation would be as follows (according to the Polish Standards):

- 2010 – 9.0 bn m³,
- 2011 – 9.8 bn m³,
- 2012-2022 – 10.2 bn m³ per year.

Furthermore, following the signed documents, OGP Gaz-System SA was appointed as the operator of the Polish section of the Yamal pipeline. The clause of re-exporting gas was waived. In addition, the parties expressed their willingness to sign a contract allowing to maintain the natural gas transit through Polish territory until 2045. It should be noted that with the appointment of OGP Gaz-System SA as the operator of the Polish section of the Yamal pipeline, since November 2011, gas supplies to Poland have been carried out using the virtual reverse flow service on Yamal pipeline. There are economic reasons behind the implementation of virtual reverse flow service. On the conclusion of intergovernmental negotiations in the first months of 2011, PGNiG SA started negotiations to reduce gas prices and change pricing conditions with the company Gazprom Export. However, talks with the Russian partner did not produce acceptable results for PGNiG and the Polish company decided, as other European companies, to employ legal options. In early November 2011, the Polish Oil and Gas Company started an arbitration procedure in a dispute with Gazprom over gas prices. On 20 February 2012, PGNiG SA filed a lawsuit to the Court of Arbitration. Finally, on 6 November 2012, the companies reached an agreement on natural gas prices, the new pricing formula will also take into account the current market price of gas. Therefore, the decrease in gas prices for customers is being expected at the beginning of 2013 (PGNiG 2012).

4. Conclusion

When analysing the state policy towards natural gas sector over the past twenty years one can notice high variability in terms of priorities. Admittedly the vast majority of documents of strategic character considered diversification of natural gas supply as the main goal; however, if the achievement of this goal is assessed through the growth of new opportunities in natural gas supply, then the assessment cannot be positive, especially for the period 1990-2006. During this period only one project was completed – the interconnector in Lasów on the Polish – German border, enabling the import of gas to Poland from the western direction at approx. 1 bn m³/year. Arguably important, both from the point of view of energy security, and the development of the domestic gas market, was the absence of follow-up to important investment projects. Political transformations, along with changes within the authorities of the gas sector were more frequent than the investment cycle of an important project in the gas industry (e.g., only in the years 1998-2003 four persons acted as President of the Management Board of PGNiG SA). Also when analysing the extension of working capacity of underground gas storage facilities it can be stated that actually only in the last few years an increase in storage capacity has been noticed (extension of UGS Strachocina, UGS Wiechowice, UGS Mogilno) and before the winter season 2012/2013 it was possible to stockpile gas reserves of nearly 2 bn m³ (investments currently underway, e.g.

Kosakowo, will translate into an increase in capacity in the coming years). As already mentioned in the 1990s of UGS national database was so limited that to secure the stability of the gas system it was necessary to rent UGS within Belarus and Ukraine, which was not a good solution from the point of view of Poland's energy security.

As results from the analysis presented in the article, most strategic documents projected an increase in domestic production. In recent years, a minimum increase in the extraction of gas from domestic reserves can be perceived, but compared to Denmark or Germany (countries that have similar proved gas reserves), it seems that boosting expenditure on exploration and development of hydrocarbon reserves should translate into a reduction of Poland's dependence on gas imports. Currently carried out prospecting and exploration work of unconventional gas, particularly shale gas formations, also gives hope that after the reporting of these deposits, the domestic gas production will notice additional increase. The U.S. experience shows that advances in technology made it possible to obtain a significant increase in gas production from unconventional sources, which in turn resulted in a strong decrease in gas prices. In recent years, one may notice an increase in the use of gas in power generation (gas price drop made it competitive against coal carrier). Moreover, the "shale revolution" resulted in a changed gas balance of the U.S., the largest consumer of gas. IEA forecast assumes that a further increase in gas production will make the United States net exporter of natural gas (Kaliski et al., 2012; Nagy & Siemek, 2011; Siemek & Nagy, 2012).

When assessing projections contained in strategic documents related to natural gas demand, one can see they were overvalued in most cases. They assumed a significant increase in gas consumption in the power generation sector, but in fact, in recent years, there has been no significant investment in combined gas and steam plants. Such investments are currently being planned and implemented, including Stalowa Wola, Włocławek, Puławy and Bydgoszcz. The scale of the use of natural gas in the production of electricity and heat will be determined by, *inter alia*, price competitiveness of gas against coal and the intensity of implementation of emission reduction measures in the domestic energy sector (Kaliski et al., 2009; Kaminski & Kudelko, 2010). The impact of these factors on the use of natural gas for electricity generation will depend on progressing liberalisation of the electricity market, which is integral part of the privatisation. The more monopolised electricity market, the greater number of investment decisions are based on reliable economic calculation. For the establishing of a common energy market it is necessary to continue investing in interconnections between Poland and EU neighbouring countries. Not only should these investments affect energy security, but also promote economic development (Mokrzycki et al., 2008; Kamiński, 2011, 2012).

This paper has been funded within the framework of the AGH statutory research
No 11.11.210.217

References

- Frączek P., Kaliski M., 2009. *The Deregulation of Natural Gas Markets and its consequences for Gas Recipients in the EU*. Arch. Min. Sci., Vol. 54, No 4, p. 739-752.
- Grudziński Z., Szurlej A., 2011. *Węgiel, ropa, gaz ziemny – analiza cen w latach 2006–2011*. Przegląd Górniczy nr 7-8, 9, s. 306-313, Wyd. SITG, Katowice.

- Kaliski M., Nagy S., Siemek J., Sikora A., Szurlej A., 2012a. *Gaz ziemny w Polsce i UE*. Archiwum Energetyki tom XLII, 2012 nr 1, s. 93-107.
- Kaliski M., Szurlej A., Grudziński Z., 2012b. *Węgiel i gaz ziemny w produkcji energii elektrycznej Polski i UE*. Polityka Energetyczna, t. 15, z. 4, s. 57-69.
- Kaliski M., Staško D., Trzaskus-Żak B., 2007. *Restrukturyzacja i prywatyzacja polskiego sektora gazowniczego w obliczu jego liberalizacji*. Wiertnictwo Nafta Gaz, t. 24, z. 1, s. 257.
- Kaliski M., Siemek J., Sikora A., Staško D., Janusz P., Szurlej A., 2009a. *Wykorzystanie gazu ziemnego do wytwarzania energii elektrycznej w Polsce i UE – szanse i bariery*. Rynek Energii, nr 4, s. 1-6.
- Kaliski M., Szurlej A., Janusz P., 2009b. *Wpływ kryzysu gazowego rosyjsko-ukraińskiego z początku 2009 r. na rynek gazu ziemnego w Polsce*. Gaz, Woda i Technika Sanitarna, nr 7-8, s. 2-5.
- Kaliski M., Staško D., 2005. *Prognozy energetyczne Polski w perspektywie roku 2025*. Wiertnictwo Nafta Gaz, t. 22/1, s. 171-177.
- Kamiński J., Kudelko M., 2010. *The prospects for hard coal as a fuel for the Polish power sector*. Energy Policy, 38, Iss. 12, p. 7939-7950.
- Kamiński J., 2011. *Market power in a coal-based power generation sector: the case of Poland*. Energy, Vol. 36, Iss. 11, p. 6634-6644.
- Kamiński J. 2012. *The development of market power in the Polish power generation sector: A 10-year perspective*. Energy Policy, Vol. 42, p. 136-147.
- Kancelaria Prezesa Rady Ministrów, 1996. *Komunikat po Radzie Ministrów – 2.04.1996*. www.premier.gov.pl
- Kubacka T., 2001. *Rynek Gazu. Jaki model rynku energii?* Red. M. Okólski, Urząd Regulacji Energetyki, Wyd. 1, Warszawa, s. 211.
- Ministerstwo Gospodarki, 2012. *Sprawozdanie z wyników monitorowania bezpieczeństwa dostaw paliw gazowych za okres od dnia 1 stycznia 2011 r. do dnia 31 grudnia 2011 r.* Warszawa; www.mg.gov.pl
- Ministerstwo Gospodarki, 2009. *Polityka energetyczna Polski do 2030 roku*. Warszawa, 10 listopada 2009 r.; www.mg.gov.pl
- Minister Gospodarki, 2007. *Polityka dla przemysłu gazu ziemnego*. Warszawa (dokument z 27 marca 2007 r.); www.mg.gov.pl
- Ministerstwo Przemysłu i Handlu, 1995. *Założenia polityki energetycznej Polski do 2010 roku*. przyjęte przez Radę Ministrów 17.10.1995 r.
- Mokrzycki E., Ney R., Siemek J., 2008. *Światowe zasoby surowców energetycznych. Wnioski dla Polski*. Rynek Energii, nr 6, s. 2-13.
- Nagy S., Rychlicki S., Siemek J., 2002. *Estimation of natural gas consumption in Poland based on the logistic curve interpretation*. Applied Energy, Vol. 75 (2003), p. 1-7.
- Nagy S., Siemek J., 2011. *Shale Gas in Europe: the State of the Technology – challenges and opportunities*. Arch. Min. Sci., Vol. 56, No 4, p. 727-760.
- Siemek J., Nagy S., 2012. *Energy Carriers Use in the World: Natural Gas – Conventional and Unconventional Gas Resources*. Arch. Min. Sci., Vol. 57, No 2, p. 283-312.
- Paczewski T., 2011. *Polityka państwa wobec sektorów nafty i gazu w latach 1990–2010*. Polityka Energetyczna, t. 14, z. 1, s. 5-28.
- Polskie Górnictwo Naftowe i Gazownictwo, 1997. *Raport roczny 1996*. [Polish Oil&Gas Company, 1996 Annual Report]
- Polskie Górnictwo Naftowe i Gazownictwo, 2001. *Raport roczny 2000*.
- Polskie Górnictwo Naftowe i Gazownictwo, 2012; www.pgnig.pl
- Protokół Dodatkowy do Porozumienia między Rządem Rzeczypospolitej Polskiej a Rządem Federacji Rosyjskiej o budowie systemu gazociągów dla tranzytu gazu rosyjskiego przez terytorium Rzeczypospolitej Polskiej i dostawach gazu rosyjskiego do Rzeczypospolitej Polskiej z dnia 25 sierpnia 1993 r., podpisany 12 lutego 2003 r.
- Protokół o wniesieniu zmian do Porozumienia między Rządem Rzeczypospolitej Polskiej a Rządem Federacji Rosyjskiej o budowie systemu gazociągów dla tranzytu rosyjskiego gazu przez terytorium Rzeczypospolitej Polskiej i dostawach rosyjskiego gazu do Rzeczypospolitej Polskiej z 25 sierpnia 1993 r., podpisany 29 października 2010 r.; www.mg.gov.pl

Protokół o wniesieniu zmian do Protokołu Dodatkowego do Porozumienia między Rządem Rzeczypospolitej Polskiej a Rządem Federacji Rosyjskiej o budowie systemu gazociągów dla tranzytu gazu rosyjskiego przez terytorium Rzeczypospolitej Polskiej z dnia 25 sierpnia 1993 r., podpisanego 12 lutego 2003 r., podpisany 29 października 2010 r.; www.mg.gov.pl

Rozporządzenie Rady Ministrów z dnia 24 października 2000 r. w sprawie minimalnego poziomu dywersyfikacji dostaw gazu z zagranicy (Dz. U. 2000 nr 95 poz. 1042).

Siemek J., Kaliski M., Rychlicki S., Sikora S., Janusz P., Szurlej A., 2011. *Importance of LNG technology in the development of world's natural gas deposits*. *Gospodarka Surowcami Mineralnymi*, vol. 27, iss. 4, p. 109-130.

Uchwała Sejmu RP z 9 listopada 1990 r. w sprawie założeń polityki energetycznej Polski do 2010 r. *Monitor Polski* z 1990 r., nr 43, poz. 332.

Zawisza A., 2011. *Gaz dla Polski. Zarys historii sektora gazu ziemnego w ostatnich dwóch dekadach w Polsce*. Instytut Sobieskiego.

Received: 06 December 2012