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## Gas trading strategies — case studies

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### Abstract

The process of liberalization of the gas market influences the behavior of market players. In Poland, there has been adopted a model based on the introduction of mandatory gas sales involving the exchange segment. It has contributed to the greater involvement of stakeholders in gas trading on the Polish Power Exchange (TGE). The interest in this segment has also been enhanced by the opportunity to actively participate in cross-border trade. The paper presents the analysis of trading strategies taking into account the limitations of the existing regulations, market liquidity, price volatility and product structures on the Polish market and neighboring markets. Calculations reflect real price data from 2015 and also include logistics costs in case of gas physical delivery. Conducted analyses showed that discrepancy between gas prices in Poland and Germany, and Poland and the Czech Republic is not significant enough to generate profit in most cases. Negative results have been obtained regardless of the direction of transmission of gas, kind of contracts or selection of entry point into the Polish system. There is therefore no universal mechanism and trading strategy that may guarantee a permanent generation of profits. The few cases in which a positive result was obtained, mainly relate to the import of gas to Poland from Germany.

**Keywords:** Gas market; Trading strategies; Interconnectors

## 1 Introduction

A look at the world gas markets leads to the conclusion that there are three main regional-continental areas and these are North America, Asia-Pacific and Europe.

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Each of them is characterized by its individual pricing mechanisms and regulations of the commercial and trading environment and the level of liberalization.

In North America, the development of competition started by Reagan and led to the gradual replacement of long-term contracting mechanisms reflecting the short-term volatility of demand/supply side, which led to the creation of the spot markets, so that the current emphasis on the long-term contracting has been reduced. It is worth noting that these actions have led to a significant reduction of gas prices in the United States [1]. It was also a consequence of the large-scale use of gas supplies from local deposits both conventional and shale.

In Asia and the Pacific region trade is dominated by long-term contracts where price parameterization is often correlated with crude oil prices. Trade and gas contracting in continental Europe is done on similar principles, but due to the diversification of sources and high liquidity of the market the flexible pricing formulas and indexing price according to exchange market prices of gas are more often used. In addition, the European dimension of gas market is particularly interesting area of analysis due to the different regulatory aspects, infrastructure, structure and dynamics of consumption and regulatory European Union objectives.

These objectives oblige Poland and each member country, to carry out activities under the direction of European Union energy policy where the constant and continuously reinforced element is the liberalization of the electricity and gas markets, in order to ensure that all consumers may freely choose the supplier, to create opportunities for development of the economies, create new products and submarkets, or to raise the productivity and competitiveness of existing market mechanisms.

The current structure of the gas market in Poland carries out the following activities:

- transmission,
- distribution,
- wholesale,
- retail sales,
- storage,
- exploration and production.

The structure of the gas sector is still highly monopolized. This is due to the market dominance of one group, which is Polish Gas and Oil Company (PGNiG), which either directly or through its subsidiaries, conducts all the above mentioned activities, Polish gas market is therefore practically 'one supplier' market.

Previously mentioned European Union objectives and the following changes apply to both the wholesale market as seen through the lens of trading companies' behaviour, as well as the retail market, as seen from the perspective of each recipient. These objectives should be implemented in accordance with the European Union policies while ensuring freedom of movement of goods and services and independent decision-making in the aspects of energy security of individual countries, guaranteed by the treaties of accession. The paper focuses on the analysis of the wholesale market as a key area from the perspective of creating and implementing trading strategies.

As a result of markets' observations and after analyzing their functioning there has been formulated a thesis that there are gas trading strategies of a universal nature that would guarantee and allow, in a sustainable way, to generate profits on the import and/or export of gas. This thesis can be extended with the statement that thanks to the strong correlation of prices between markets in Poland, Germany, and the Czech Republic it is not possible for a longer time perspective to pursue profitable trading strategies. The aim of this paper is to prove the validity of the thesis on the example of a detailed analysis of the given case studies on the wholesale gas market.

## 2 Wholesale gas market in Poland

One of the first initiatives to create a gas market in Poland, was the launch of the Gas Release Program (PUG). This action, initiated in November 2011 by the President of the Energy Regulatory Office assumed the available by Polish Gas and Oil Company (PGNiG) in the auction mechanism, the gas covering 70% of market demand or approximately 10.5 billion m<sup>3</sup>. Auctions were to be carried out through the exchange segment, which was supposed to be a guarantee of transparency and within which the next stage was to create a secondary gas market trade. Strongly protested by market participants and industry associations the PUG program was not implemented. Simultaneously there were taking place detailed works on the implementation of mechanisms known and proven within the energy market, which has been implemented since January 2013 in the framework of Transmission Network Code (IRiESP).

For the most important issue there should be considered the creation of gas trading conditions in so-called a virtual point of gas trading, that is, trading in isolation from the physical location of the receiving point in the network. This provision made it possible to make a transaction without physical delivery. It became the source for further changes, both in terms of the adjustment segment

of the exchange, as well as regulatory issues. The next step was expressed in the statement [2]: the release of licensed energy companies from the obligation to submit tariffs for gas for approval, in terms of their sales to energy companies buying them for resale, which was tantamount to saying that the area of wholesale gas trading meets conditions for recognition as a competitive market.

Gas trading within the exchange segment in Poland began on 20th Dec. 2012 and it was the first ‘practical effect’ of work on the commissioning of the gas market. In 2013, there operated the spot parquet within the Polish Power Exchange (*Towarowa Giełga Energii* – TGE) allowing the execution of transactions through the continuous trading system and a package of forward transactions, in which participants had the opportunity to trade monthly, quarterly and annual contracts type BASE. The relatively small interest in gas contracting through the exchange was the reason for the amendment of the energy law [3], the result of which there has been introduced so called exchange obligation, i.e., the obligation for gas trading through the exchange of at least 30%, 40%, respectively for the years 2013, 2014, and 55% from 2015 onwards, of gas in the transmission network.

To meet the needs of the market and adapting the TGE offer to the exchanges in other member states (e.g., TTF (Title Transfer Facility) in the Netherlands, Gaspool and NCG (Net Connect Germany) in Germany, in 2014 there was also introduced a seasonal product and other new contracts such as weekend and weekly. The segment of daily transactions also evolved as it operates in other European solutions. In June 2014 a fixing mechanism there was started, and in the second half of the year hourly intra-day market there was inaugurated. It was a natural evolution of the exchange segment, which consists of gradually introduced new products, according to ‘demand’ reported and stated by market players.

Market mechanisms operating in Poland due to a link of systems with neighboring countries allow active participation and involvement of trading exchanges with foreign hubs, also in terms of contracts with physical delivery. A key role in these processes play trading price spreads between the different markets, the liquidity of markets and the cost of gas delivery.

Due to the high possibility of gas import and export, developed and highly liberalized market, and one of the largest exchanges in Europe – European Energy Exchange (EEX) – German gas market significantly affects the price level in Poland. The gas supplied to the German transmission system comes mainly from Russia, Norway, the Netherlands, Denmark and the United Kingdom. It is worth noting that the storage capacity of the German hubs (48 warehouses with a total capacity of 20.4 billion m<sup>3</sup>, which represents 70% of the total storage capacity in the EU) can also be used for the implementation of trading strategies.

In the German market, which is the largest market in terms of volume of natural gas consumption in the European Union, there are operating two parallel gas hubs – NCG and Gaspool. The area of their functioning is related to network coverage of the operators, which are their shareholders. From the perspective of the gas contracts with physical delivery to Poland and due to lower transmission costs and capacity allocation, it is favorable to build strategies based on trading within Gaspool hub.

Trading strategies can also be implemented in the Czech market. The operator of the electricity and gas in the Czech Republic is OTE a.s. headquartered in Prague, and the beginnings of its activities date back to 2001. The company provides comprehensive services for individual market participants, and it started gas activities in 2010. Transactions are made in the intra-day market, which significantly limits the possibility of trading activity with the use of term contracting.

### 3 Gas trading strategies

Regulations and mechanisms of gas market functioning in Poland and in neighboring countries allow for active participation and they give possibility of doing business in both financial contracts, as well as those with physical delivery. Thus it becomes possible to export or import gas to a virtual point in Poland, taking into account the limitations resulting from the capacity allocation and related costs. Barriers related to gas logistics are important and they are one of the primary determinants of the profitability of trading activity with physical delivery. The vast majority of contracts for the interconnectors capacity is a long-term scope and it is difficult to implement trading strategies that go beyond the profile of Germany/Czech Republic/Poland. It is worth to note that the interconnector: (i) Waidhaus limits to 2035 accessibility of capacity – profile the Czech Republic/Germany, (ii) Badajoz point, limits to 2035 availability of capacity between Spain and Portugal or (iii) Bocholtz limits to 2030 gas transfer – profile Germany-Netherlands. Trade restrictions and the potential to exploit the favorable price spreads follow the underdeveloped transmission infrastructure, or even the lack of such connections between France and Italy, Slovakia and Hungary, Poland, and Lithuania.

Is there, therefore, a universal trading strategy which does not generate losses, possible to perform on different trading profiles? Is arbitrage between markets and products profitable? Stated questions imply the need for variant analysis taking into account: (i) direction of trading activities meaning export or import

of gas, (ii) spot and forward transactions, and (iii) speculations and arbitrage between markets. A wide range of products traded on the gas exchanges, starting from the intra-day market, the next day market, weekend, weekly, monthly, quarterly, seasonal, yearly contracts, make impossible to carry out a full analysis of all possible options of trading activities. There has been carried out, therefore, the analysis of selected scenarios, illustrated in Fig. 1, conducted taking into account the seasonality and variable demand on the market. The analyses take into account the real market scenarios based in 2015.

Obtained and presented further results reflect the strategies:

- import/export;
- trading between countries (profiles): Poland-Germany, Poland and the Czech Republic;
- various interconnectors within one profile (Lasów, Mallnow), in order to perform a sensitivity analysis from the perspective of capacity costs;
- trading on the future, spot and mixed markets;
- products arbitration within the markets.

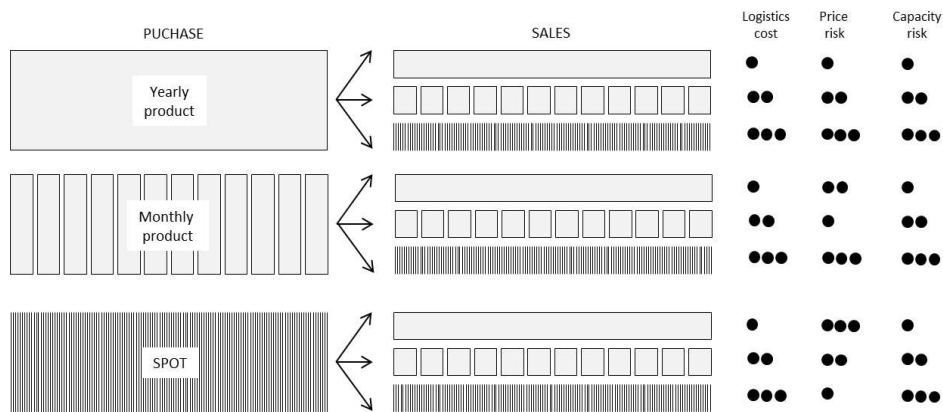


Figure 1: The range of product used to build scenarios with an assessment of costs and risks.

Figure 1 shows the gas purchase options (column 1) divided into the yearly product (the longest strip), the monthly products (second row) and the current transaction on the SPOT market (last row of the first column). The second column shows the possibilities associated with the sale of purchased gas. And, accordingly, for each case, it can be sold as an annual product, as well as monthly products and on the SPOT market. The right part of Fig. 1 is devoted to estimating the

intensity of logistics costs and risks for each scenario. One dot means the smallest intensity, two means the average risk/cost and the highest risk/cost is marked using three dots.

Different scenarios of analysed strategies listed below do not include costs related to the exchanges transaction fees and clearing houses. In turn, the costs associated with the logistics of gas have been analyzed for variants: annual, monthly or daily capacity reservations, as indicated in the figures (daily/monthly).

**Strategy 1** Trading on the Poland-Germany profile, import/export, taking into account:

- illustrated in Fig. 2, the purchase of gas – the yearly product (YEAR) on the future market and its sales on the future market in the variants: yearly product (YEAR), monthly products (M) or on the spot market;
- the cost of transmission systems: Ontrans and Gas-System at the points Lasów and Mallnow.

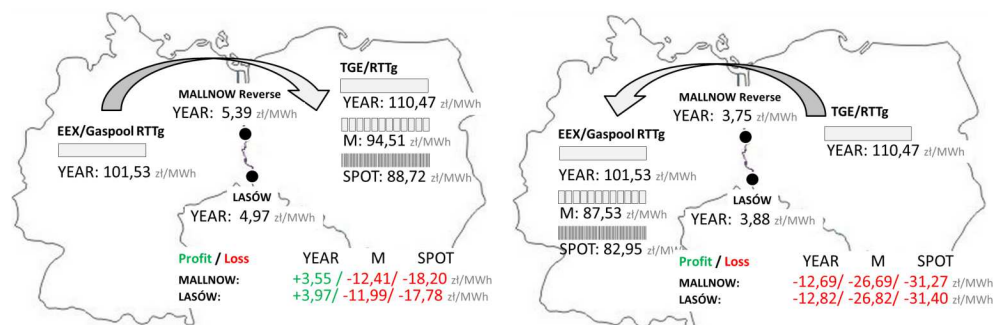


Figure 2: Trading strategies: future markets, Poland-Germany profile.

The results indicate that the only strategy that generates a positive result would be the purchase of yearly product at Gaspool at an average price of trading 101.53 PLN/MWh and selling the yearly product at TGE. Profit generated for this particular case calculated between 3.55 PLN/MWh and 3.97 PLN/MWh and resulted from the selection of an interconnector. As each of the interconnectors has different price the profit was calculated in the above-mentioned range assuming various pricelists. Strategies for the purchase of gas as yearly product and selling it on the future market in each of the months, or selling on the daily market would mean a loss ranging between 11.99 PLN/MWh and 31.40 PLN/MWh.

**Strategy 2** Trading on the Poland-Germany profile, import/export, taking into account:

- illustrated in Fig. 3, the purchase of gas on the future market, monthly products (M) and selling it in the future market, monthly products (M),
- selection of months assigned to the different quarters of the gas year, reflecting the different levels of the cost of transmission systems Ontrans and Gaz-System, Lasów and Mallnow.

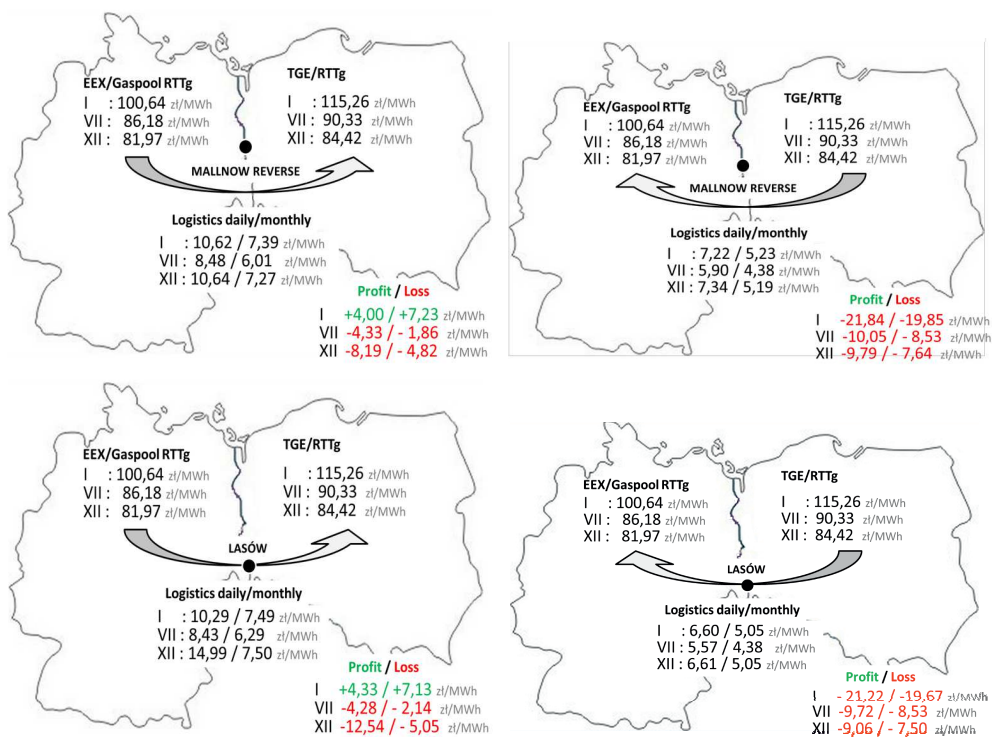


Figure 3: Trading strategies: future markets, monthly products, Poland-Germany profile.

The results of the analysis illustrated in Fig. 3 show that the only strategy that generates the positive financial effect for this variant would be a gas import in January 2015 and selling gas on the TGE. In January 2015, the price spreads between the markets were so large that they covered the costs associated with the reservation of capacity and transmission of gas (logistics). Monthly capacity allocation gives further positive effect on the level of 2.80 for Lasów and 3.23 PLN/MWh for



Mallnow. While maintaining the same kind of capacity, the differences in logistic costs between interconnectors are between 0.1 PLN/MWh and 0.33 PLN/MWh. It should be emphasized that the pricing spreads for the import of gas to Poland were in all cases positive, but insufficient to cover logistics costs. In the case of realization of trading activities in the remaining months the losses relating to the average market prices have ranged between 1.86 PLN/MWh and 21.84 PLN/MWh.

**Strategy 3** Trading on the Poland-Germany profile, import/export, taking into account:

- a) a mixed strategy involving the purchase of gas on the future market, monthly product and selling on the spot market, or buying gas on the spot market and selling on the future market;
- b) selection of months assigned to the different quarters of the gas year, reflecting the different levels of the cost of transmission systems Ontrans and Gaz-System, Lasów and Mallnow.

Mixed strategies illustrated in Fig. 4, assuming alternate purchase gas on the future market and selling on the spot market, also does not bring the expected results. Due to the occurring in 2015 sustained downward trend in gas prices, to the strategies bringing financial benefits we may include those strategies based on selling monthly product on the future market, and the purchase of gas on the daily market. The level of price discrepancies between markets would make a profit for January 2015 and December 2015 (transmission through both interconnectors). Export of gas from Poland would be cost-effective only in December for the scenario of selling the monthly contract on a Gaspool and purchase on spot TGE market. This strategy would allow the implementation of the profit 2.31–4.60 PLN/MWh depending on the crossing point and the mode of capacity reservations. Other scenarios of trading behaviors would bring losses up to 36.95 PLN/MWh.

**Strategy 4** Trading on the Poland-Czech Republic profile import/export, taking into account:

- a) illustrated in Fig. 5, a mixed strategy involving the purchase of gas on the future market in Poland, monthly product (M) and selling on the spot market in the Czech Republic, or purchasing gas on the spot market in the Czech Republic and selling on the future market in Poland. Trading activity on the OTE exchange is limited to the intra-day market due to lack of transactions for future products;

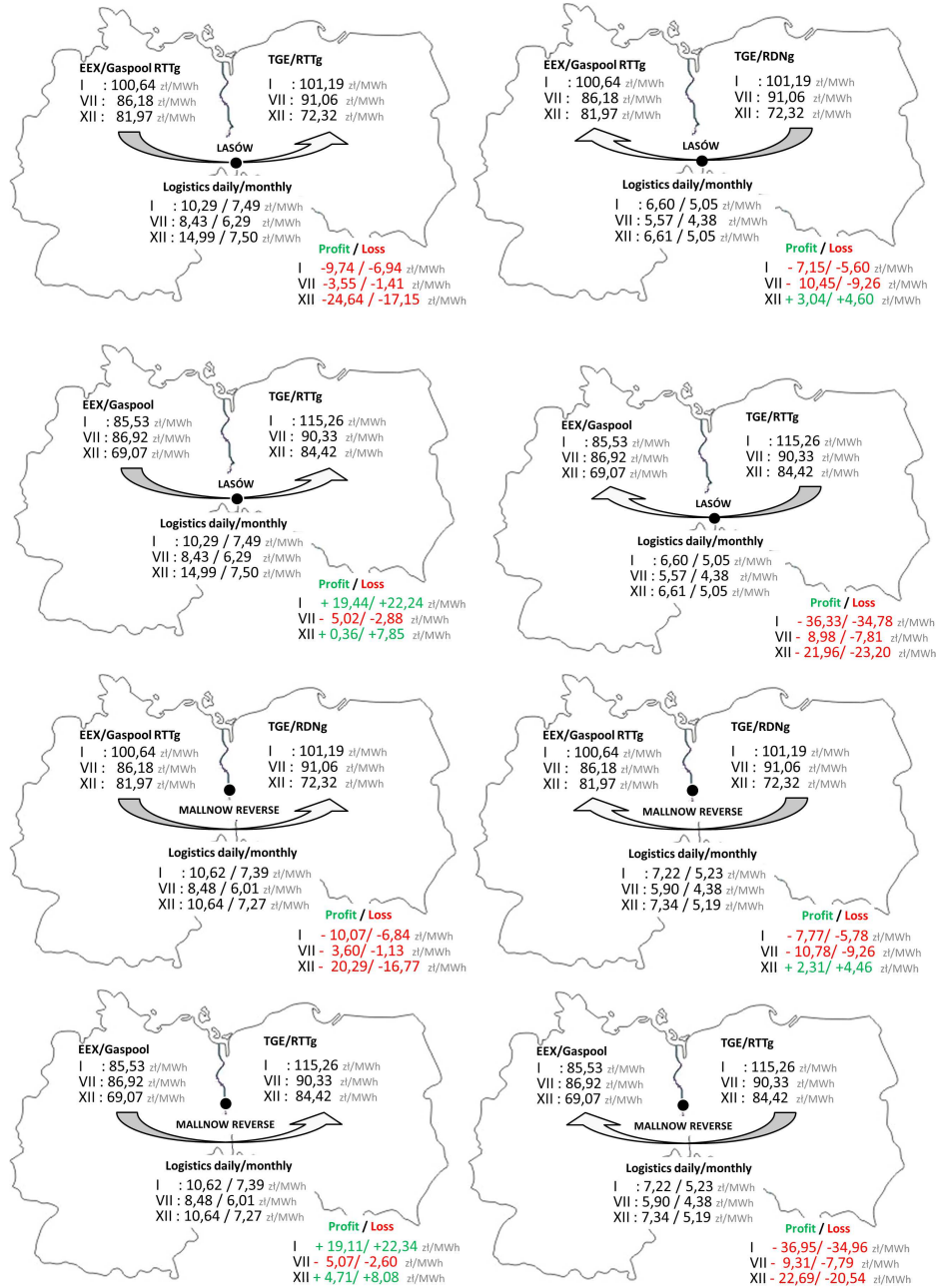


Figure 4: Trading strategies: future markets, monthly products, Poland-Germany profile.

- b) selection of months assigned to the different quarters of the gas year, reflecting the different levels of the cost of transmission systems: NET4GAS and Gaz-System at the point of exchange near Cieszyn.

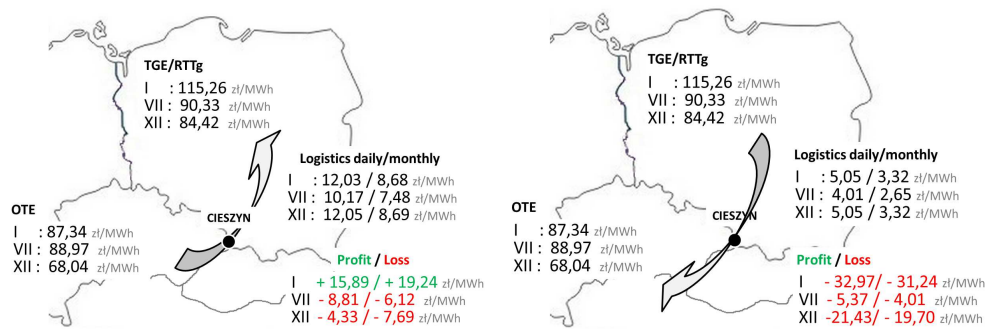


Figure 5: Trading strategies: future and spot markets, Poland-Czech Republic profile.

The gas market in the Czech Republic is strongly correlated with the German market, which significantly affects the comparability of prices in these markets and at the same time implies a price disparity with respect to the Polish market, which can potentially be used to build trading strategies. It should be noted, however, that the cost of gas transit through the interconnector in Cieszyn is significantly higher than the one with the German border. While maintaining a comparable level of price differences on gas exchanges, transmission costs almost always prevent the realization of transaction with profit. The only exception among the cases analyzed is the import of gas in January 2015, where selling gas on the future market at an average price of 115.26 PLN/MWh would make a profit, depending on the type of capacity reservations, at the level of 15.89–19.24 PLN/MWh.

**Strategy 5** Trading on the Poland-Czech Republic and Poland-Germany profiles import/export, taking into account:

- a) illustrated in Fig. 6 the strategy of buying and selling gas only on the spot market;
- b) selection of months assigned to the different quarters of the gas year, reflecting the different levels of the cost of transmission systems: NET4GAS, Ontrans and Gaz-System at the point of exchange Cieszyn, Lasów and Malinow.

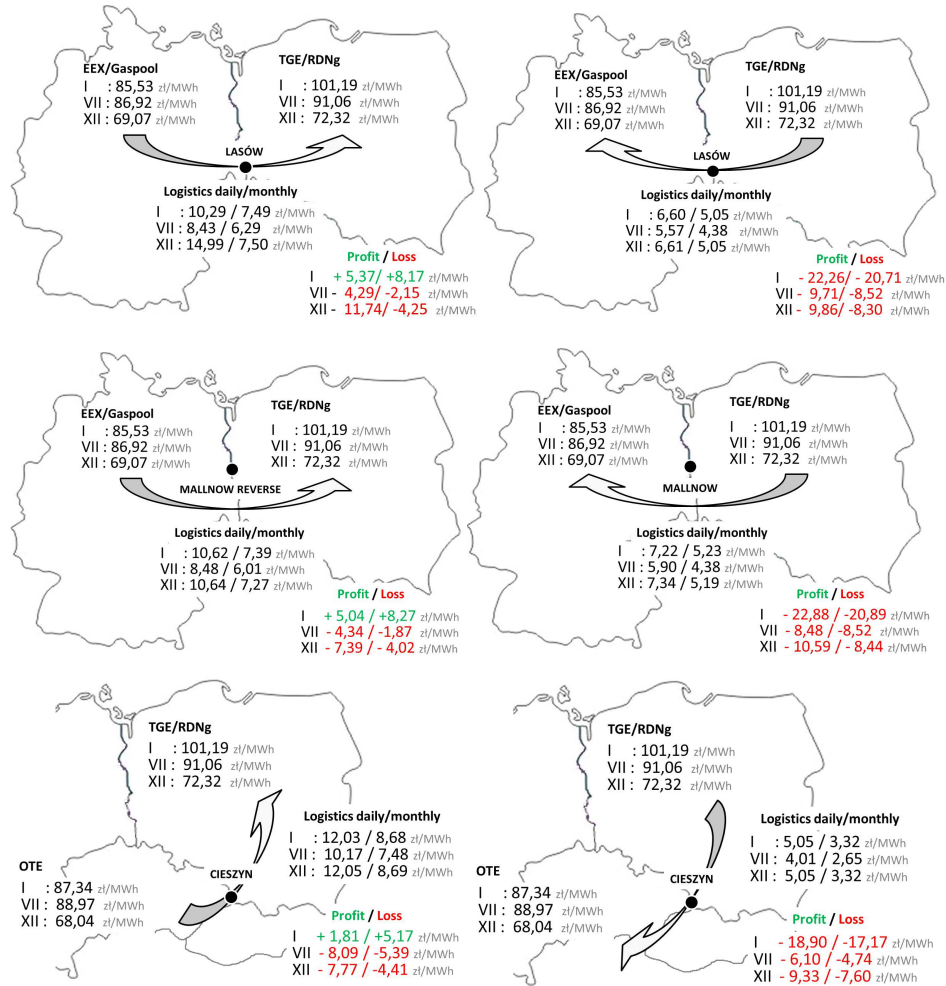


Figure 6: Trading spot strategies: Poland-Germany and Poland-Czech Republic profiles.

Monotonicity of prices on the gas market is conducive to build trading strategies based on price arbitrage between the future and spot contracting. These strategies, however, have high-risk arising from the possibility of reversal of the trend. Scenarios based on the purchase and selling gas within the daily market, limit this risk, however, because of the coincidence of the markets, they do not generate significant differences in prices to cover transmission costs and generate a profit margin. Figure 6 illustrates scenarios with trading activities only within the spot markets. The analysis shows that only in January 2015 import of gas

to Poland purchased in the Czech Republic or Germany would generate a profit. The unit value would fluctuate between 1.81 PLN/MWh and 8.27 PLN/MWh, depending on the choice of the interconnector and the way of capacity reservations. In other scenarios, import and export would generate a loss reaching even 22.88 PLN/MWh.

## 4 Summary

It is possible to use different gas trading strategies in Poland and neighboring countries. They can be implemented both on the domestic market, and at the junction of several markets. The necessary condition for the rationality of building a strategies are the levels of price spreads between the markets based on gas import or export in various configurations product, for different principles of capacity reservations and selection of interconnectors.

Conducted analyses allow to conclude that the persistent discrepancy between gas prices in Poland and Germany and Poland and the Czech Republic is not significant enough to pay for gas transmission and generate a profit in most cases. Analyses were conducted on the real price data from 2015. Negative results have been obtained regardless of the direction of transmission of gas, kind of contracts or selection of entry point into the Polish system [4]. There is therefore no universal mechanism and trading strategy that may guarantee a permanent generation of profits, which in the opinion of the authors demonstrates the thesis stated in the paper.

The few cases in which a positive result was obtained, mainly relate to the import of gas to Poland from Germany. This is due to the fact that the German market is a primary market where the price trends are initiated. The other two markets operate with notable inertia. It is also important that the transmission costs for interconnectors Lasów and Mallnow are several percent lower than in the case of Cieszyn.

The conducted for the publication analyses do not take into account transaction costs and there was not carried out the valuation of risks, in particular relating to price and technical constraints in the allocation of capacity. This element, in the assessment of the authors, may be interesting from the perspective of carrying out further analysis in this area.

*Received in January 2017*

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