GAS HUB AS A SOURCE OF REGIONAL MARKET DEVELOPMENT IN THE CENTRAL AND EASTERN EUROPEAN REGION

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1 Abstract

Natural gas has an ever growing importance in the energy supply of the European Union (EU) with its direct share exceeding 25 percent of the total supply. The EU natural gas extraction has not increased in line with domestic demand and this has resulted in a growing dependency on non-EU sources of natural gas. The ever increasing gap between supply and demand has led to the EU’s dependency on natural gas imports, currently exceeding a level of 60 percent of its natural gas consumption. Assuming that current market and regulatory trends continue, in the forthcoming decades electricity generation will remain the main driver of the increasing demand for natural gas. Today, gas-fired power stations produce one-fifth of the electricity in the European Union, and their numbers are increasing. Compared to the current level, these trends are expected to lead to an 87 percent increase in natural gas demand by 2030\(^1\). The latest natural gas difficulties between the Russian Federation and the Ukraine has again reminded the European Union, and most particularly the Central and Eastern European (CEE) countries, about their dependence on natural gas imports, for which the envisaged long term solution could be the construction of the Nabucco and the South Stream pipelines, as well as the expansion of European LNG capacities.

The CEE countries, including Hungary, are participating in the realization of the above listed long term projects, however, in our opinion, the consequences of such a gas crisis may be significantly mitigated in the short term by the establishment of a transparent and interconnected regional natural gas market. The regionalization targeted by the EU Commission would provide the possibility to overcome the security of supply issues in the EU. With the help of the analysis in this paper, we will introduce how organized natural gas markets could support the market integration and regionalization in the EU.

One of the requirements for the establishment of a transparent market is a properly functioning spot market, where market participants are able to sign anonym short- and long-term contracts in organized and circumstances. The increasing volume traded in the spot market contributes to the increasing role of market-based pricing, which provides gas hubs a significant role both in ensuring security of supply and in providing transparent prices for market participants. Through this study we will show that an important supporting tool of the development of a transparent market-based pricing mechanism is the establishment of a natural gas spot market, resulting in support for the consumers in managing the risks of a short term supply crisis, and in managing price volatility. This practice can be transferred to other countries in the region, which would support the integration of the regional gas markets.

To support the above assumptions, we will demonstrate the liberalization process in the western European countries serving as a benchmark for the rest of the EU Member States in the beginning of the development process. The comparative analysis will be based on the timeline of the process, stability, competitiveness of the domestic economy, infrastructure development, security of supply, and risk of dependency factors. Regarding the establishment of a gas hub in the CEE region, the most important requirements will be analyzed in order to be able to ensure an adequate level of liquidity.

We will illustrate that as a result of the advantages of a gas hub a regional competitive market not only promotes market transparency, but through the coupling of markets it also contributes to the improvement of the security of supply in the CEE region.

\(^1\) Datamonitor, 2009
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2 Introduction

Natural gas is an increasingly dominant energy source in terms of economic development and social well-being. It amounts to 24.1 percent of the world’s total energy consumption. The largest consumer regions are North America, Europe together with the former Soviet Union, and the Far East. As the chart illustrates, there has been a significant increase on the demand side in the last decade.

![Figure 1: Development of the world wide natural gas demand](image)

Source: BP Statistical Review 2009

Europe and Russia consume 34.7 percent of the world’s total natural gas consumption. The developing countries, especially in the Central and Eastern European (CEE) region, are showing a gradual increase in natural gas demand. There is a sufficient quantity of natural gas available in the world to satisfy the growing demand and many developing countries on the supply side exist with a great potential for increasing the natural gas production. As a result, the increasingly dominant factors in maintaining the security of supply are the securing of infrastructure, supporting trading platforms and considerable investments all over the value chain.

2.1 Natural gas situation in the European Union

The European Union (EU) market is characterized by the gradual growth of energy consumption. The total energy demand is derived from electricity, heat and transportation related consumptions. Even though the utilization of natural gas is significant in all these areas, the role of natural gas in electricity and heat production is increasing. As the chart illustrates, the natural gas demand in the EU has shown a gradual increase between 1990 and 2007. This overall increase of more than 40 percent is derived from the growth of general electricity consumption and general natural gas consumption. In the residential and commercial sector, gas consumption has steadily increased in line with the expansion of the infrastructure and the associated rise in the number of gas users, while natural gas currently accounts for 33 percent of industrial final energy consumption.

![Figure 2: The development of EU natural gas demand 1990-2007](image)

Source: Eurostat, June 2009

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2 BP Statistical Review 2009
Natural gas extraction in the 27 Member States of the EU (EU-27) is not able to satisfy the total natural gas demand. In the United Kingdom (UK), the natural gas production culminated around 2000. Since then the yearly production volumes are decreasing by 9-10 percent per year. In the past 4 to 5 years, the UK has already become a net importer. Similarly to the UK, the natural gas extraction culminated in the Netherlands also, but in the 1970’s. Subsequently, the extraction is under strict control allowing the Netherlands to support the natural gas supply in the Western European region. Denmark is also a net exporter, although the provided volumes are only moderate. In the CEE region, more countries have access to natural gas fields, though only Romania extracts a significant amount of natural gas.

The quantity of production has not grown in line with the growing demand; moreover, the volume of extraction in the North Sea region is showing a decrease in the last decade. As a result of the demand and supply imbalance, the EU-27 is increasingly dependent on natural gas imports.

### 2.1.1 EU natural gas import dependence

As the chart illustrates, the natural gas import dependency reached 60 percent in 2006 due to the increasing imbalance of EU production and demand.

![Figure 3: EU supply and demand imbalance and import dependency](image)

The level of import dependency varies with Member States. As it was mentioned, Denmark and the Netherlands are exporters, while the UK and Romania are satisfying a significant portion of their demand from their domestic production. Malta and Cyprus are not consuming any natural gas. Apart from these Member States the average natural gas import dependency amounts to 70-100 percent. The criticality of import dependency is determined by the portfolio and proportion of imported natural gas per source.

In addition to the growing import dependency, the limited number of import sources is observed to be critical. With respect to the imported volume of the EU-27, the Russian Federation, Norway and North Africa are providing more than 90 percent of the total. The origin of the imported natural gas clearly defines the location of its utilization within the EU. Western Europe imports natural gas from Norway, North Africa and South America in the form of LNG. Southern Europe imports mostly from North Africa. In the CEE region, the eastern natural gas imports are dominant, provided by the Russian Federation. As a result of this split, the security of the natural gas supply is much higher in the Western European region than in the CEE region where the portfolio of natural gas supply is dominated by one source.

### 2.1.2 Natural gas issues identified in the EU

The future outlook of the EU natural gas market indicates the potential growth of import dependency as a result of increasing future natural gas consumption and decreasing internal extraction. There is a significant difference in the security of supply among the EU-27, due to the fact that the EU is not operating as one country. This can further increase the risk of natural gas dependency for EU Member States. The current community mechanism is not adequate to guarantee a timely response to a natural gas supply crisis that goes beyond the level of national competence.

Furthermore, it is very difficult to measure the natural gas supply situation within the EU due to the lack of transparency. Similarly, natural gas prices are also not transparent. As mostly the import sources set the prices of the regions, there is a large price difference in the EU-27 (please refer to Figure 18 on page 28).
As the following table illustrates, the natural gas supply is guaranteed for the next 100 years based on the reserves to production (R/P) ratio of the potential export regions. Considering the currently running infrastructural project developments, the available sources as well as volumes are expected to increase. Unfortunately the infrastructural improvements will only deliver results in the long term, which leaves the EU with unsolved natural gas issues in the short term.

![Figure 4: Overview of the major natural gas exporter countries and regions in relation to the EU](image)

<table>
<thead>
<tr>
<th>2008</th>
<th>Annual production in bcm</th>
<th>Global share</th>
<th>Proven reserves in bcm</th>
<th>Global share</th>
<th>R/P ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Federation</td>
<td>601.7</td>
<td>19.6%</td>
<td>43 300</td>
<td>23.4%</td>
<td>72.0</td>
</tr>
<tr>
<td>Norway</td>
<td>99.2</td>
<td>3.2%</td>
<td>2 910</td>
<td>1.6%</td>
<td>29.3</td>
</tr>
<tr>
<td>Caspian region</td>
<td>173.2</td>
<td>5.6%</td>
<td>12 540</td>
<td>6.7%</td>
<td>72.4</td>
</tr>
<tr>
<td>Africa</td>
<td>214.8</td>
<td>4.8%</td>
<td>14 650</td>
<td>7.9%</td>
<td>68.2</td>
</tr>
<tr>
<td>Middle East</td>
<td>381.1</td>
<td>6.3%</td>
<td>75 910</td>
<td>41.0%</td>
<td>199.2</td>
</tr>
<tr>
<td>Total</td>
<td>1 470.0</td>
<td>47.9%</td>
<td>149 310</td>
<td>79%</td>
<td>101.6</td>
</tr>
</tbody>
</table>

Source: BP Statistical Review 2009

**2.2 EU objectives**

The EU Community envisaged the creation of a single market through market integration, enabling it to act efficiently as one country. Market integration is especially important to reduce the risks of import dependency and the effects of a natural gas supply crisis, like the supply cut reoccurring as a result of the Ukrainian and Russian disagreements. The Russian import dominance is high especially in the CEE region, and could be reduced by providing access to alternative natural gas sources, like the Caspian and Middle East sources. The potential for accessing such sources is limited due to both political and economic aspects. Further objectives of the EU are also reflecting similar major areas requiring attention, such as the improvement of the security of supply in the EU-27. The EU foresees that the individual Member States will have the possibility to access a portfolio of various sources of natural gas available on the market.

In order to reach the mentioned objectives, liberalization and restructuring of the markets have begun in the EU. However, it is not enough as it is less likely that the individual markets will not couple on their own. For the integration of the markets the development of organized markets is also required. From their nature organized markets bring together the suppliers and consumers from a geographic region irrespective of country borders, providing that there are no physical bottlenecks of cross-border trading. Overall the market integration with the support of organized markets would result in eliminating the existing price differences among the EU regions through the appearance of transparency, increased competition and efficiency.
3 Objectives of the discussion paper

The development of organized natural gas markets – referred to as gas hubs – have a key role in reaching the targets of the European Union. As it was mentioned, gas hubs – besides being an effective tool of facilitating market integration – are increasing the natural gas security of supply through providing transparency for the market.

The objective of this paper is to examine how natural gas hubs support the EU market integration. As gas hubs are already established in Western Europe, the discussion paper analyzes their development and their effects on market efficiency. Based on the impact of gas hubs in the Western European region, the potential of gas hubs and how they would support market integration in the CEE region will be examined.
4 Development

Regional market integration is one of the key factors in the development of the CEE gas markets, especially when the significant dependence on Russian gas is taken into consideration. In our opinion, the establishment of a gas hub contributes to regional market integration in the short run, as well as in the long run. In relation to gas hub development, a couple of development stages can be identified; a common characteristic is that upon their start-up gas hubs function as national interchanges, and only later, with the interlinking of other regional networks, do they become regional centers for one or more countries. During the development of the gas hub the need for more sophisticated services and regionality arises on the side of the market participants. Based on practical examples, the development of a gas hub is also a learning process for market players, whereby they may practice the most advantageous trading techniques with respect to the relevant country-specific circumstances and in each development stage. Our analysis follows the subsequent methodology:

**Figure 5: Methodology of the analysis**

- **The progress of market integration**: Besides the implementation of a unified and effective legislation and the securing of the infrastructural background the breakthrough in the development of market integration is provided by the development of natural gas hubs. An operating gas hub presumes the existence of sufficient infrastructure thus leads to the development of cross-border capacities, storage capacities, and domestic interconnection pipelines.

- **Introduction of gas hubs**: We prepared our descriptive study to provide an accurate portrayal and take account of the characteristics of natural gas hubs success, discover new factors, and classify existing information. In the natural gas industry, several opportunities for secondary analysis exist by using the national Transmission and Distribution System Operators’ (TSO and DSO) information, relevant companies’ reports, European Regulator’s Group for Electricity and Gas (ERGEG), European Federation of Energy Traders (EFET) and other associations’ secondary analysis. For data collecting we used internet research methods to collect the necessary information.

- **Examination of the current status of gas hubs**: Gas trading is dependent on several factors: a.) the entire infrastructure, access to networks and gas storage and the related flexibility issues; b) The basic requirement for the origin of hubs is the existence and conduction of third party access (TPA) principle. We have prepared this analysis along these aspects, identified four steps of spot gas market development and the critical techniques for maintaining the success of gas hubs.

- **Identification of prerequisites of gas hub establishment**: In a narrower point of view, the infrastructure requirements are necessary for providing access to infrastructure in a transparent way. In a broader view, the prerequisites are analyzed to realize gas-gas competition in the region through gas diversification. It is examined why one of the best solutions in the short term is the establishment of a virtual gas hub for national authorities to boost market integration.

- **Analysis of a gas hub implementation in CEE**: As a result, we can evaluate market integration in different alternative scenarios. In the scenario analysis the mid-term (3-5 years) status of development of an optimal process is presented for the CEE region. The scenario assessment goal is to show that gas hubs are necessary in the CEE region in order to facilitate regionalization and market integration on a European level.
4.1 The progress of market integration

Market liberalization as such is often understood to be a process indicating the withdrawal of the state from the market and the market mechanism taking its place. In the EU, market liberalization is associated with reduced state involvement. The state remains a vital part of the market mechanism facilitating the market development as it sets the framework of the liberalized wholesale market in terms of design and structure.

4.1.1 EU liberalization

Looking at the natural gas situation of the European Union diverse levels of development, security of supply and market access can be observed. It has already been stressed that if the Member States – especially in the CEE region – have access to only one dominant source of natural gas, the internal market cannot function in terms of market development and security of supply. As stated, the objective of the EU is to integrate the natural gas markets, so that the individual Member States have the possibility to access various sources of natural gas available on the market. Integrating the natural gas market efficiently is an extensive and complex process that is facilitated in the EU through legislative directives.

The EU is defining the skeleton of the market development process through various directives, which should be adapted and amended by the Member States. The first natural gas directive was formulated in 1998 as part of the First Energy Package. Since then further amendments were formulated in the Second and Third Energy Packages in order to support the objectives of the EU Community. These directives cover the specifications on unbundling, market functioning, regulatory powers, efficient cooperation, and measures to reinforce security of supply (further detailed in appendix 3).

As the chart illustrates, in the process of market development decentralization and privatization are prerequisites of market liberalization. A liberalized market enables the creation of organized natural gas markets that ensure the further development of already liberalized markets and the evolution of free and competitive gas markets.

The liberalization of the EU's electricity and gas markets began several years ago and contributed to the transformation of the energy sector. While the developments are encouraging and emphasize the benefits of the liberalization process, the full potential of liberalization has not yet been realized. In many Member States the existing EU legislation has not been properly implemented.

In the process of liberalization – knowing that the infrastructural considerations dominate the gas industry – the framework for competition had to be set by separating the service and the commodity, i.e. the transportation facilities and the ownership of natural gas respectively. With this first step the decentralization and unbundling began in the EU.

The European natural gas market is still undergoing major changes. Initially the liberalization attempt was differing country by country as the countries had different structures to deal with. In the UK the downstream incumbent was privatized introducing market competition, in France the state monopoly was maintained, while in Germany a controlled oligopoly dominated the market. A similar situation can be observed in the case of the newer EU countries. The CEE Member States are going through a similar market development process, however, they have the chance to learn from the previous examples and to follow the preferred path toward market liberalization.

4.1.2 Requirements of market integration

The integration of the EU Member States’ natural gas market requires a unified legislative background, effective regulation by regulators, infrastructural investments and supports, independent system operators, and the development of organized markets. Initially the regulatory background of each country has to be approximated. As was previously referred to, the EU has prepared three Directive packages as guidance for the legislative restructuring of the national regulations. The restructuring process is slow and lengthy as it takes time for the EU Member States to implement the legislative modifications. In certain cases the Commission had to take legal steps ensuring the full and correct adaptation of the Directives. In formulating the national legislation to be in line with the EU

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3 The Future of Natural Gas in the World Energy Market, The Emirates Center for Strategic Studies and Research, 1999
4 Report on progress in creating the internal gas and electricity market, The European Commission, 2009
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Directives, optimally the market players should be involved to assure public acceptance and support of market liberalization.

On the technological side the congestion management principles are targeting the improvement of the infrastructural background. Further improvements are required to reach full integrity of the transmission network including cross-border capacities and capacity allocations. Looking at the EU there are significant differences between the regions in terms of infrastructural trespassability. An integrated network without bottlenecks is a prerequisite of free flow and security of supply. For this purpose significant investments are required especially in the CEE region. The legislative initiatives also consider the availability of market information. In natural gas, the entry and exit points, contracted and available capacities and flow information should be provided to the market.

Besides the implementation of a unified and effective legislation and the securing of the infrastructural background, the breakthrough in the development of market integration is provided by the development of natural gas hubs. An operating gas hub presumes the existence of a sufficient infrastructure which leads to the development of cross-border capacities, storage capacities, and domestic interconnection pipelines.

Similar steps must be followed on a regional level by extending the efficiently operating natural gas markets into neighboring countries. The nearest neighboring countries without cross-border bottlenecks must be connected, assuming that the convergence of national regulations is already in an advanced phase. Transparency will be increased as a result of the approximated regulatory backgrounds leading to equal opportunities for market players acting in the coupled markets. The practice of trading over gas hubs also stimulates the development of the supporting infrastructure as trading over the borders becomes more common. It can be stated that natural gas hubs have an important role in the integration of the European natural gas market.

4.2 What is a gas hub?

Most of the European natural gas purchases come in the form of two types of contracts: long-term contracts (LTCs) and spot contracts. Markets are dominated by LTCs, the pricing of which uses indexing, i.e. the price of natural gas is tied to the price of a certain crude oil product basket. This indexing ensures the return of the upstream investment, however, it does not reflect the marginal cost of the gas extraction. The random walk characteristic of the crude oil price changes causes highly volatile natural gas prices, which means a price risk during the whole fixed term of the contract.

In the spot market actual contracted prices on a given day are weighted with the volumes of the contracts in order to get the daily price index, which reflects the daily demand and supply conditions. In the presence of diversified supplies, this pricing method enables the gas-on-gas price competition (i.e. cost-based pricing). Spot market trading, as a transparent trading platform, provides consumers with the benefit of price advantage through short-delivery purchases or sales. Spot markets begin to emerge at gas hubs, where hub signifies a trading platform established at the connection of gas pipelines. This enables buyers and sellers to trade standardized natural gas products on a variety of delivery dates and locations.

This leads to the question of whether oil indexed and spot-priced contracts can exist parallel to each other. As per the IEA analysis, such co-existence can be identified in the UK where the majority of gas is sold at the NBP (National Balancing Point) price (around 60%). In parallel, an essential minority of oil indexation still exists, originating from old long-term contracts that are now running out. In continental Europe the situation is different in that oil indexed long-term contracts are still significantly prevailing, with hardly any spot-priced long-term contracts having been signed. On the other hand, a lot of short or medium term contracts exist, which are either fully or partially spot priced.\textsuperscript{5}

Basically, a large share of European supply contracts have included a considerable amount of flexibility allowing the buyer a variation in his daily, monthly and yearly purchases. Hence suppliers have been able to pay for the physical flexibility offered by the producer’s infrastructure. OECD (Organization for Economic Co-operation and Development) Europe has an import capacity of approximately 50 percent more than its yearly consumption. This flexibility has significant value in allowing suppliers to react to variations in demand, or even shortfalls from another supplier, or enabling producers to optimize transit routes. However, as European gas production contracts, this flexibility will more likely have to come from outside the EU. As traded markets develop, the value of this flexibility becomes much better defined, the reason being that flexibility can also be monetized by bringing it to a gas hub. It is important to realize that the change to a

\textsuperscript{5} Ian Cronshaw, Jacob Marstran, Margarita Pirovska, Daniel Simmons and Joost Wempe, Development of Gas trading in Continental Europe, IEA Information Paper, OECD, May 2008, p. 41.
spot-based market comes with many advantages; instead of every customer contracting for his flexibility needs.\(^6\)

As it is clearly defined by OECD and IEA, two types of gas hubs can be distinguished. A virtual hub covers a whole area and pools volumes for trading, while a physical hub defines a market at a single point. An example of a virtual gas trading hub is the British NBP (which was established by system operator National Grid plc). The British system is using a classic entry/exit system, which means that gas inputs and outputs are charged. When the gas enters the network, it appears at the very same moment on the trading hub.\(^7\) An example of a physical gas trading hub, where different pipelines run into the hub or cross the hub, and which is connected directly to storage facilities, is the Henry Hub in the United States or Baumgarten in Austria. The Henry Hub is the largest commercial pricing point in the world, and it functions as a reference point for futures contracts trading on the New York Mercantile Exchange (NYMEX). It is situated in southern Louisiana, connects twelve gas pipelines and there are three storage facilities in its neighborhood.\(^8\)

An exchange is an open, organized marketplace where buyers and sellers negotiate prices. Exchanges require an almost instant (real time) bid and ask matching mechanism, settlement and clearing, and market wide price communication and determination.\(^9\) The main function of an exchange is to guarantee fair and orderly trading, as well as the efficient spread of price information for any securities trading on that exchange. The main target of exchange-based markets lies in assisting the trading of standardized products as well as supporting market information, participation and liquidity. As supported by the IEA study also, all exchanges in Europe provide an electronic trading platform where traders can announce bids and offers. For example, in the UK physical futures trading takes place for the month ahead and beyond on the Intercontinental Exchange (ICE), while within-day, and day ahead trading is introduced on the APX Gas UK. A similar adjustment exists for the TTF (Title Transfer Facility) where ENDEX (European Energy Derivatives Exchange) provides curve trading, while day-ahead trading can be executed at the APX Gas NL. Most trading within the brokered market is introduced as OTC forward trading.\(^10\) \(^11\)

The main difference between OTC (over-the-counter) trading and trading on an exchange is that on an exchange-based market the market participants can preserve their identity, thus their strategy. In OTC markets bilateral contracts are used where the market participants will have to step up in public in order to execute a bilateral trade.\(^12\) Another important difference is that in OTC markets the counterparty risk is not managed by the exchange, but by the parties who bear the risk.

As highlighted by the IEA and also supported by practical experience, at a given level of maturity a more efficient derivatives market develops. The market has also experienced attempts at an earlier launch of derivatives trading, however, it has proven to be unsuccessful. These markets provide financial products based on an underlying asset price which is the price of natural gas in the case of a gas hub. This level of development can only be reached once counterparties are assured that the hub price represents the real value of gas, and then they will base futures pricing and options pricing on the market. These derivatives markets are then used by different companies. An example of the use of derivatives by a company supplying gas to final customers might be that it sells gas to these consumers at a fixed price under a one year contract and then buys the gas back in the futures market. This is a typical hedging contract. In general, the derivatives markets are used to change the risk profile of a company given its physical assets.\(^13\)

Based on the trading type we can distinguish between spot and futures trading. In the case of spot trading, contracts with same day (Within-day market, see APX UK) or within two days (Day-ahead market, see EEX) delivery are traded. In the case of futures trading, platforms delivery may take place next month, quarter, season, or year (see ENDEX). Gas hubs contribute to the evolution of spot markets, and also to the development of financial trading forms. Financial trading means that such non-gas market players as financing institutions or trading companies are able to enter the market and participate in the trading of

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\(^12\) Ian Cronshaw, Jacob Mastran, Margarita Pirovska, Daniel Simmons and Joost Wempe, Development of Gas trading in Continental Europe, IEA Information Paper, OECD, May 2008, p. 58.

\(^13\) Ian Cronshaw, Jacob Mastran, Margarita Pirovska, Daniel Simmons and Joost Wempe, Development of Gas trading in Continental Europe, IEA Information Paper, OECD, May 2008, p. 58.
Gas contracts are used by market participants to manage their price risks caused by regional price differences, seasonal changes (winter-summer) and the price fluctuations of other energy underlying products. The efficiency of a gas hub is characterized by its liquidity, which is determined by the volumes traded, the churn ratio\(^\text{15}\), the difference between bids and offers, the detail level of network information, and the number of trading parties. Based on these elements three Western European gas hubs have extraordinary liquidity: NBP (UK), Zeebrugge (Belgium) and TTF (Netherlands). This liquidity is related to the Interconnector, a 230 km long marine gas pipeline directly connecting Bacton and Zeebrugge terminals, which has an annual capacity of 20 bcm and can be utilized in both flow directions.

### 4.3 Current status of development regarding gas hubs in the EU

Gas supplies to Europe remain ruled by long term contracts (15 to 25 years) between main players, who are the main importers, and producing companies from exporting countries outside the European Union (Gazprom in Russia, Sonatrach in Algeria and Statoil in Norway) and countries from the EU, e.g. Gas Terra in the Netherlands. These contracts provide price indexation clauses on crude oil and oil products. Zeebrugge and TTF are the two main market places (gas hubs) on the continent. Several others are emerging; even so, their development is encumbered by obstacles to cross border gas transit within the EU. Gas trading in Europe is growing, yet the only real liquid trading markets are the NBP and the Benelux. Trading liquidity in other countries is limited, although they have a trading market with good potential outlook (PSV, PSG). Gas is traded both bilaterally in the OTC market and at many exchanges in Europe. The NBP is the most liquid gas market in Europe with OTC spot and forward trading. Derivative contracts provide swaps and options, and virtual storage contracts are also traded. In continental Europe, the most liquid gas markets are in Belgium and the Netherlands. In Belgium Zeebrugge is a main physical trading hub, featuring both bilateral and exchange-based trading. Italy, France, and Spain all have small but increasing trading markets based around a special variation of virtual trading points, border crossing locations and LNG terminal trading.\(^\text{16}\) As Figure 6 shows, the total traded volume in Europe in 2008 was approximately 11,735 TWh.

![Figure 6: Overview of traded volumes in Western Europe](image)


15 The churn factor is calculated as the ratio of traded volume to volume physically delivered.
4.4 Assessment of Best Practices of gas hub development

There is no single benchmarking process that has been universally adopted. The wide appeal and acceptance of benchmarking has led to various benchmarking methodologies emerging, based on which the following benchmarking methods for the contemporary analysis can be identified: 17

Process benchmarking means that initiating companies focus their observation and investigation on business processes with a goal of identifying and observing the best practices of one or more benchmark firms. In our case the focus of benchmarking was not a firm or a company, it was market type because we identified that liquidity is the main criteria for success in this industry. We have to consider the fact that several background elements exist contributing to a high liquidity ratio. Our main target was to clarify these elements, and understand how these elements are interconnected, and what the sources of success are. Hence, this type of benchmarking was not suitable for our market analysis purposes.

Financial benchmarking means performing a financial analysis and comparing the results in an effort to assess the overall competitiveness and productivity. In our case it is less relevant, because our focus does not contain the return of investment aspects of the gas hub operator and the maintenance costs. Hence, this type of benchmarking was not suitable for our market analysis purposes.

Product benchmarking means the process of designing new products or upgrades to current ones. This process can sometimes involve reverse engineering, i.e. disassembling competitors' products to find strengths and weaknesses. In our case we have to consider the product, because this element is very important with regards to the high level liquidity. The different types of natural gas trading products usually reflect the customer’s needs. This is the reason why product benchmarking is applicable as a tool for achieving customer satisfaction, and that is why we were using it as a part of our analysis.

Strategic benchmarking involves observing how others compete. This means that an important aspect in the analysis is identifying the main competitive advantages that contribute to the leading position of a company. In our analysis the liquidity level is the basis of that competitive advantage, although several other elements support it. That is why we used this method as a main tool in our analysis.

In our analysis we were looking for the best practice, which means the belief that there is a technique, method, process, activity, incentive or reward that is more effective at delivering a particular outcome than any other technique, method, process, etc. Best practices can also be defined as the most efficient (least amount of effort) and effective (best results) way of accomplishing a task, based on repeatable procedures that have proven themselves over time for large numbers of people.

We had to decide whether we would examine the industry, or we would look for other industry examples or data for best practices. We believe that the natural gas and electricity markets are very special industries belonging to the natural monopoly disciplines, and hence, we insisted on the natural gas industry data. In order to maintain the simplicity of the model, we were focusing on Western European gas hubs, since the liberalization process has almost the same institutional background in the whole CEE region.

Once we identified the core focus, we created a model for contemporary analysis, which contains the main elements of liquidity (we have identified 10 fundamentals, however, due to the size constraints of this paper, we will focus only on the four most important):

1. **Daily, Monthly, Annual Volumes and churn ratio:** These are very good indicators which lead us to a comprehensive basic starting point for the comparison of Western European gas hubs. These indicators are of high importance for a starting gas hub operator in relation to the level of critical volumes. Churn ratio describes how many times the same physical gas is exchanged on the hub. The churn factor is calculated as the ratio of traded volume to volume physically delivered.

2. **Most active players:** It is important, especially for a start-up gas hub operator, to determine what types of trading regulations need to be in place in order to maintain balance among market players, meaning that none of the players are able to influence the market condition in unfair ways.

3. **Most active contracts:** The products are critical factors for the attractiveness of a gas hub, since products provide the customer value and encourage regular use of the hub.

4. **Market-based balancing:** This is the first step of gas hub development. The experience gained is necessary for starting a gas hub and the acquired knowledge of techniques assures the customers of participating.

We have prepared this analysis along these aspects, identified four steps of spot gas market development and the critical techniques for maintaining the success of gas hubs.

4.4.1 Introduction of the secondary analysis

As a simple explanation, secondary analysis refers to a research process, or a set of endeavors, that uses existing data to answer research questions. The process of data acquisition differentiates primary research methods from secondary analysis methods. Primary data collection requires the investigator to obtain information directly from research participants to answer a specific research question, whereas secondary analysis requires the application of analytical techniques to data already collected.

Secondary analysis is executed within an existing data set to answer missing research questions not posed in the primary study. Many studies include more data than the researcher can analyze, and a variety of research projects can be executed using preexisting data.

The main advantage of secondary analysis is its potential for resource minimization and low cost executions. Usually the database supports the research with access to information that took months or even longer to accumulate. Secondary analysis also solves other data collection challenges such as finding suitable participants, and obtaining appropriate sample sizes.

We prepared our descriptive study to provide an accurate portrayal and take account of the characteristics of natural gas hubs success, discover new factors, and classify existing information. In the natural gas industry, several opportunities for secondary analysis exist by using the national TSO’s and DSO’s information, relevant companies’ reports, ERGEG, EFET and other associations’ secondary analysis. For data collecting we used internet research methods to collect the necessary information.

There are several aspects that we have to take into consideration when using preexisting data. Secondary data do not permit the progression from formulating a research question to designing methods to answer that question. It is also not feasible for a secondary data analyst to engage in the habitual process of making observations and developing concepts. That is why we conducted interviews with Hungarian market players (TSO and customers) in order to discover the answers to our research questions in connection with the CEE region and to get additional information.

4.4.2 Development of gas hubs in Western Europe

Analysis of the Western European emerging markets is a common practice as many regions beginning the liberalization and regionalization of their markets are looking for best practices to follow. In the following, the characteristics of the Western European examples are shortly summarized based on the recent IEA information paper, official reports, interviews, as well as on practical experiences gathered.

4.4.2.1 National Balancing Point (NBP) in the United Kingdom

NBP was the first liquid trading hub in Europe, and has a good geographic position. In the United Kingdom, the transmission network is owned by National Grid Gas plc. Besides trading in the primary market, market participants in the market are free to trade capacity bilaterally in a secondary market. A significant part of the gas imports comes from the Norwegian offshore pipelines, which belong to the Gasled company (Norway). This results in a favorable situation because remote access is provided to the market participants from the production platforms. This is an important factor for the development of NBP. Trades at the NBP are executed with an OCM (On-the-day) trading system.19

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4.4.2.2 TTF in the Netherlands

Other markets have also taken advantage from direct connectivity to the North Sea gas fields, for example the Dutch TTF which is connected directly to gas production pipelines. Additionally, large volumes can also be imported from Germany, where the Emden/Dornum area just across the border receives gas from three main pipelines. Gas market incumbents in Europe increasingly use the Dutch gas trading platform TTF (Title Transfer Facility) to trade their gas. The Interconnector (UK) Limited (a more direct link between the TTF and the NBP) operates an undersea gas pipeline and terminal facilities to provide a strategic bi-directional link between the UK and continental European energy markets.20 The pipeline has a capacity of 15 bcm per year of which 8 bcm per year is held in a long-term contract. The TTF, operated by Gas Transport Services B.V. (GTS), experienced significant growth in 2008. Market players supplied 20.3 billion m3 of natural gas via the TTF.21

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Gas Hub as a Source of Regional Market Development in the CEE Region

Figure 8: Major characteristics of the TTF gas hub

- **Volumes**
  - Traded volumes for January-March 2008 over twice as high as the same time in 2007.
  - Only around 10% high-cal (HC) gas in Netherlands reaches TTF.
  - Only 1% low-cal (LC) gas in Netherlands reaches TTF.

- **Most active players**
  - There are 47 published shippers, with a maximum of 42 shippers on a given day so far.
  - Financial Institutions are Merrill Lynch and Morgan Stanley.
  - Gas producers are Norway’s Statoil, and Norsk Hydro, BG Group and Denmark Dong’s, Total.
  - The vast majority of domestic production comes from NAM gas fields (30-50% of Dutch production).

- **Most active contracts**
  - The only prompt contract that hardly ever trade is Within-day, again this is for physical reasons.
  - There are hourly flexibility limits in the Netherlands, which mean only companies with large portfolio can trade.
  - There is still a tendency to leave Weekend and WDNW trading until the last two days of the week.
  - Quarters normally only start to trade in the couple of months before the start of delivery.

- **Market-based balancing**
  - Gas Transport Services (GTS) started trading on the APX for balancing purposes from January 2007.
  - The amount is small compared to the total of gas GTS uses for balancing.


4.4.2.3 Zeebrugge in Belgium

The Belgian hub is connected to the United Kingdom, and through transit pipelines to Germany, the Netherlands, France, and also to an LNG plant. There is a physical storage facility which supports the largest financial gas exchange market in the EU. There are three main entry points in the Belgian network: at the French border (Blaregnies), at the Dutch border (Hilvarenbeek), and at the German border (Aachen). In 2007 Zeebrugge Hub physically traded 447,000 GWh. Daily average trading fluctuates between 1,300 and 1,500 GWh. The principal price driver at Zeebrugge is the NBP price because of the Interconnector pipeline. Basis trading against the NBP is still the main type of trade.22

Figure 9: Major characteristics of the Zeebrugge gas hub

- **Volumes and churn**
  - In 2007, Zeebrugge Hub physically traded 447,000 GWh.
  - Daily average trading fluctuates between 1,300 and 1,500 GWh.

- **Most active players**
  - 72 companies were signed up to trade including banks.
  - The most active companies at Zeebrugge are still the large European incumbents with physical positions such as Distrigas, BP, Centrica, EDFT, GMT, Conoco, Statoil, Gaselys.

- **Most active contracts**
  - Basis trading against the NBP is still the main type of trade.
  - NBP balancing is done daily, but Zeebrugge is hourly with a two hour lead time, that’s why there is still little within-day trade at the hub.

- **Market-based balancing**
  - Zeebrugge Hub is primarily a transit hub, originally designed and still primarily used for balancing transit flows in and out of Belgium.


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4.4.2.4 PSV in Italy

There is another market which has several connections to a large number of different sources, the Italian gas hub Punto Scambio Virtuale (PSV). From the North, Russian gas coming from Austria, as well as gas coming from France and Germany cross Switzerland to Italy. Furthermore, gas is brought into PSV from the LNG terminal, as well as from the south by two pipelines originating in Algeria and Libya. Transporting gas into the PSV is a main problem for new entrants, as virtually all pipeline capacity is booked on existing long-term contracts with Italian market participants. New regulations including a requirement that 10 percent of imports be traded on the hub may improve liquidity on PSV. There has been a steady growth in PSV transactions since its start up in 2003, both in terms of transaction numbers and gas volumes. The total traded volume in 2007-2008 was 16.12 bcm.

Figure 10: Major characteristics of the PSV gas hub

<table>
<thead>
<tr>
<th>Volumes and churn</th>
<th>Suppliers of industrial conglomerates of regional municipalities are active.</th>
<th>Generation companies optimize their positions on the PSV. Edison and Electrabel are the most active spot market traders.</th>
<th>Traders are helping to build liquidity on the PSV, they are looking for arbitrage with Europe’s other hubs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most active players</td>
<td>The total traded volume in 2007-2008 was 16.12 bcm.</td>
<td>Companies regularly swap gas for weekend versus working days.</td>
<td>Within-day trading is possible but rare.</td>
</tr>
<tr>
<td>Most active contracts</td>
<td>The most active period varies according to market conditions. The next gas year will typically start to trade towards the end of March, when some suppliers start to sign new end-user deals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market-based balancing</td>
<td>Snam Rete Gas (Snam) primarily uses storage and import volumes for balancing.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


4.4.2.5 NetConnect in Germany

The German market has several transport operators, each developing gas hubs. For a long time, the BEB V.P. in northern Germany was the most developed. It has an entry point in Emden and receives gas through the Danish-German Deudan pipeline. Germany has a similarly sized gas market as the United Kingdom, but the UK only has one area, while Germany had 21 at the start of 2007. By October 2008 the number of German market zones decreased to eight, but the market still remains fragmented. Owing to the regulation, transporter companies have volunteered to merge different parts of their network into larger market areas to support trading by third parties. The market area begins from Emden/Bunde and ends at Frankfurt am Oder. In the south, it transports gas from Russia at the Austrian and Czech borders and maintains an export route to France. The gas transmission companies E.ON Gastransport and Bayernets established the cooperation between market areas in Germany by merging their H-gas market areas as of 1 October 2008, which is the Netconnect Germany virtual hub.

26 NetConnect official website, Retrive on 15, July, 2009
### Figure 11: Major characteristics of the NetConnect gas hub

<table>
<thead>
<tr>
<th>Volumes and churn</th>
<th>From March 2008 to March 2009 the traded volume was 396,012 GWh.</th>
<th>The churn ratio was 2.12 in March 2009.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most active players</td>
<td>119 companies were signed up to trade including banks.</td>
<td>The Leipzig-based European Energy Exchange reported increase of total derivatives market volumes.</td>
</tr>
<tr>
<td>Most active contracts</td>
<td>The underlying OTC market may still be the main driver of liquidity.</td>
<td>The prospects of liquidity development in Germany are positive.</td>
</tr>
<tr>
<td>Market-based balancing</td>
<td>Balancing is hourly, that's why there is a little within-day trade.</td>
<td></td>
</tr>
</tbody>
</table>

Source: NetConnect

### 4.4.2.6 PEG in France

Currently, France has five market hubs, four belonging to the transportation subsidiary of Gaz de France (GRTgaz) and one belonging to TIGF (transportation subsidiary of Total). GRTgaz merged the three northern Point d’Echange de Gaz (PEG), named North H, West and East, into one gas hub. This was an important step in increasing liquidity. This market area has pipeline connections to Belgium, Germany and Switzerland. The southern part of GRTgaz’s network involves the LNG terminal at Fos Cavaou, and is connected to both the northern hubs and the southern area. PEG’s connectivity with both pipeline gas and LNG terminals in France and Spain, makes the market areas attractive to a number of different companies, whether be companies searching for arbitrage, looking to source gas to other markets such as Italy, or to explore local opportunities. For this reason GRTgaz has more than 30 different companies registered as shippers. Since November 2008, Powernext provides spot and futures natural gas contracts on the French PEGs. The participants take part in the setup of reliable price references allowing the market participants to cover their volume and price risks from Within-Day to the next three gas seasons.

### Figure 12: Major characteristics of the PEG gas hub

<table>
<thead>
<tr>
<th>Volumes and churn</th>
<th>In one year, the traded volume was 118,000 GWh.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Most active players</td>
<td>24 companies were signed up to trade including banks.</td>
<td>The most active traders on the PEG’s are Total, Essent, EDFT, and Gaselys.</td>
</tr>
<tr>
<td>Most active contracts</td>
<td>Day-ahead is the most actively traded contract.</td>
<td>There are three different markets, Powernext Gas Spot, Powernext Gas Futures, Powernext Balancing GRT Gas.</td>
</tr>
<tr>
<td>Market-based balancing</td>
<td>16 shippers were registered to use French network operator GRTgaz’s new balancing platform.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Powernext

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28 Powernext official website
4.4.2.7 Central European Gas Hub (CEGH) in Austria

In 2006 CEGH transacted trading volumes of 7.7 bcm, making it one of the three largest gas hubs in continental Europe. This position was made even more firm in 2007, and trading volumes are now approximately 1.5 bcm per month. CEGH provides a title transfer facility, a wheeling service, and a no notice storage nomination service at the location of the pipeline import interconnections at Baumgarten, Austria. The main difference between Europe’s other gas hubs and the CEGH is that all gas arriving into Baumgarten is made up of Russian gas molecules. Moreover, this gas all comes from one company: Gazprom. In January 2008 OMV Gas International GmbH and Gazprom signed a cooperation agreement on a participation of Gazprom in the CEGH, providing the Russian company with 50 percent of the shares in the Austrian hub. Together with Gazprom, OMV aims to establish an international gas exchange in cooperation with the Vienna Stock Exchange in 2009, with the intention of building the most important trading platform in Continental Europe. Although there is only one type of gas (Russian molecule) at the CEGH, there are many destinations nearby (PSV, NetConnect), leading to the opportunity to become a liquid hub.29 Gas can be transported from Baumgarten by the Trans Austria Gas Pipeline leading to Italy and by the West Austria Gas Pipeline to Germany. Owing to the supply situation, most of the trading is related to the long-term contracts held by larger European suppliers.

![Figure 13: Major characteristics of the CEGH gas hub](source: CEGH, OMV, Heren Energy: European Gas Hub report, 2007)

4.4.3 How a balancing-market become a gas exchange?

In the gas market the take-or-pay contract is the most commonly used contract type. Due to the special features of gas consumption (weather dependency, technical outages) the supply relationship is not perfectly balanced. Buyers and sellers cannot stick to the originally contracted volumes, and flexibility is crucial in this business. The starting point of a spot market development is the trading need generated by the short-term (daily) balancing needs. In the US the short-term balancing needs have come to the forefront due to the emergence of new market entrants and the new contract structures relating the attempts to acquire even more high volume gas consumer clients. In order to manage these off-balance situations an informal activity among traders has emerged: the bilateral telephone market. Traded volume was low, however, transaction number has constantly increased, and price movements were used as a rule of thumb.30

Every piece of information is important, however, price information is crucial for spot markets. For strategic and tactical reasons, traders try to stand on a higher information base than their competitors do. In primitive

markets this may be achieved by the continuous collection and aggregation of information, and also by using informal information to get around the market. As traded volume increases, markets will be pushed to operate at a higher efficiency, as primitive markets cannot handle higher volumes. Energy market information service providers will emerge in the market when the market reaches a certain level of development – e.g. in the European market there are several reports including spot prices and gas market news (Argus, Heren, Platts, Bloomberg). Eventually these reports will begin to gain authenticity in the market and also integrate the expectations of traders. In the next development phase traders use fax, e-mail and electronic price information as prime information sources before negotiating a deal. Besides serving as the background for such negotiations, this information is also included in the contracts as index clauses. In the 1970’s the Platts Rotterdam rates (from the simplest Platts plus 40 cents to the more elaborate average or indexed structures) of the Western European oil refineries were the most commonly used price formulas in the oil contracts. The short-term volatile price movements present in the spot markets mean risk for the companies. When the need arises, forward deals emerge for the management of risks inherent in different time periods, and then futures deals develop in the exchange trading.\(^\text{32}\)

The following four steps of spot market development do not necessarily follow each other in this order, and there may also be overlapping periods. However, they display the changes we can anticipate in relation to hub development, for example, in Hungary.

\begin{figure}
\begin{center}
\includegraphics[width=\textwidth]{figure14.png}
\end{center}
\caption{Steps of the spot market development}
\end{figure}

\begin{quote}
\textbf{Short-term physical balancing}
\end{quote}

The dominance of pipelines is expected to reduce as contract switching spreads. Open access to the infrastructure will remove the regulated price mechanism. Participants now will have to accomplish their own search for trading partners and pay the costs of this action, and they will perform other unusual tasks such as contract bargaining, arranging transportation, and scheduling deliveries. Participants will not only be faced with learning new procedures, but will now directly pay the costs to conduct transactions.

Buyers and sellers will be willing to pay transaction costs because of the existing situation. Producers with surplus productive capacity will decrease production that the pipeline companies will not take, and they will be willing to sell in the spot market to maintain cash flow at prices below those of the pipeline companies regulated rates. Access to gas will prove good motivation for buyers to invest in the necessary human assets. Competition for sales to end users was largely nonexistent when the pipeline companies controlled the merchant function. As the spot market develops, gas-on-gas competition among many suppliers will result in a more efficient market. The potential growth of the spot market will reduce the prospect for opportunism because each party will now be more likely to find a match and will be able to change partners more easily.

The end of physical asset specificity reduces the need to use long-term contracts (bilateral governance) as a check against opportunism. This market structure will no longer be efficient because of its inflexibility, such as the inability to respond to fluctuations in supply and demand or to falling prices.\(^\text{33}\)

With the emergence of trading, the need for a Bilateral Telephone Market is also expected to come up. This is an explicit description of a market in which individuals maintain a telephone information network through

\begin{flushright}
\hspace{1em}\textsuperscript{32} Platts.com
\hspace{1em}\textsuperscript{33} Roeber J., Development of a UK Natural Gas Spot Market, In: Energy Journal, Volume 17, Issue 2, April, 1997. Pages 1-16
\end{flushright}
which they learn about prices, what's on offer, what's needed, who's in play and other market information. In
a primitive market, they will do this by tirelessly combing the market looking for word-of-mouth information
(and planting misinformation where they can). Such a market is inefficient, but it can be sufficient for the
needs of certain low-volume commodities. (For example, specialty chemicals and rare earth metals are
satisfactorily traded in this way.) But as the pressures on the market grow (as the example of Baumgart en
toons), which will certainly happen with the gas market, there is a need for more systematically available
information and for standardized trading instruments.

**Price reporting and transparency**
The end of the pipeline company merchant function will result in a void in the institutional environment. An
independent merchant function will come up to take the place of the interstate pipeline companies because
many buyers and sellers will be eager to use other companies in order to economize on the transaction costs
involved in the marketing channel. Since the procedures will not be common knowledge, there will be a
learning curve for each individual firm that desires to market or purchase its own gas. Companies with low
sales volumes will not be able to realize the economies of scale that the market can provide. Also, there will
be an opinion that small producers are not a credible source, thereby encouraging the use of a marketer to
aggregate or pool supply and demand.

Participants will recognize an opportunity and make the investment in human assets and learn the identities
and needs of specific market participants, the procedures necessary to procure and sell gas, and the
transportation required to physically move the gas, knowledge once held exclusively by pipeline companies.
This will give them a first-mover advantage, which combined with building a favorable reputation, will result in
increased business as they market services to those participants unwilling to invest in a marketing
distribution channel on their own. The human assets will be specific to the industry, not necessarily to
bilateral relationships, especially as the marketing segment develops and competition increases. The early
marketers will be brokers; entry requires little more than some money and a telephone to conduct the search
and matching function. Once identities are established and bargaining concluded, the trading partners will be
obliged to obtain transportation rights and schedule deliveries in and out of the pipeline. Participants will be
responsible for their own billing and contract execution as well as for maintaining a pipeline balance between
nominations and actual volumes delivered.34

**Price Feedback**
Modernized and standardized contracts will be used in the spot market to include quantity, contract term,
price, delivery point, payment schedule, and performance obligations; and as a result they will lower
transaction costs by saving time on confirmation of verbal agreements and reducing the potential for
misunderstanding. In response to the problem of buyers’ withdrawal if they can get a better price or lose a
market, marketers will begin to include wording regarding nonperformance. For example, if prices fall and the
buyer does not take over the gas, the buyer will repay the difference in price to the original seller, and a
similar penalty will be involved if prices rise and the seller does not deliver.

At first there will be no standard long-term contract for gas trading and contractual relationships will become
highly personalized. However, with the huge increases in volume, long-term gas contracts will become
standardized as well.

Open access to and the increasing interconnectedness of the natural gas grid, and increased storage
suggest reduced asset specificity for existing pipelines. This reduction in specificity, along with regulated
rates, provides some degree of protection from opportunism and this, along with increased uncertainty in the
natural gas industry and shorter contracts in the marketing of gas, leads us to expect a reduction in the tenor
of transportation contracts as well.35

Standard contracts need to appear. This is the critical first step in the development of any central efficient
market and has to be the result of a mindful company decision. Further development of the market is not
possible without such a trading instrument, which will allow counterparties to trade in short-term – everything
taken for arranged except the names, quantities and prices. In the Brent market (a close parallel) different
‘standard’ contracts coexisted for twenty years, causing little confusion. It was not until the failure of the
market in 1986 that the effort was made to produce Shell’s standard Brent contract. Several spot gas
contracts are in existence, and ‘master terms’ are using in the western European market, like the EFET
trading agreement.

34 Dahl, Carol A.; Matson, Thomas K., Evolution of the U.S. natural gas industry in response to changes in transaction costs, In: Land
Risk management
Seasonal demand will cause a variation in production volume under fixed prices, and a variation in prices under a spot market. This price volatility will raise the risk of unfavorable price movements from month to month and make financial planning precarious at best (Lyon 1990). Price volatility prompted the creation of an organized futures market for natural gas on the NYMEX in April 1990. A futures market is primarily a financial management tool which may be used to protect against volatile price movements in the spot market, hence, reducing price uncertainty but increasing the cost of accomplishing transactions.

There will be uncertainty on the part of buyers and sellers to use the futures market on their own because of the additional skills required. The early marketers will perform only the brokerage function of matching buyers and sellers. With a futures market, traders will be able to manage their exposure to the risk of taking title to gas for resale, will promote taking over the task of managing risk for others, and they will become wholesalers.  

The development and wide acceptance of a standard trading instrument will open the possibility of starting up a forward market. This could be like a 'professionals' market': informal and lightly-regulated, for the most part flexible enough but with fundamental flaws and, as a result, fragile. It will happen spontaneously in the gas market as the capability for forward trading becomes attractive for covering price and supply risks. (The market being set up by the IPE is aimed at this development.) Forward trading was the form explicitly favored by the oil companies in spite of its fundamental weaknesses, and it may have some appeal to gas companies today for the same reasons as in Hungary.

4.5 Identification of prerequisites of gas hub establishment in the CEE
In a narrower point of view, the infrastructure requirements are necessary for providing access to infrastructure in a transparent way. In a broader view, gas diversification is necessary in order to ensure the gas-gas competition in the region. As a result, one of the best solutions in the short term is the establishment of a virtual gas hub for national authorities to boost market integration

As the analysis of EFET describes, the first advantage of a Virtual Transfer point (VTP) is that it provides pooling of liquidity that would otherwise develop at different physical entry or exit points. In this way, it is possible to establish an efficient market where buyers are able to find the cheapest source of gas, and sellers can find the parties who place the best value on the gas available. Transaction costs are decreased as less time is used trying to find out who is able to buy or sell at a specific location. Trading and information systems can only be developed by relatively large costs when only relating to one single point. Barriers to entry are decreased as participants do not need to deem a vertically integrated business. A VTP can also be used as a balancing market platform or for a gas release program. The balancing market allows a TSO to choose the accessible offers from a larger number of potential locations brought into that hub. A gas release program allows it more easily to organize from a combination of contracts rather than related to a specific purchase contract of the releasing party.

Source: Roeber J.; EFET; M. Laczkó

37 European Federation of Energy Traders, The features of a successful, on-system Virtual Trading Point, p.1
38 European Federation of Energy Traders, The features of a successful, on-system Virtual Trading Point, p.2
The second tool to boost the market integration in the short terms is to establish a balancing market with the main players. In the early stages of liberalization, a balancing market may be illiquid and flexibility may be concentrated with only a few suppliers. To reduce the impact of low liquidity, it is important that holders of flexibility participate in the balancing market. Some companies are not unreasonably concerned that their dominant position may lead them to constant investigation by competition authorities, with the result that they withdraw from such a market. It is therefore important that the national regulatory authorities establish conditions that allow the holders of flexibility to participate in an open manner with transparent rules without the need to establish a regulated price on the balancing market. This could be achieved by the dominant player(s) reaching an agreement with the regulator to make all the spare flexibility available on a day, within an agreed bid/offer spread. The dominant player(s) can then decide the price level to place bids and offers, around where it/they believe the market will be. The incentive to ensure that the price is close to market is that otherwise an opportunity is created for suppliers deliberately long or short into the system, and arbitrage between the cash-out price and the market price, where there is a difference.

Overall, an effectively operating trading hub requires liquidity as detailed above, gas-gas competition deriving from a broad portfolio of sources, access to supportive infrastructure that allows managing volume risk by utilizing of storage or accessing of a large consumer base, and a transparent and supporting legal and financial framework. Market participants being involved in bilateral trading schemes are facing barriers, which they could overcome by transferring their trades onto an organized gas exchange. The currently operating national exchanges could further improve the conditions of trading by coupling their markets. As a result, market participants could have access to an increased source portfolio and customer base, which would also serve the interests of the European authorities desiring an integrated and open EU gas market.

5 Results
ERGEG has announced that regional initiatives are delivering concrete results in electricity including improved transparency of information due to the common regional approaches, better managing congestion at borders by requiring TSOs to cooperate on how to calculate and allocate capacity, and efforts to integrate balancing markets. As bottlenecks are an obvious barrier of market integration and cross-border trading, market coupling is promoted that offers the highest potential of integrating the EU markets.

Similarly to the electricity markets, three gas Regional Energy Markets (REMs) were identified within the EU, which would be able to cooperate on the long term. The gas REM relevant for the CEE region plans to integrate Austria, Italy, Bulgaria, Czech Republic, Greece, Hungary, Poland, Romania, Slovakia and Slovenia. Common priorities across the three REMs include improving transparency, gas interoperability and hub development. Examples of results from the northwestern European region include improved regulatory cooperation and the development of a roadmap. Following the northwestern European examples, the CEE region is expected to develop towards the desired market integration, yet there are multiple paths to choose from.

5.1 Future outlook in CEE market integration
We evaluate market integration in different alternative scenarios. In the analysis the short-term (3-5 years) status of development of the process is presented. The scenario assessment goal is to show that gas hubs are necessary in the CEE in order to facilitate regionalization and market integration. As the integration process should be split into phases, the scenario analysis focuses only on the situation of Austria, Hungary, Romania and Bulgaria.

Scenario based analysis according to the following specifications:
1. Business as usual
2. Expansion of CEGH
3. Development of a Hungarian gas hub
4. Development of more gas hubs in the region

The identified scenarios are assessed based on the following criteria:

Timeline of the process. The (1) level of development within 3-5 years is analyzed in each scenario and (2) the remaining time needed to reach a fully integrated natural gas market on a regional level. Without a gas hub the process is expected to slow down or not even reach a fully integrated market.

Stability. It is reviewed whether with the help of an operating gas hub the connected markets are expected to become more stable, due to a common platform where the supply and demand sides are more diverse.

Competitiveness of the domestic economy. Analysis on whether a lack of a well operating domestic natural gas market results in disadvantages for the domestic industry, thus decreasing the competitiveness of the country.

Infrastructure development. Examination of whether the existence of a gas hub facilitates the development of infrastructure or whether the infrastructural investments would stagnate without a gas hub.

Security of supply, risk of dependency. Analysis on whether the risk of natural gas dependency would be higher, as only the importer and the supplier can trade with natural gas, if there is no gas hub; and whether more storage capacity would be required in order to ensure the security of supply, if there is a gas hub and an integrated market.

5.1.1 Implementation of a gas hub in the CEE region
Scenario #1
Business as usual means that the only gas hub would be the CEGH without any competitors in the region, and we assume that the operating management has no intent to connect other Eastern European countries for gas hub trading.

This scenario would mean that the efforts for market integration would become stronger since the continuously growing natural gas demand would increase the need for diversification of the supply route and the creation of a new infrastructure. This would be further reinforced by the special characteristics of the CEE region:
Gas Hub as a Source of Regional Market Development in the CEE Region

fragmented markets, dominant suppliers/sources, lack of interconnections, lack of energy supply safety, lack of financial opportunities and motivation for significant infrastructure development projects. In this case the following two programs would be a prerequisite of further market development, i.e. a) establishing pipelines for grid connection between the neighboring countries, still remaining on the national level; b) the New European Transmission System (NETS), which is a project to unite Central and South Eastern Europe's natural gas transmission networks by creating a common gas transmission system operator (TSO), will be stronger. An integrated regional transmission company may overcome these challenges and may mean a solution for the above problems, and may also mean economic growth for all participants. The project is foreseen to create a large, scalable and efficient regional gas market that significantly enhances gas supply security in the participating countries.

Scenario #2
In the second scenario the Austrian gas hub operator will try to make satellite gas hubs, which means that along the Nabucco and South Stream pipeline countries CEGH will try to force these trading volumes into the Austrian gas trading.

This would result in many products which are available on the Austrian gas hub becoming available to trade in the other countries. Some local products might appear at the CEGH, however, in all cases the Austrian dominance would be strong. This would mean that the local market integration would be led by OMV. However, we have to consider that many countries are now participating in the Nabucco project, and they may have other interests. Until the Nabucco is accomplished and transporting non-Russian gas, this would not be a realistic scenario, since its advantages (knowledge of trading and power of position) would not appear until the traders can find alternative opportunities for trading Russian gas.

Scenario #3
In the case of the third scenario the establishment of a Hungarian domestic gas hub is assumed, which would mean that in the next 3-5 years a Hungarian gas hub would appear with its own development path.

The local TSO would establish a trading system suitable for local market needs and a closed bulletin platform, which supports bilateral trading. In the short run this would promote the evolution of transparent prices only at low efficiency, however, it would also largely contribute to the development of market balancing and trading of free capacities. These effects would only realize on a national level.

Scenario #4
In the fourth scenario a Hungarian gas hub and other organized markets would emerge in the CEE region. This would mean that all countries would be able to establish at least a market-based balancing market, which would lead to local markets with local products and local customers in the region.

Such a situation would result in each market needing to develop step by step as it was examined before in this paper. In the first phase, the local energy regulators would be required to establish a local market-based balancing market, and oblige TSOs in the establishment of a local market-based balancing trading platform. The TSOs would be expected to create trading rules in order to balance market opportunities between traders. One example of creating trading rules would be the organizing of road-shows to generate a positive attitude in the potential customers and involve market participants in the process. Another example would be when the TSO company and the wholesaler company have the same owner, they are negotiating with their own clients, who could be the first users of the market in favorable conditions. We have to realize that in this first phase the customer needs education, since the new techniques and potential advantages are not common knowledge. As we introduced it through the analysis of the gas hub development phases, the following development stages are expected to occur in the region.

1. **Short-term physical balancing**: Pipelines will lose their asset specificity with the possibility of contract switching. Open access to the infrastructure will remove the regulated price mechanism. Participants now will have to accomplish their own search for trading partners and pay the costs of this action, and they will have to perform other unusual tasks such as contract bargaining, arranging
transportation, and scheduling deliveries. Participants will not only be faced with learning new procedures, but will now directly pay costs to conduct transactions.

2. **Price reporting and Transparency**: The end of the pipeline company merchant function will result in a void in the institutional environment. An independent merchant function will come up to take the place of the interstate pipeline companies because many buyers and sellers will be willing to use other companies in order to economize on the transaction costs involved in the marketing channel. Participants will recognize an opportunity and make the investment in human assets and learn the identities and needs of specific market participants, the procedures necessary to procure and sell gas, and the transportation required to physically move the gas, knowledge once held exclusively by pipeline companies.

3. **Price Feedback**: At first there will be no standard long-term contract for gas trading and contractual relationships will become highly personalized. However, with the huge increases in volume, long-term gas contracts will become standardized as well. Modernized and standardized contracts will be used in the spot market to include quantity, contract term, price, delivery point, payment schedule, and performance obligations; and as a result they will lower transaction costs by saving time on confirmation of verbal agreements and reducing the potential for misunderstanding.

4. **Risk management**: There will be uncertainty on the part of buyers and sellers to use the futures market on their own because of the additional skills required. The early marketers will perform only a brokerage function of matching buyers and sellers. With a futures market, traders will be able to manage their exposure to the risk of taking title to gas for resale, will promote to take over the task of managing risk for others, and they will become wholesalers.

In any of the above described scenarios the long term purpose should be to prepare the individual markets for coupling with their neighboring markets and to develop such common products that are tradable in more countries. These characteristics are observed to be prerequisites of an efficient regionalization in the CEE region.

### 5.2 Requirements of regionalization

An efficiently operating gas hub in the CEE region would encourage the development of an integrated market. Considering the required liquidity, broad portfolio of sources, access to infrastructure, and transparent and supporting legal and financial frameworks described previously, we have identified that in order to operate efficiently the environment of a hub should be developed to support:

- Traded volume evolution through incentives that are needed in order to increase activity. The required conditions can be provided through regulation, beneficial contracting conditions, and accessibility.
- Churn ratio development through increasing trading volume and the number of participants.
- Spread of the price of buy/sell bids, as facilitating transparency and the existence of a reference price is expected to lead to more realistic bids and is expected to eliminate extreme cases.
- Complexity of network information: the availability of more detailed information should be facilitated (through regulation) as it is an incentive for traders to trade on the gas hub.
- Number of active traders: regulator should promote trading on the gas hub.

As discussed previously, the EU market integration is a complex and lengthy process. It is required to split up the integration process into phases. Before the three regions defined by ERGEG could be developed, we believe that three sub regions should be identified and integrated. After the three sub regions are successfully integrated, the CEE region can be integrated. For this purpose, we have considered the following phases in the development process:

2. Development of domestic gas hubs in the other countries of the CEE region.
3. As a pilot project market, the coupling of Austria, Hungary and Romania.
4. Extension of market coupling to Italy and in the CEE to Slovenia, Bosnia and Herzegovina, Croatia, Serbia, Kosovo and Montenegro resulting in the establishment of a sub region within the CEE.
5. Similar integration process to the Hungarian pilot project between Poland, Czech and Slovak Republic.
6. Similar integration process to the Hungarian pilot project between Bulgaria, Greece, Albania, Macedonia, and later Turkey.
7. Market coupling of the three sub regions of the CEE would result in the regional market integration envisaged by ERGEG.
8. As soon as the three large market regions are integrated a European integration could be targeted.
5.3 Advantages of a gas hub in operation

Generally, gas hubs are considered to be an effective tool for market development and integration. As described throughout the analysis, gas hubs provide consumer benefits through a transparent market with a more realistic price. Gas hubs speed up the standardization of the national regulations, which is a requirement of efficient regionalization, as the market price on a gas hub carries all information about the market value for the regulator. As gas hubs facilitate transparency and thus market competition, the risk of monopolistic market player dominance is reduced. The opportunities of market players get broader with the increasing competition.

Market integration requires the strong cooperation of TSOs, which can be inspired by the development of gas hubs. It should also be the aim of TSOs to develop support or develop a gas hub in their own region to have control over their own area. If they miss this opportunity, foreign gas hubs may move in causing the TSOs to lose control over their own market.

As the most obvious short term solution for decreasing the risks of natural gas dependency and ensuring the security of supply, gas hubs must be established and operated on a country level before developing an integrated EU market. Well operating gas hubs lead to a more transparent natural gas market by providing a reference price and thus eliminating the negative effects of oil-indexed prices of long term agreements.

Figure 16: Advantages of a gas hub establishment in the CEE region

<table>
<thead>
<tr>
<th>Transparency</th>
<th>Regional competitiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard reference-price</td>
<td>Adoption of the European business model</td>
</tr>
<tr>
<td>Unbiased trading</td>
<td>Collaboration between TSOs</td>
</tr>
<tr>
<td>Equal treatment</td>
<td>Realization of market coupling in the short run</td>
</tr>
<tr>
<td>Equal access to information</td>
<td>- Increased trading demand and supply</td>
</tr>
<tr>
<td>Managed counterparty risks</td>
<td>- Balanced market features</td>
</tr>
<tr>
<td>Anonym trading</td>
<td>- Optimizing investments</td>
</tr>
<tr>
<td>Increasing market competition</td>
<td>- Increasing traders activity</td>
</tr>
<tr>
<td>Maintaining market supervision</td>
<td>- Liquidity of traders</td>
</tr>
<tr>
<td>Close cooperation with market participants</td>
<td>- Increasing cross-border capacities</td>
</tr>
<tr>
<td></td>
<td>- Simple regional trading for international traders</td>
</tr>
<tr>
<td></td>
<td>- Product compatibility</td>
</tr>
<tr>
<td></td>
<td>- Comparability</td>
</tr>
</tbody>
</table>

Source: KPMG analysis
6 Conclusions

The establishment of natural gas spot markets in Europe has spread as a result of the natural gas liberalization, which means that: (i) consumers may purchase natural gas from any market participants, allowing for replacing suppliers, and thus contributing to the decrease of tenor in the case of long term contracts; and (ii) in the frame of natural gas auction programs dominant market players are forced to sell natural gas for other market participants, which leads to an increase in the volume available on the spot market. By 2007, the total natural gas volume traded on the spot markets had exceeded total consumption by one third in the European markets. Out of this traded volume only 10 percent took place on gas exchanges, and most of the natural gas volumes were traded on over-the-counter markets or based on bilateral contracts. Registered traded volume in gas hubs located in the EU was approximately 11,735,000 GWh in 2008, out of which 9,000,000 GWh was traded through the OTC market of NBP.

The increasing volume traded in the spot market contributes to the increasing role of market-based pricing as opposed to the crude oil-indexed pricing used in long term contracts. Gas hubs play a significant role both in ensuring the security of supply and in providing transparent prices for market participants. Through the example of establishing a gas hub in Hungary, it was illustrated that one of the most important tools for the development of a transparent market-based pricing mechanism is the establishment of a natural gas hub in the spot market, which supports the consumers in managing the risks of a short term supply crisis, and manage price volatilities. This solution could be exported to other countries in the region, which would accelerate the integration of the regional gas markets.

As the analysis introduced in relation to the establishment of a Hungarian gas hub, the most important requirement is to ensure an adequate level of liquidity, which is closely related to (i) the open access for both vertically integrated and non-integrated participants (hence mitigating the risk of dominant market position abuse by monopolistic participants); (ii) the open access to entry-exit capacities on local pipelines (hence allowing for gas transportation for any delivery dates); (iii) the open access on the regional level to large capacity transportation pipelines, and (iv) the open access to transportation and storage information for all participants.

Gas hubs not only promote market transparency, but through the coupling of markets they also contribute to the improvement of security of supply in the CEE region. Among the prerequisites of a successful gas hub establishment we found the endeavors to introduce unified regulation and also to obtain the support of consumers and public acceptance. As a combined effect of the above, a transparent market can develop, serving for natural gas consumers both as a market price indicator and as a risk management tool. These ideas lead to the conclusion that the establishment of a gas hub is advantageous not only for the customers but is also a good tool to accelerate the regional market integration in the CEE region.
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Figure 17: Introduction of the European Union

Source: EU
Figure 18: Natural gas prices in the EU-27

Gas prices by type of user - Euro per Gigajoule - Industry I3-1

Legend (Series: 2008)

- 5.9103 - 7.7517
- 7.7517 - 9.5997
- 9.5997 - 12.14
- 12.14 - 13.32
- 13.32 - 16.539

Source: Eurostat, June 2009
**Major milestones of the EU liberalization process**

Negotiations between the EU authorities, the member states and the market stakeholders during the 1990s culminated in an Electricity Directive (96/92/EC) and, two years later, in a Gas Directive (98/30/EC) introducing a first set of common rules for the EU energy markets. On natural gas, the new legal framework was aimed at opening the gas networks to third parties. This was to be achieved through the unbundling of the vertically integrated historical gas operators, thus allowing competition for supplies and customers within the natural monopoly network.

**2000 & 2003: LISBON AND BARCELONA COUNCILS**

Even before the implementation of the first Gas Directive there was already a push to accelerate gas and electricity liberalization. The European Council, held in Lisbon in March 2000, requested that the Commission undertake further steps towards the completion of the internal energy market. The new aims were far more ambitious and global than the first Gas Directive, and this time gas and electricity were treated jointly in one proposal. Therefore, a second Gas Directive was postulated before the first had been fully incorporated into some member countries’ national laws.

**2003: SECOND GAS DIRECTIVE**

The new Directive was accompanied by deeper analysis of the public service obligations and of the security of supply issues. Although the first Directive already recognized the weight of these issues in the European gas industry by relying on subsidiary and “made to measure” solutions for each state, in the new diagnosis, the process of liberalization was treated separately from security of supply measures, which was to be a matter for a separate directive.

**2004 & 2005: 4th AND 5th BENCHMARKING REPORTS**

By 2003, the market reality in Europe was that competition was still very slow to develop. After two attempts to open the energy sector to competition, a new series of benchmarking reports made by the Commission (third & fourth) in 2004 pointed out the issues that seemed to impede the creation of a truly competitive and functioning energy market in the EU.

**2007: 6th BENCHMARKING REPORT AND 3rd PACKAGE**

The 6th benchmarking report was issued in January 2007 and provided a general overview of the future energy policy of the EU. It envisaged a “third package” of legislative proposals for the European gas and electricity markets. The rationale of this third package is the integration of the energy and the environment objectives of the EU through the use of market based environmental and other measures.

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