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# IMPROVING NATURAL GAS TRADING IN EMERGING MARKETS: GAS EXCHANGE AS MARKET DRIVER IN THE CEE REGION

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## Abstract

Competitiveness of natural gas is measured by losing or winning market share. Following the trends, more efficient and cleaner alternative technologies as well as cheaper available energy sources pose the biggest threat to natural gas. In today's market situation, price sensitivity is a more and more dominant factor when deciding on fuel sources. To prevent natural gas from becoming a secondary energy source in emerging market such as in countries of the CEE Region, the right methodology of gas pricing should be implemented.

In practise, the National Regulatory Authority (NRA) should come to the conclusion that the actual pricing mechanism in their market is not appropriate and change is needed. On the other hand, the final goal has to be understood at the same time, i.e. a market base pricing has to be reached on the long term. In order to implement a healthy market base pricing mechanism in an emerging country, a linkage is required to a stable and trustworthy hub price index. The most important prerequisites of a stable hub price index are an adequate and transparent liquidity, the appropriate supply diversity, and a well-developed supporting infrastructure.

Based on the best practise analysis, the changes required for the development of a liberal gas market were identified. The first and most important is the demergers of monopolistic government owned entities. An additional component of a successful market development is the need for developed infrastructure, due to which governments are urged to allocate funds into this field. In parallel, an organised market is required, which is also advised to be supported by regulation. From an organised market with enough liquidity, a free market competition can develop. Long-term bilateral contracts can be substituted by standardised physical futures contracts. As a result of a developed gas market, the pricing mechanism can be further developed. The examined best practises show that the main components for success were:

- The demergers of the monopolistic market by regulation
- The creation of a single point trading hub that created a reliable trading spot
- The creation of organised markets, i.e. hubs and exchanges
- Standardisation of contracts and trading
- Continued infrastructure developing

A liberalised gas market can develop a free market competition environment through an organised wholesale market. As the observed best practises indicated, developed markets became strong and stable through the increasing utilisation of gas hubs both for balancing and organised wholesale trading. As an early step, national and regional market integration improves the security of supply and decreases the supply dependency. The more liquid a natural gas hub can become, the higher supply source diversification it offers, increasing trading and thus price competition.

As numerous advantages can be realised through the implementation of a gas exchange, it is highly recommended for decision makers of emerging markets to take the first step towards gas market development. A successful implementation of a gas exchange is only the first step on the development path. Various other requirements need to be met in order to utilise the gas hub and reach a development stage where the gas pricing can be positively affected. Overall, the benefits of proactively developing a gas market towards free market competition are much higher than the associated risks.

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# 1 Background

The role of natural gas as a primary fuel is getting smaller in the fuel mix of Hungary and the Central and Eastern European (CEE) Region. The decreasing market share of natural gas is showing that this primary fuel is less competitive than 10 years ago.

Huge expectations towards natural gas could be observed in emerging markets about 11-12 years ago. Investment into gas fired power generation was popular, which caused an exponential raise in gas demand. Another significant influence on the market is the limited number of importers, due to which the gas supply became dominated by only a few importers. These market conditions lead to double the natural gas price in the last 5 years especially in the emerging Eastern European countries that had limited domestic supply availabilities.

As a result of the increasing gas prices, consumers started to find other alternative solutions, which led to restructuring of demand. In urban areas, electricity heating and solar panel installations spread together with the improvement of housing efficiency rates. In rural areas renewable energy sources (RES) started to substitute gas sources. Furthermore, in the industrial and commercial sector consumption rationalisation started to spread and other organic fuels appeared as substitutes to gas. As a result, natural gas is becoming an important, but expensive energy source.

Competitiveness of natural gas is measured by losing or winning market share. Following the trends, more efficient and cleaner alternative technologies as well as cheaper available energy sources pose the biggest threat to natural gas. In today's market situation price sensitivity is a more and more dominant factor when deciding on fuel sources.

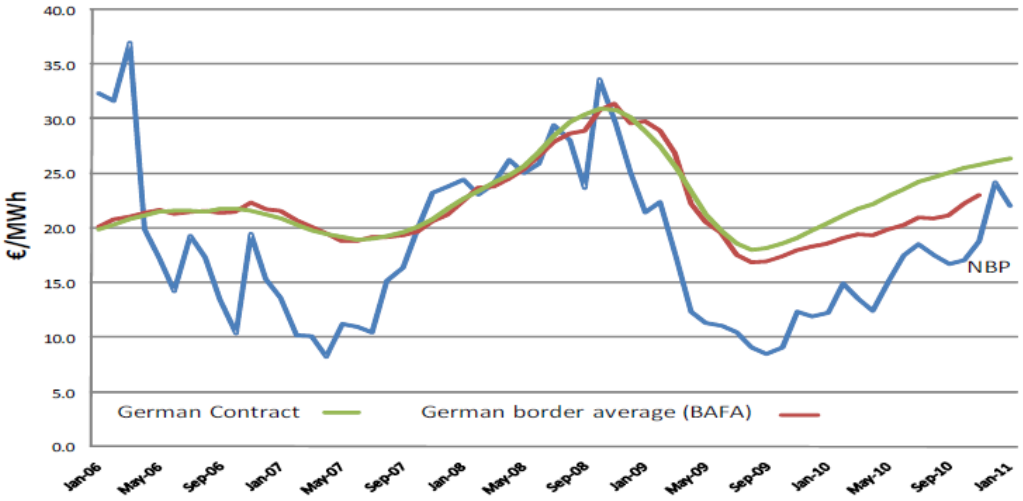
The price of the natural gas is determined by the pricing methodology. Many presentation and survey tried to find the answer, which solution is better choice for the market: oil indexed or gas on gas pricing.

## *1.1 Oil price indexation versus Gas on gas market*

First of all, to understand the principals of the pricing methods, the history of natural gas trading has to be analysed. Oil-index pricing method is based on the economic philosophy of substitution. For natural gas consumers oil meant a perfect substitute as primary fuel. Those technologies were able to switch easily from gas to oil firing. The end-users would change from gas to oil if the price of the natural gas is incentive to do so. The oil product linkage pricing was established in the 1970s. These times oil linked indexation provided reliability and predictability for the market participants. There was a security of supply and demand as well, sellers and buyers benefited from that.

The pricing method of the long-term contracts is oil-indexed, the period is 20-30 years. These conditions ensured the producers the return of their investment, which decreased the risk of the projects. The financial planning was easier, because the contractual term is harmonised with the return of investment. Take or pay obligations also helped to decrease the financial risk of the producers. These long-term contracts were able to offer as collaterals for the financial investors.

**Figure 1: Comparison of long-term oil-indexed gas prices and the NBP spot prices**




*Source: Howard Rogers, OIES*

With time, the economical environment changed. Oil price was getting volatile due to commoditisation of oil market. Indexation to the basket of oil products is softening the volatility, but the price does not reflect physical fundamentals of the oil. Oil price is high and volatile. The original replacement value economic philosophy is getting far from the oil-indexed contract formula. The end-users do not calculate with oil as a perfect substitute of natural gas any more. The cost of maintaining oil-burning equipment and storing stocks of oil products is high. The new gas-burning technologies with higher efficiency do not support the use of oil products. Residual fuel oil and light fuel oil are not perfect replacement fuels any more.[1]

In general, gas on gas market guaranties a fair market price according to the demand and supply of natural gas. Oil-indexed pricing has not reflected the market fundamentals for the recession time since 2008. In Europe is an over-supply of gas due to the increase of LNG infrastructure, however the demand declined due to economic downturn. In 2011, the Libyan civil war and the riots in Egypt pushed oil prices to a higher level. Gas and oil product markets diverged.[2] End-users are monitoring the transparent hub prices to negotiate the supply contracts. They see a "real" value in the public hub prices. They need a more competitively priced gas to be competitive on their own market. Market pricing separates the physical delivery from the financial settlement. It ensures to manage the financial risk separately. As a result, gas on gas pricing is the next step of wholesale market development, which increases gas on gas trading. This growth in traded volume can improve the liquidity of the OTC market or the exchange platform.

## *1.2 OTC versus Exchange trading*

Nowadays, commodity trades as natural gas deals can be traded bilaterally or on exchange platform. The OTC platform can also be divided to brokered and without broker segment. In the first case, the broker, as an agent helps to find the other party to make the deal. In the second case the OTC deal rest on personal contact and mostly discussed over the phone.

### Market dominance versus equal treatment

First of all, to make an OTC deal, the counterparties have to have a master trading agreement with each other. These agreements provide the framework to trade with the partners on the OTC market. There are different types of contracts, but all of them have to include the most important factors, such as payment terms, gas quality, collaterals or delivery. The advantage of these agreements is that the counterparties can customise the

details of the agreement, but they have to negotiate the contents and sign the agreements with every partner. Sometimes the negotiation process is cumbersome and takes long time. Furthermore, there is the opportunity to take advantage of market dominance. Therefore, some small market players are at a disadvantage. It can also happen that a market player cannot sign a master trading agreement due to the requested collaterals, which were dictated by the other partner. Without the master trading agreement, the small market player is unable to make deals. Since the contractual terms are confidential, a dominant market player is able to request different guarantees or collaterals from its partners, which can restrain the activity of the small players on the market.

Standard master trading agreement forms are available on the OTC market. One of these is the standard contract of the International Swaps and Derivatives Association (ISDA). Financial institutions prefer this type of agreement. The other one is more popular in the energy sector, the standard agreement of the European Federation of Energy Traders (EFET).[3]

Another type of businesses on the OTC market is the brokered deals. These trades happen with the help of a broker, who find the counterparty for the partner to make the deal. Irrespectively of the agent role of the broker, the master trading agreement between the parties is also required. The master trading agreement has to be signed with every partner. It can happen that both parties are the clients of the broker, but they do not have contract with each other. In this situation, the business partners or the broker can find a third party who has trading agreement with both partners. Now this market participant can sleeve the deal. This solution has an additional cost, the fee of the third party.

Trading on exchange is also based on an agreement, which is signed by the member and the exchange. This standard agreement is one of the most important advantages of the exchange trading, as it provides equal treatment of the members. There is no opportunity to abuse with market dominance. The exchange agreement contains standard rules and obligations, which will not put the smaller players at disadvantage.

On the exchange platform contrary to OTC, it is sufficient to sign only one contract to trade with every participant. Additionally every exchange member can keep their anonymity and they do not have to reveal their positions.

### Risk management

The counterparty of the exchange trades is always the central counterparty, which is a top rated bank. This helps the market participants to reduce and manage the risk of the partners. Furthermore, it is an important benefit that the financial settlement of the deals happens on daily basis. It is on the same day as the delivery or on the first following business day. On the OTC market, sometimes more weeks elapse between the physical delivery and the financial settlement. The payment is in a lump sum. These factors together increase the financial risk of a company on the OTC natural gas market. Trading on exchange platform can manage these risks. Additionally the strict margin requirements provide an extra security against excessive exposure.

## 2 Aims

To prevent natural gas from becoming a secondary energy source in emerging market such as in countries of the CEE Region, the right methodology of gas pricing should be implemented. For this purpose, the gap between the Western European gas-on-gas competition and Eastern European oil price escalated pricing schemes should be reduced and the interconnection of the regional gas markets should begin as soon as possible. This study is dedicated to identify the opportunities of emerging markets in increasing the competitiveness of natural gas trading through affecting the pricing mechanisms applied on their market.

First step has to be the identification of the critical points to develop a monopolistic and oil escalated gas market. This part of the examination is crucial in order to find the right tools after the requirements of a gas-on-gas competition market have been defined. Best practise analysis provides the useful patterns in terms of the development of a competitive gas-on-gas market. There are many ways to successfully improve an emerging market, but the difference in the economical and political environment cannot be neglected. After the necessary changes and requirements have been determined, the tools can be chosen in order to achieve the goal, a competitive wholesale gas market with gas-on-gas pricing. One of these tools can be the establishment of a gas hub/exchange, which can significantly foster the market from oil indexed to gas-on-gas pricing. This step is required, but not sufficient.

The chapter of methods goes through the best practises and looking at the compatibility of the applied tools to develop the gas market in emerging countries. The case study of Hungary analyses the possible scenarios regarding the achievement of the gas market evolution. Based on the best practises and examples, the paper is intended to show that the competitive gas market in emerging countries, such as the CEE region, is not only a vision, even more a feasible objective.

# 3 Methods

In general, the competitiveness of gas trading depends on three major factors:

- supply diversity
- legislative and regulatory framework
- pricing methodology

The study is dedicated to examine the competitiveness from the pricing methodology point of view by concluding the below analysis steps:


## 3.1 Best Practises

The existing practise in different locations around the world gives a clear picture how could an emerging market evolve and step on the tested mature stage. Regions where the natural Gas can be found developed first and from these the setbacks and best practises can be learned for this industry. In natural gas trading, the leading example is the Henry Hub in the United States of America. Even though, the liquidity of the Western European (WE) gas hubs and exchanges are far from the Henry Hub performance, the WE markets also considered as leading examples for emerging Eastern European and Far East markets. The European Union (EU) even works on the development of a unified gas market model to be implemented later on throughout Europe.

First to be analyzed the United States Gas markets and Hubs, then the European continent. In the Europe region there are two well built gas market, the NBP in United Kingdom and Dutch APX TTF. The continent lacks of Natural Gas except Norway, which has considerable gas production. The analysis first part is the liquidity in each market, this follows a regulation background of these regions and the last not least the price and source infrastructure. As a comparison, the EU Gas Target Model will be considered as an indication towards the future market design in Europe.

**Figure 2: Best practise analysis methodology**

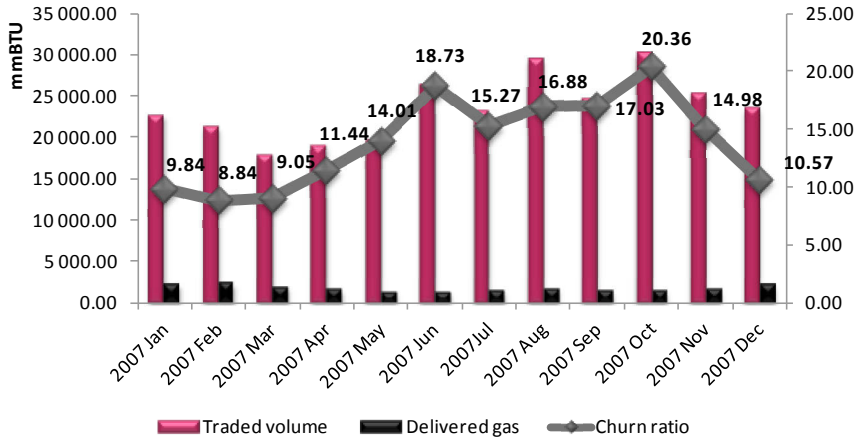

### 3.1.1 Liquidity measures

Liquidity is an important function of a market. Without liquidity the prices could distort and be easily manipulated. For a commodity with lot of consumers and producers is important to have a stable price in every period, to properly represent the supply and demand. Real liquid markets these days are in the United States and United Kingdom.

For liquidity measures the churn ratio will be used, which measures the amount of gas traded before it is delivered. This means that the trading volume can be higher than the actual gas delivered. This ratio is a good sign of a healthy market and trading activity. The common number for a healthy market is 15.[4] It means 15 times traded compared to the real delivered

volume. In this mature stage, larger volumes in any period cannot distort prices and manipulate the market. This leads to a fast and successful exchange of traded products or contracts. Figure 3 the example of United States Natural Gas futures churn ratio in 2007. Before the winter period, the markets churn ratio reaches 20.36, which mean the traded contract is 20.36 bigger than the delivered gas.

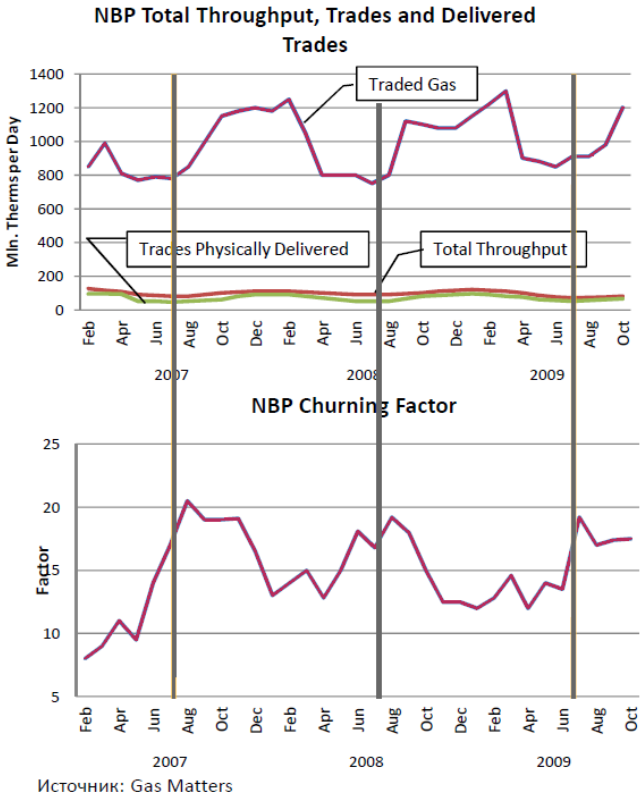
**Figure 3: Churn ratio US Natural Gas Futures 2007**




*Source: Author Calculated from IEA monthly data and NYMEX historical prices*

The critic of the measure is that if the traded volume is relatively high compared to the psychical, the churn ratio gives a number that not showing correctly the exact liquidity and distorts the average churn ratio. For example, the summer low traded supply volume corresponds to high churn ratios.

**Figure 4: Churn ratio critics**




Источник: Gas Matters

*Source: How market hubs and traded gas in European gas market dynamics will influence European gas price and pricing, Dr. Andrey A.Konoplyanik*

As Figure 4 shows, the churn ratio much higher in the periods of low delivery month in the summer. The delivery in the summer is periods lower due to summer gas usage, while the traded volume not changes. This will lead to higher churn ratio in the July period. If this average turns out to be two or three times more, as a result the yearly churn ratio distorted. This phenomenon can be seen on Figure 3 as well. In June, the delivered volumes significantly lower (24%)[5] while the churn ratio almost peaks in 2007 with 18.73.

Knowing this slight distortion to yearly churn ratios still can produce a valid picture how effectively the markets and exchanges works. In this paper, the churn ratio will be used as a reference point through the liquidity analysis.

### *3.1.2 Gas market in the United States of America*

#### United States of America (USA) gas market infrastructure

United States is the biggest natural gas market in the world and production increases every year. The largest production segment is from gas wells. By 2010 more than 759 000 million $m^3$ produced and still growing. [6] As the Figure 5 shows out of the top five producers, the largest output area is Texas by the end of 2011[7]

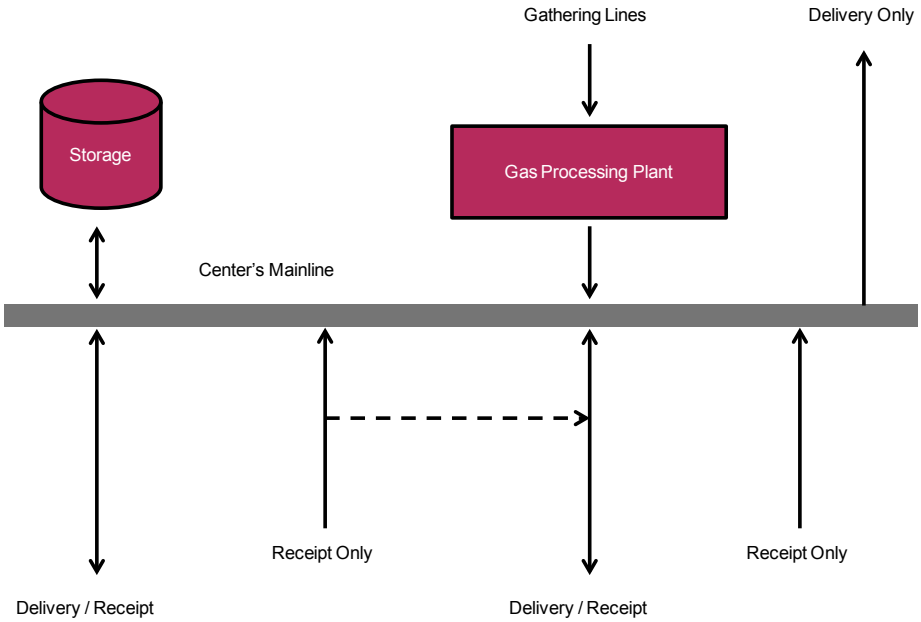
**Figure 5: The top 5 gas supplies area in the USA**

| Top 5 natural gas supply region | | | | | | |
|---|---|---|---|---|---|---|
| | Total Gross withdrawals | Repressuring | Vented and Flared | Marketed production | Extraction loss | Dry production |
| **Alabama** | 240 703 | 736 | 2 617 | 222 932 | 19 059 | 203 873 |
| **Alaska** | 2 812 701 | 10 173 | 0 | 20 835 | 353 391 | 353 391 |
| **California** | 2 724 | 279 | 3 019 | 13 244 | 273 597 | 273 597 |
| **Louisiana** | 2 218 283 | 3 606 | 4 578 | 2 210 099 | 102 448 | 2 107 651 |
| **Texas** | 7 593 697 | 558 854 | 39 569 | 6 715 294 | 437 322 | 6 277 972 |
| million cubic feet | | | | | | |

*Source: http://www.eia.gov/naturalgas/annual/*

There are 10 major hubs and 7 suppliers from which the most important is Henry Hub. The pricing power of this Hub is the greatest in the continent. Henry Hub connects the main supply chains with the rest of the world and from here, the regions gets the demanded supply. In the United States due to long distances, the pricing of the hubs may differ. If any imbalance occurs, the transportation fees can produce higher prices in different locations. The price can go far beyond above the prices on other hubs because there is no incremental capacity.

**Figure 6: Natural Gas Hub Schematic**




*Source:* http://www.eia.gov/pub/oil_gas/natural_gas/feature_articles/2003/market_hubs/mkthubs03.pdf

These Hubs or pricing points usually contains junctions of pipelines and storage facilities allowing the Hub operator to offer balancing services and options for natural gas buyers or sellers. The most important Hub services in the United States:

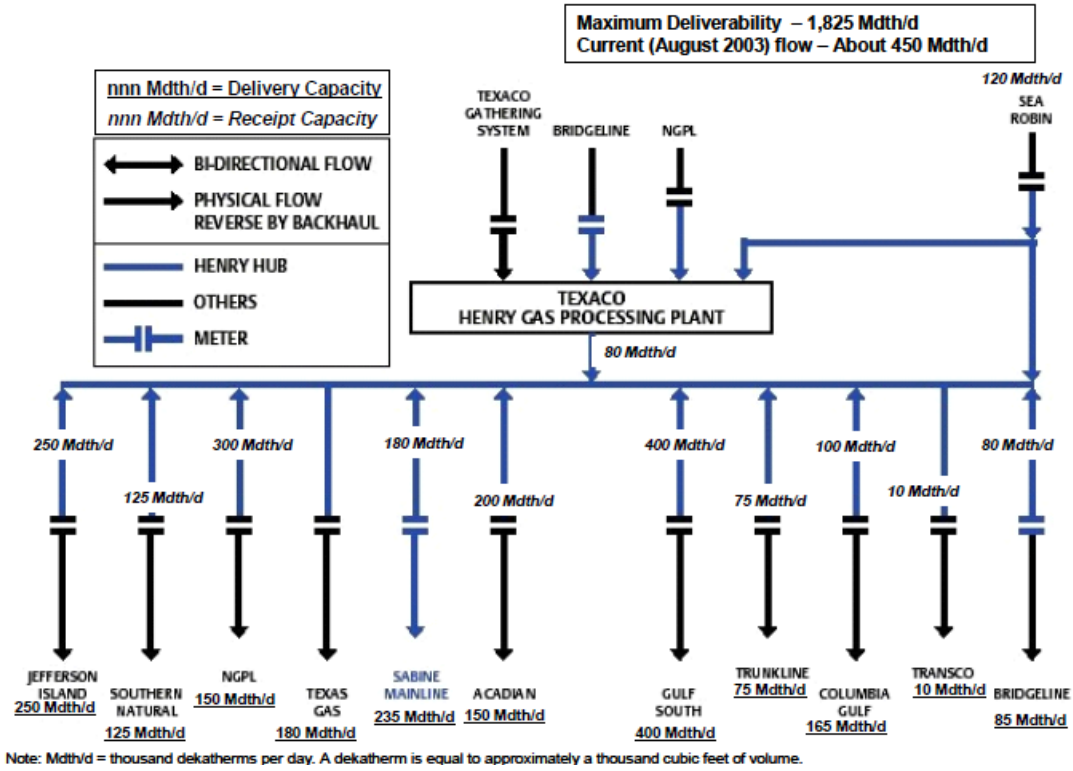
- Transportation / ownership change
- Electronic Trading
- Storage/Parking
- Administration
- Compression
- Risk management

To cover any imbalances that might occur when the receipt/delivery volume exceeds nominated capacity on either pipeline, the shipper can execute an operational balancing agreement with the hub.

## Henry Hub

This Hub in the United States is the benchmark for all the hubs in this region and the most liquid. This Hub is close to natural gas sellers and the gas flows from here to buyer Hubs like the Chicago Citygate Hub. The Henry Hub is connected to many large pipelines serving different consumer regions.

**Figure 7: Henry Hub Schematic**




*Source: http://www.eia.gov/pub/oil_gas/natural_gas/feature_articles/2003/market_hubs/mkthubs03.pdf*

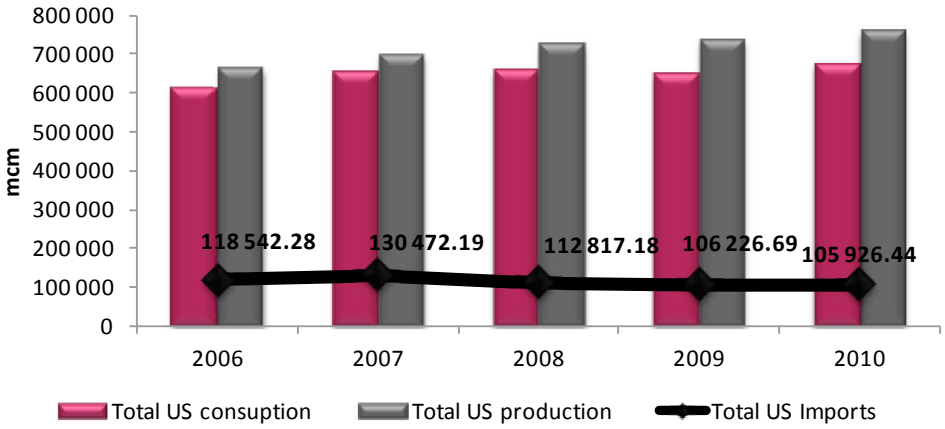
It has capacity to storage enough gas for different gas traders and provides a liquid high volume trading area for every day traders. The Henry Hub in this context the most developed market with 72-month a-head futures market products maintained by NYMEX in New York. At this hub marketers and traders have access to large consumer markets in the Midwest, Northeast, and Southeast and along the Gulf Coast through nine interstate and three intrastate interconnecting pipelines. [8] In last decade, the Henry Hub spot and futures prices have become the surrogate for "real-time" wellhead natural gas prices. The correlation between the wellhead and Henry hub is more than 0.97 meaning a strong linear relationship.

Today's one and most important service is the online electronic trading of these products. This helps a greater price discovery and an efficient allocation of needs. Not mentioning the reduction of price risk in critical periods. The infrastructure justifies that the good placement of a marketer HUB helps creating liquidity. The provided services further supply the efficient distribution of natural gas. This schematic could lead to a developed mature market and a good trading point where supply and demand can meet.

## The liquidity of US Gas market

The number of wells in the end of 2010 was 487,627 and the production average growing from 2006 is 23,370 million cubic meters per year. The import in 2010 was 105,926.41million cubic meters this is the 13.94% of the production.

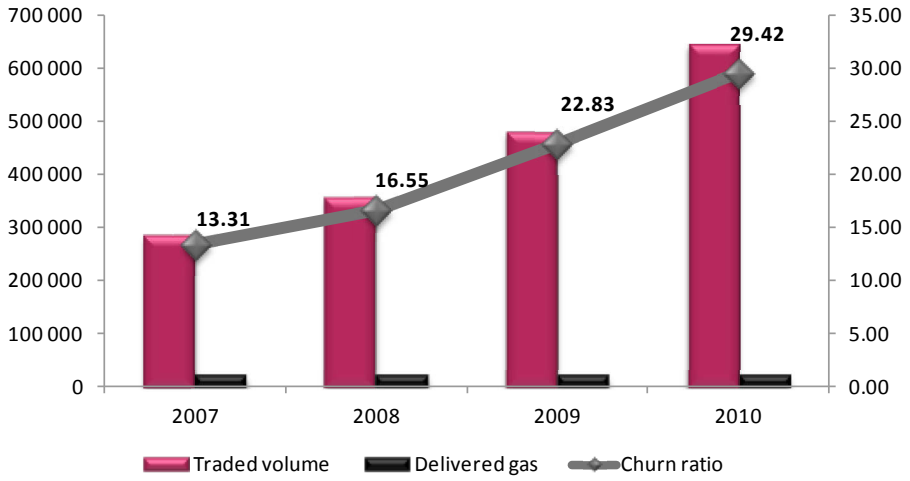
**Figure 8: United States gas market**




*Source: http://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_nus_a.htm*

The main importer of the US is Canada. The imports are decreasing contrast to the increasing production. Hubs estimated total daily deliverability 1,390 MMcf/d [9] The Henry Hub churn ratio is approximately 29.42 in 2010 for the NYMEX Gas futures. Excluding SPOT and OTC market, the futures market volume in 2011 gained 19.5% compared to the last year.

**Figure 9: Churn ratio US Natural Gas Futures**

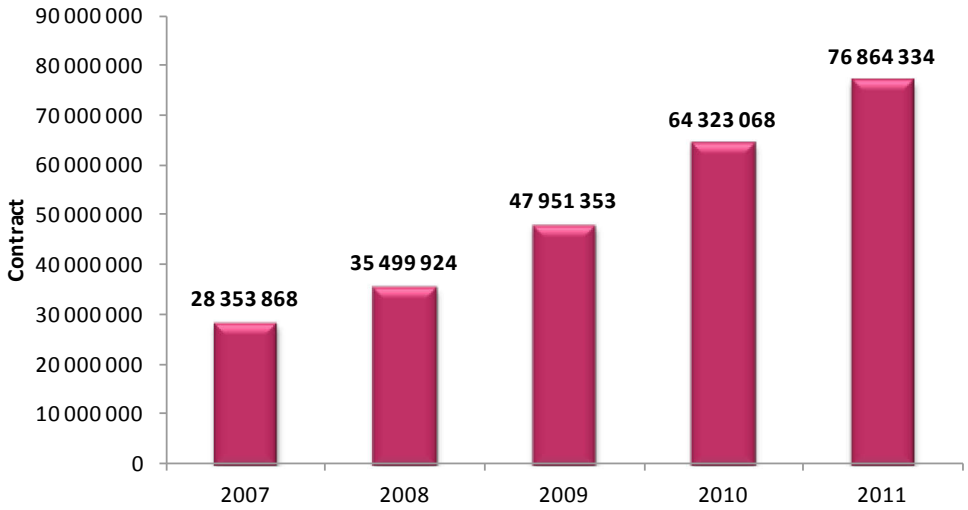



*Source: Author Calculated from IEA Annual Data and CME group web monthly volume report CMEG*

At the same time options market volume remained the same. The option trading is 30% of the futures market.[10] The SPOT and OTC market are excluded from Figure 9. The churn ratio for the complete US market is approximately 377.[11]

The last years trading volumes in natural gas futures rose in average 25% on NYMEX with Henry Hub delivery. The production and consumption remained relatively unchanged. This can be seen on Figure 8.

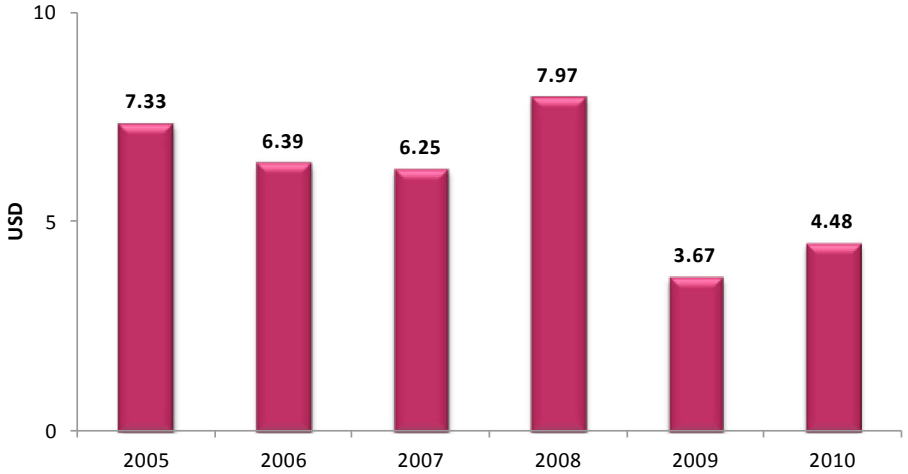
**Figure 10: Natural Gas Futures traded volume**




*Source: http://www.cmegroup.com/trading/energy/natural-gas http://futures.tradingcharts.com/chart/NG/M*

The prices of the gas in the wellhead and in Henry Hub, has been decreasing from 2005. This is because the warmer winters in this region the storage facilities cannot empty their injected capacity in the winter season. At this time, new form of natural gas production emerges the shale gas. This combined with the more and more effective market the prices are declining.

**Figure 11: Natural Gas Futures traded volume**




*Source: http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_nus_a.htm*

## The legislate background of the US Gas markets

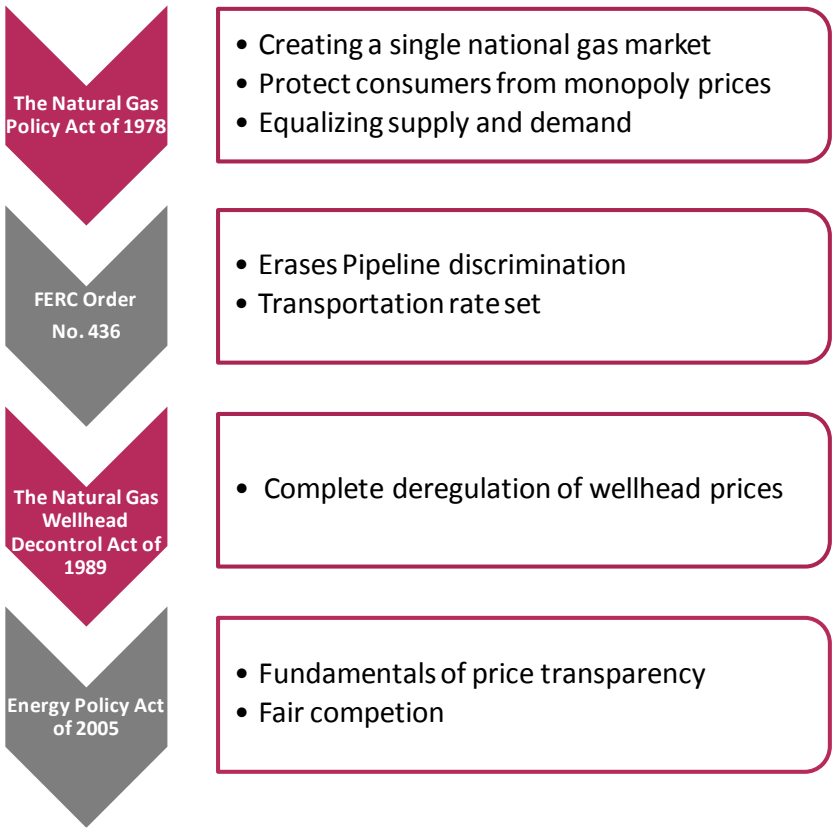
The gas supply shortages led the US Government to protect the consumers from high gas prices. These were a lawful maximum wellhead price. This became an incentive to search for more natural gas fields. After several years, the price ceiling caused high demand and low supply. After several years because of unbalanced market, the Government started to deregulate the wellhead prices. The regulations led to the erase of wellhead price discrimination.

After 1989, the deregulation of natural gas wellhead prices the natural gas market undergone in a significant change. It became one of the most transparent commodity markets in the world. The Energy Policy Act of 2005 laid the fundamentals of price transparency, such as:

- Encourage of building natural gas storages
- Consumer protection
- Criminal penalties on trading
- Transparency rules
- Incentives for production

The aim was to protect the integrity of the markets and make fair competition among the sellers and buyers. Created liquefied gas forums and new natural gas storage facilities.[12]

**Figure 12: United States Regulation History**




*Source:* http://www.naturalgas.org/regulation/history.asp *and The energy Policy Act 2005*

With large distances, the Gas Industry Standards Board needed to standardise the gas trading language beginning with the common time of the delivery and shipping order. Now the North American Energy Standards Board (NAESB) is the responsible for these standards. The market also developed an indexing system for the better understanding of the price movements. The index price published every morning of the next business day. With a greater price discovery, the consumers and producers could easily plan deliveries. The law to create more storage facilities could handle the excess supply and demand easily. This extensive psychical market infrastructure and regulation contributes to the most developed financial gas market.

The financial markets for natural gas are actuated by NYMEX, a member of the CME Group. The contracted trade with a guarantee of a third party made easily trustworthy the market and their participants. These standardised products expire three business days before settlement. The financial products provide the best means of insurance against unfavourable price volatility. The number of instruments still growing until 2008 there were 22 kind of natural gas swaps. The options trading exceeded the 25,000,000 contracts in 2011. [13] This was mainly driven by private sector.

## The success of US Gas Markets

The following main features led to the success of the US natural gas market:

- Large Hydrocarbon deposits
- Numbers of producers and consumers
- Several large monopolies instead of one Government production
- Infrastructure development driven by government
- Active consumer lobby
- Continuous deregulation of wellhead prices

The government regulations were essential in the evolution of the US gas markets and the infrastructural setups in this region. Many producers and consumers drove the regulations and infrastructure development. Another driver was the number natural gas deposits and wells. After the price transparency and standardisation was completed, the market was ready to create an excessive psychical spot market. The futures market could easily develop after the supply and demand realises the power in hedging risks. These days the price control and risk management has a greater concern.

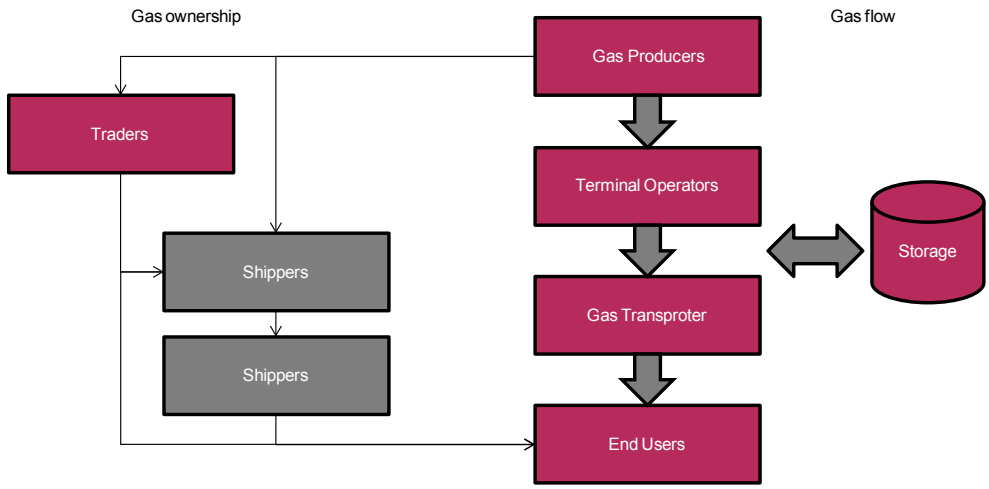
### *3.1.3 Gas Market in the United Kingdoms*

## United Kingdom gas market Infrastructure

The United Kingdom gas infrastructure was built by the Publicity owned British Gas. From 2006, the gas production was slowly declining, while the consumption remained the same. The British Gas was privatised in 1986, the non-Domestic completion was allowed from 1982 but no other suppliers entered the market until 1990. This first move was not enough to a fully competitive market. The structure fully changed until 2010 until this year many competitors appeared near Transco with new pipelines. In October 2000, BG plc demerged into two separately listed companies, of which Lattice Group plc was the holding company for Transco, while BG Group plc included the international and gas storage businesses. On 21 October 2002, Transco and the National Grid Company merged to form National Grid.

The privatisation and demerger of British gas market lead to a developed market. It took almost 15 years to reach almost the free market stage. For an emerging market, this example is very useful. Monopolistic markets are slow developing and do not have the real incentive to lead the markets towards consumer protection and supply efficiency. On the other hand, the monopoly has the power to create larger investments. Figure 13 the UK gas market evolved into this schematic after the demerger of government owned companies.

**Figure 13: United Kingdom Gas market**



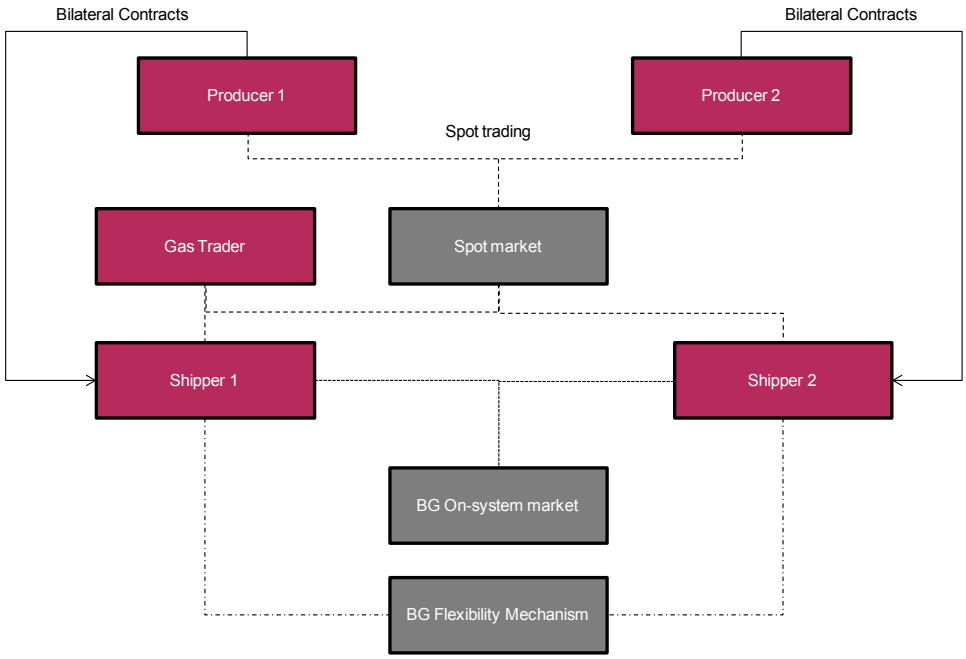

*Source: http://rru.worldbank.org*

The on-system market is a natural gas spot market with the delivery point at the National Balancing Point (NBP), a notional point in BG's pipeline network at which BG balances its high-pressure pipeline system. In effect, all gas supplies transported through BG's high-pressure pipelines can be traded at the NBP.[14]

The UK gas traders use four trading types:

- Bilateral contracts
- Spot markets
- The on system markets
- Flexibility mechanism

**Figure 14: United Kingdom gas trading**




*Source: http://rru.worldbank.org/documents/publicpolicyjournal/138juris.pdf*

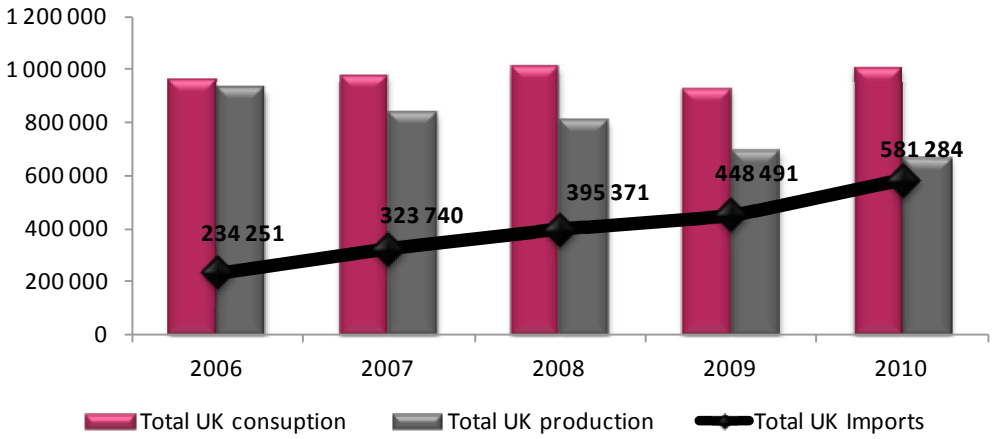
Typically, the producers of natural gas use bilateral contracts. These contracts variety from long to short timeframe contracts, this helped to be more flexible in demands. New independent suppliers needed a better pricing; this moved the market to the spot and on-system market trading. The schematic of today's trading on NBP can be seen on Figure 14.

A transaction in the on-system market typically involves shippers that own transportation contracts and are willing to sell or purchase natural gas. Selling shippers use their reserved pipeline capacity to deliver natural gas to the NBP, where they sell it to interested buyers. Buying shippers then use their pipeline capacity to transport the gas from the NBP to the desired location. Transactions are facilitated by BG, which keeps track of traded volumes and provides transportation services.

## The liquidity of United Kingdom Gas market

The 2010 production was 665,083 GW/h. The Gas network serves 40 power stations, the regional gas distribution is privately owned. Nine storage facilities located three of them are LNG capable.[15]

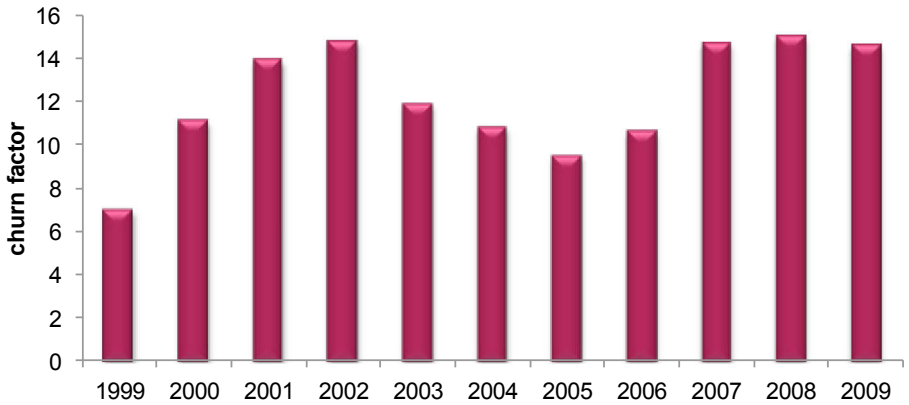
**Figure 15: United Kingdom gas market**




*Source: http://www.energydelta.org/mainmenu/edi-intelligence-2/our-services/Country-gas-profiles/country-gas-profile-uk*

The UK Gas traded volume is growing from year to year. In 2008, the traded volume was 10,845 TWh, 6% increase from 2007. The increasing is mainly from OTC markets.[16] The prices of the UK NBP are largely correlated to the European prices. The Churn ratio of NBP is remained the same during 3 years. The volume statistics clearly shows that the UK market is the biggest in the European region. The average daily volume is 41,500 GWh. The British gas market became the European continent most significant trading hub. The proper state owned company demerger and constantly developed infrastructure again in this example leads to a liquid market. In this market, the centralisation ambition and the connection of several pipelines and LNG terminals led to a professional distribution system.

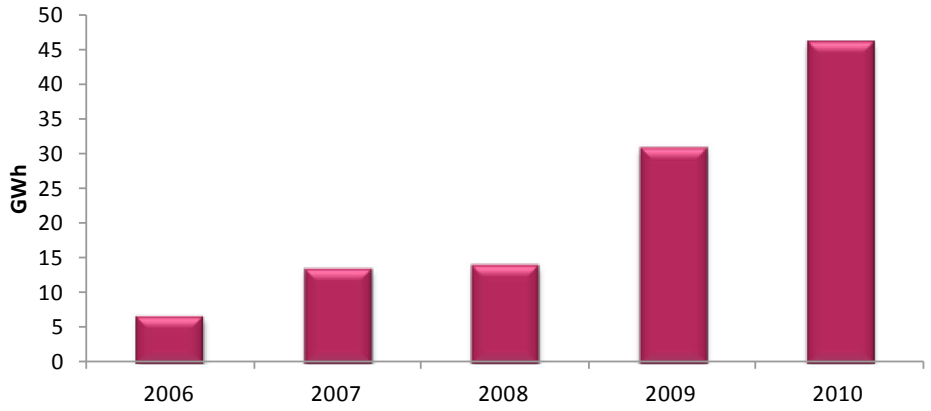
**Figure 16: NBP Churn Ratio**




*Source: Icis Heren*

The ICE Futures delivery point is the NBP it is futures growing rapidly and posting records from year to year. This market's churn ratio is far behind the US figures, when the delivered amount is compared to the traded volume, which results only 11%. [17]

**Figure 17: ICE Futures Traded Volume**



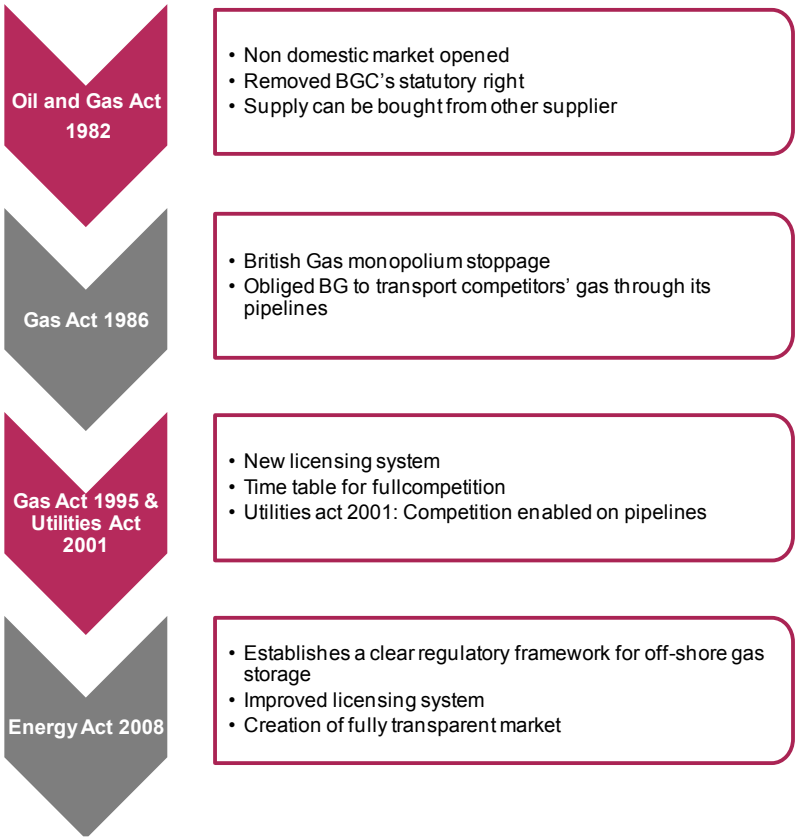

*Source: ICE Futures Traded Volume*

After the spot and the OTC, trading the need for physical futures clearly showed on Figure 17. This trading supports the more effective pricing mechanisms. This exchange clearly supports the effective natural gas market and in the emerging regions, the installation is considerable.

## The legislate background of the United Kingdom gas markets.

The early years of Gas production and supply were in the hands of British Gas. It took almost a decade to remedy the failure to unbundle British Gas before its privatisation. Only after U.K. regulatory authorities intervened in the acquisition of natural gas from producers and the incumbent's operation of the pipeline network could real competition emerge in natural gas supply. The legislation process is illustrated on Figure 18.

**Figure 18: United Kingdom Gas Regulation History**




*Source: http://www.decc.gov.uk*

For non-domestic competition, the British market was opened in 1982 and allowed the third party access. The 1986 Gas Act is the centerpiece for the UK Gas regulation and industry. This was the first attempt to create completion in the British Gas controlled region. It requires that efficient systems are developed for the operation of gas transmission and distribution networks, and requires that reasonable requests for connection to the network be met within set times. After Gas Act 1995, the British Gas was fully separated into two entities. The transportation was moved to Transco. This Act cleared the way to a perfect competition preformed by stages. New licensing system was introduced and British Gas was obligated to give up more than half of the market. After year 1997, the standardised contract was introduced. All deals became the same and were traded in packages of the multiple of 25 000 British Thermal Units per day. After 2000 there were more regulatory interventions mostly connected to the British Gas company demergers. Transco was sold to National Grid and the storage moved to Centrica. This was followed by a consolidation of procedures and regulations to attract more participants to the market. The unified network code was helping to create market that is more robust and the LNG terminals were created during this stage. Today the market is liquid and transparent and the government tries to keep this way with current Energy Bill 2010-2011.[18]

### The success of UK Gas Markets

The main components of the success in this region are

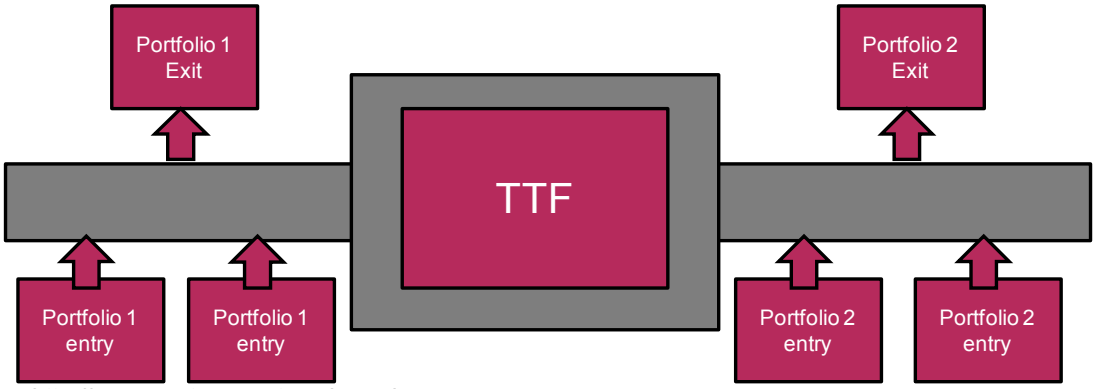
- The demergers of the monopolistic market by regulation
- The creation of a single point trading hub helped a lot in creating a reliable trading spot for suppliers and consumers
- Standardizing contracts and trading
- Important role of brokers
- The creation of exchanges (APX-Endex/ICE Futures)
- Continues infrastructure developing

### *3.1.4 The Dutch Gas market APX TTF*

### The infrastructure of Dutch Gas markets

The Netherlands is a key player in natural gas production in the European Union with a highly developed gas distribution and transmission network. The country is the biggest research centre in the natural gas industry. The reserves are started to decline in the recent years and after 2025 Netherlands would be a net importer. Gasunie is the TSO of the country and an independent natural gas transport provider. The network has four storage facility and one LNG terminal. The Netherlands has become the major trading place in the euro zone with the Dutch Title Transfer Facility.

**Figure 19: Dutch Gas market TTF schematic**




*Source: http://www.gastransportservices.nl*

Natural gas at Title Transfer Facility (TTF) is a virtual market place market parties has the opportunity to transfer gas that is already present in the system only owner ship changes. Today the trading takes place on APX-ENDEX as the Gas Exchange Operator. APX operates as a physical, SPOT exchange with delivery on the TTF. Futures contracts are traded on ENDEX, also with delivery on the TTF. [19]

The Services of GTS (Netherlands Gas Transport Services) is almost the same of a typical United States Hub. Contractually modelled, where shippers can book capacity, 10 days before the delivery date.

Other Services:

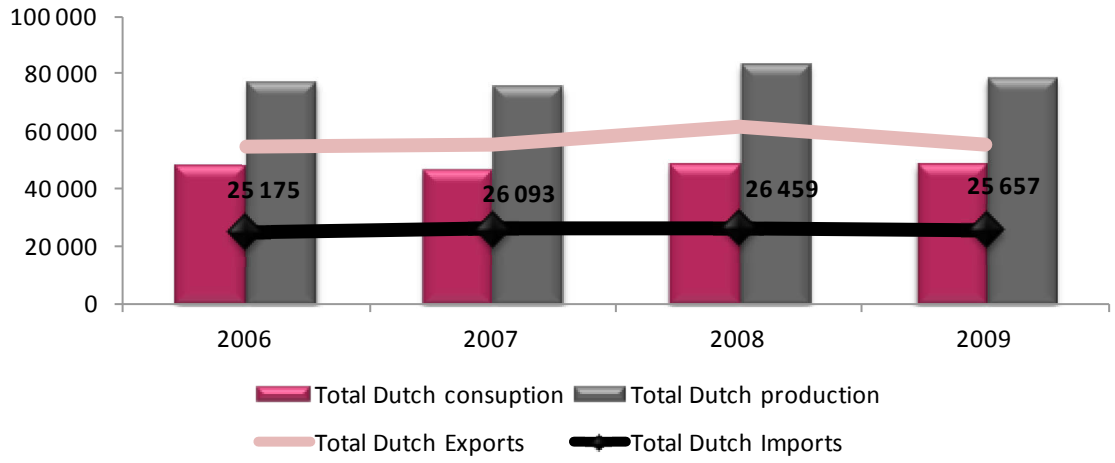
- Transportation / ownership change
- Wheeling, Diversion
- Storage/Parking
- Start-up service
- Title Transfer Facility
- Online administration

The Dutch Network system is around 11,500 km with four storage facility and a proposed LNG terminal. The Dutch TSO (GTS) prepares its network to 2025 when Netherlands became net importer of Gas.

## The liquidity of the Dutch Gas markets

In 2008, its gas production was equivalent to 36% of gas production in the EU. The 83 572 $m^3$ production mainly from (70%) Groningen field. The production slightly decreasing and the recent years the consumption remained the same showed on Figure 20. Today the Dutch are net exporters.

**Figure 20: Dutch Gas market**




*Source: Energy Delta Institute Dutch Gas profile*

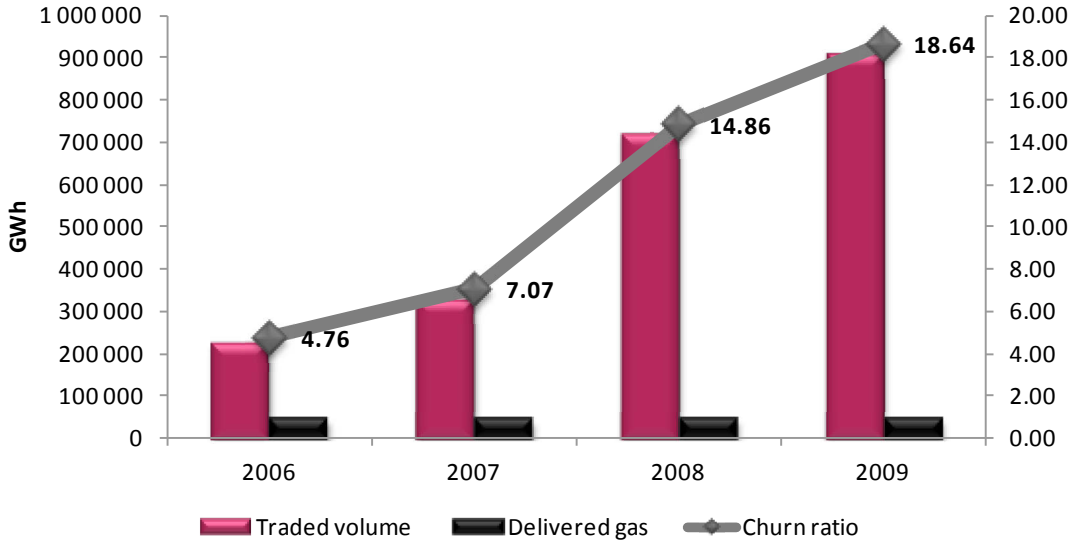
The TTF is the 3rd liquid market of the world and first in the European continent. Not just domestic players are in the market but several German and French. Today's volume in TTF is above 1 615 924 GWh. (until 2011 Nov.) The increasing volume illustrated on Figure 21.

Figure 21: Dutch TTF Traded volume


*Source: http://www.gastransportservices.nl*

The TTF usually trades at a slight premium to the UK NBP. The churn ratio reached the mature market factor 15 in 2008. The estimated Churn ratio for today is 33. This is almost the same value as in Henry Hub futures. The difference is that the whole Dutch market churn ratio is 33 where in the United States only the future market reaches this number. [20] The change in churn ration can be seen on Figure 22. The big jump is between 2007 and 2008.

Figure 22: Dutch TTF Churn ratio



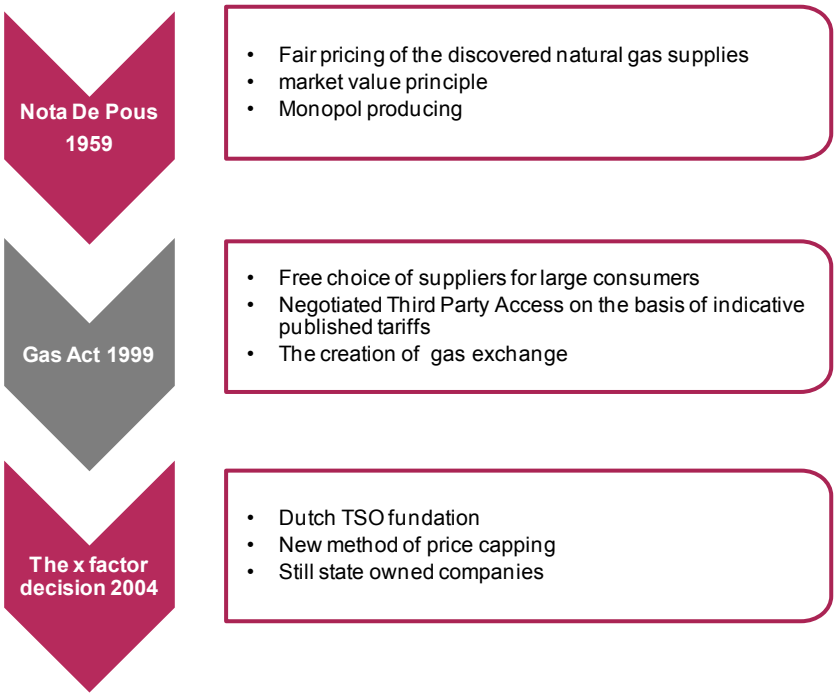

*Source: Author calculated from traded volume*

## The legislate background of the Dutch gas markets

After the discovery of Gorningen natural gas fields the Minister of Economic Affairs created the fundament of Dutch natural gas policy. The government created a state holder of the concession the NAM a 50/50 percent joint venture by Shell and Exxon. The market value principle what was introduced connected the natural gas price to the substitutes. With this schematic the Dutch was always against the deregulation of the gas markets. Opposed until the mid 1995 when the approval of the European Electricity (96/92/EC) and two years later the Gas (98/30/EC) Directives empowered the EU-Commission to undertake a process of

liberalisation in the European energy markets. After 1998 Dutch gas Act assigned APX-ENDEX with the creation of the gas exchange. This market today supervised by Netherlands Authority of the Financial Markets.

**Figure 23: Dutch Regulation History**




*Source: http://www.loyensloeff.com/nl-NL/Documents/Nieuws/Publicaties/Artikelen/vlam_custers_ICLG_NL.pdf*

In 2005, N.V. Nederlandse Gasunie has been demerged in trading activities and transportation. The GTS got the transportation (Gas Transport Services) trading moved to GasTerra. The companies in the Dutch region are still state owned. GTS owns the network system, which is 100% state property. Today the network system is contractually modelled. Ministry of Economic Affairs (MEA) puts indirect restrictions of Export and licensed exploration and production. [21]

### The success of Dutch Gas Markets

The main components of the success in this region are

- Domestic supplies of gas
- State revenues from natural gas production
- Private concession owners
- Liberalizing and state owned regulatory hand by hand
- Gas exchange existence by law

### *3.1.5 EU Gas Target Model*

The 18th Madrid forum provided the regulators and the European Commission to explore the initial process of establishing a Gas Target Model, which covered all the relevant areas for network codes and regulatory frameworks. This event followed by four organised workshops between December 2010 and June 2011.

Today the European market is dependent of natural gas. Most of its supply comes from outside of its borders by pipelines and LNG terminals. With growing need on low emission energy resource the demand on gas is increasing. Today European States mostly gets its supplies with long-term contracts. These contracts usually contains take or pay obligations which leads to rigid pricing and supply. The long-term contracts only giving the security of

supply, but not give the incentive to develop. This could cause shortage and less coverage fluctuations in demand. The European Gas Target model tries to set a vision for a regulatory framework and an integrated competitive gas market. The key aspects are to set rules and create effective cross-border trading.

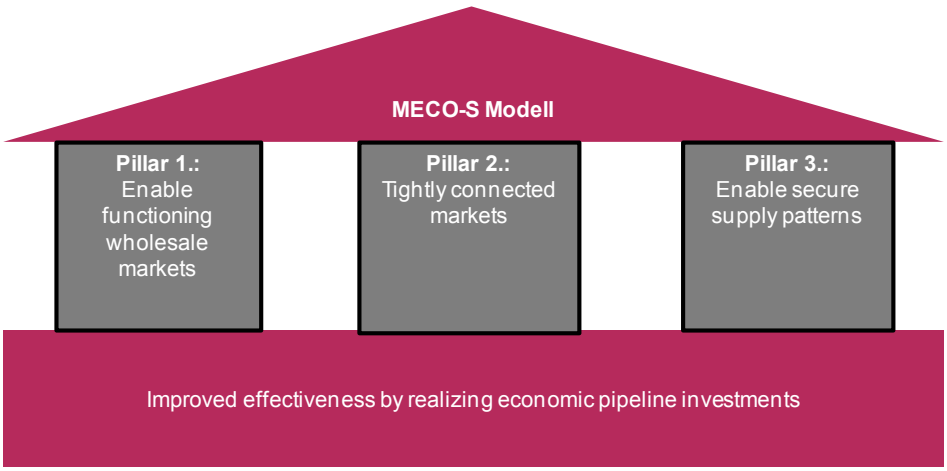
## The Gas Target Model objectives

The Gas Target Model (GTM) provides a description on a top-down, non-binding and broad as possible framework how the market should develop in the future. The GTM adverts to a wider energy policy of sustainability and supply security. Also contains supporting guidelines to implement the 3rd Energy Market Package which was proposed by the European Commission to aim on consumers fair market conditions. The 3rd Energy Market Package most notable element is to organise a Europe wide TSO network access for a harmonised system where an integrated market could develop. This means a flexible system and not a tight regulation which sets the numbers of the entry exit points.

## The MECO-S target model

"Market Enabling, Connecting and Securing" model sets an end state gas market which should be reached over time. "The MECO-S Model rests on three pillars that share a common foundation, the latter making sure that economical investments in pipelines are realised:"[22]

**Figure 24: Dutch Regulation History**




*Source: European Energy Regulators CEER*

Pillar 1 aims on create state or region markets on the same framework and system. These markets first should be liquid and domestically accepted. In order to achieve, a well built infrastructure and completion incentive regulatory framework is needed. It can be cross-border market to reach the sufficient liquidity. This model should base on exit/entry regimes.

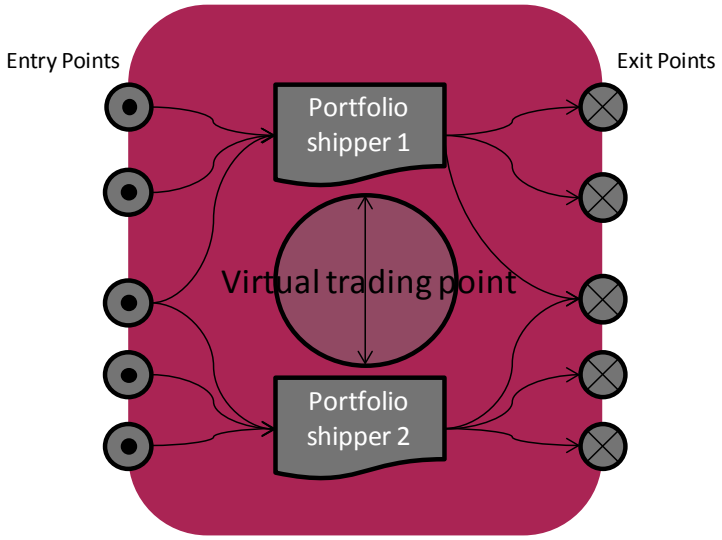
Pillar 2 is realises connected markets where the cross border trading is working very efficiently. The first stage would be to reach a price alignment which would connect virtually all the European markets, and an efficient supply/demand harmonisation.

Pillar 3 contains secured supply patterns which considering the revise of the long-term contracts and shipping. With appropriate shipping contracts mostly cross border would help the shipping agents to create a competitive market. Additionally aims on economically efficient distribution of long-term contracts and sound shipping. In order to achieve secured supply pattern, new shipping products must be installed. Hub-to-Hub products, link chain products (packages of hub-to-hub transfer) would secure the sufficient capacity. [23]

## Balancing network code implications

The effective wholesale market needs a slightly standardised TSO system with real time information for consumers. For the competitive market, the TSO's should create the entry/exit point system domestically. Cross-border capacity must be maintained without shortages.

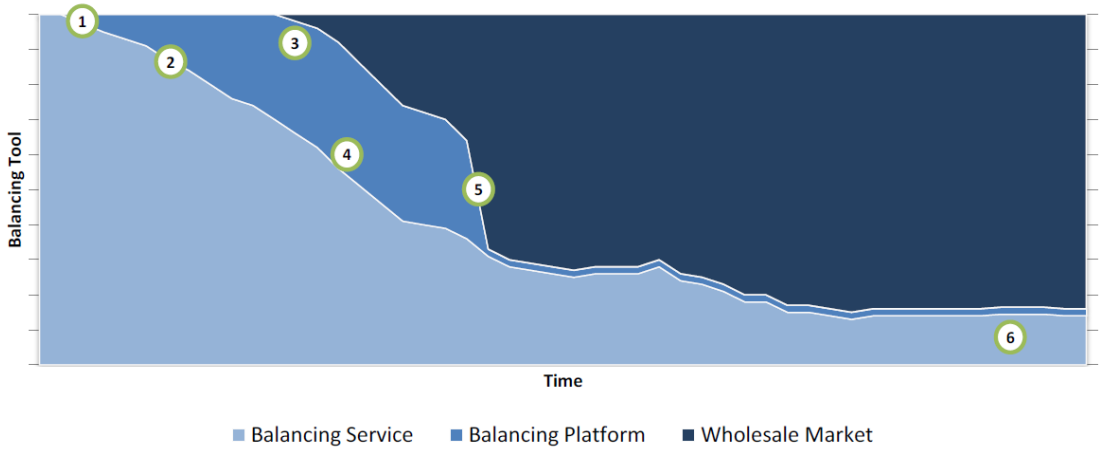
**Figure 25: Virtual trading point**




*Source: Gas balancing launch documentation BAL0125-11, December 2011*

If these conditions are met, in the E/E system the users can trade in a virtual trading point (VTP) where TSO guarantees the capacity distribution. There is practically unlimited capacity in VTP. While the transparency is very important, the exchange further helps the better balancing for TSO-s. After a mature market evolved the TSO balancing platform usage, drops to minimal.

**Figure 26: TSO balancing tools development**




*Source: Gas balancing launch documentation BAL0125-11, December 2011*

In this section, the balancing service reduction can be seen in an evolving market. The stages marked on the picture, with each level the competitive market takes over the balancing services. This development only could exist if a well-defined regulatory framework supports the stages. In order to achieve this transition standardised products must be introduced by TSO.

The following products are the framework guidelines for creating the standardised products in natural gas markets[24]:

- Short-term products
  - Balance-of-day products
  - Intra-day products
  - Balance-of-day products at a specific entry or exit point
  - Intra-day gas at a specific entry or exit point of the network
  - Time swap
- Standardised long-term products
  - Long term option to buy/sell flexible gas
  - End-of-day; intraday
  - at the VTP
  - Standard capacity bundles for storage
- Non-standardised Balancing services
  - Options to receive within-day on specific E/E
  - Tailor made parking-and-loaning type services

These products developed in order helps to create an efficient market step-by step.

### *3.1.6 Comparison of leading practises*

**Figure 27: Comparison of observed best practises**

| Order of application | Liquidity | Infrastructure | Regulations |
|---|---|---|---|
| Henry Hub | Most liquid<br>Natural Gas supply growing<br>Churn ratio on futures market 30 | 216 excessive storage capabilities<br>13 LNG terminals<br>Centralised Physical HUB | Regulated on Exports<br>Deregulated on prices<br>Privately owned |
| NBP | Europe most liquid market<br>Natural Gas supply decreasing<br>Churn ratio 19 | 9 storage<br>9 LNG terminals<br>Centralised virtual HUB | Deregulated<br>Privately owned |
| APX-ENDEX TTF | Increasing liquidity<br>Natural Gas supply decreasing<br>Churn ratio 18 | 4 storage<br>2 proposed LNG terminals<br>Centralised virtual HUB | Publicly owned networks<br>Partly privatised<br>Liberalised downstream |

*Source: author analysis*

First and most liquid market is in the United States the gas regulations started earlier than the other examined countries. Due to regulations, the infrastructure started developing earlier and several natural disasters led to an almost deregulated market. The regulations always tried to protect consumers but the price protection led to lack of supplies. The infrastructure shows that in the US, the centre of flow is the Henry hub. Almost all states are sink zones and the Henry hub is the source. LNG terminal concentrated in the coastal area. While the main difference in these regions the virtual/physical HUBs. The main reason to compare the pipeline and storage is to see every example uses centralised system. First, when liquidity is not given due to monopolistic markets the centralisation with deregulation could lead to liquid liberalised markets. All of the regulations are heading towards this direction.

The least regulated and liberated market is the Dutch market. However, with regulated and publicity owned network system and partially privatised upstream still have a liquid market. The continuous deregulation can be seen in each example. While smaller countries the

Network system cannot upgraded or privatised easily because the costs of building new infrastructure. With Dutch practise, the liquid market can be obtained.

## 3.2 Compatibility analysis for emerging markets

Looking at the example of the previously examined leading concepts, both the features of the developed market and the applied tools on these markets have to be analysed whether the same principle could be implemented in emerging markets to affect gas pricing as well as improve gas trading. Since the identified market models might not be 100% compatible, the minimal requirements should be formulated to be able to successfully implement the desired changes.

### 3.2.1 Key features of monopole and liberal gas markets

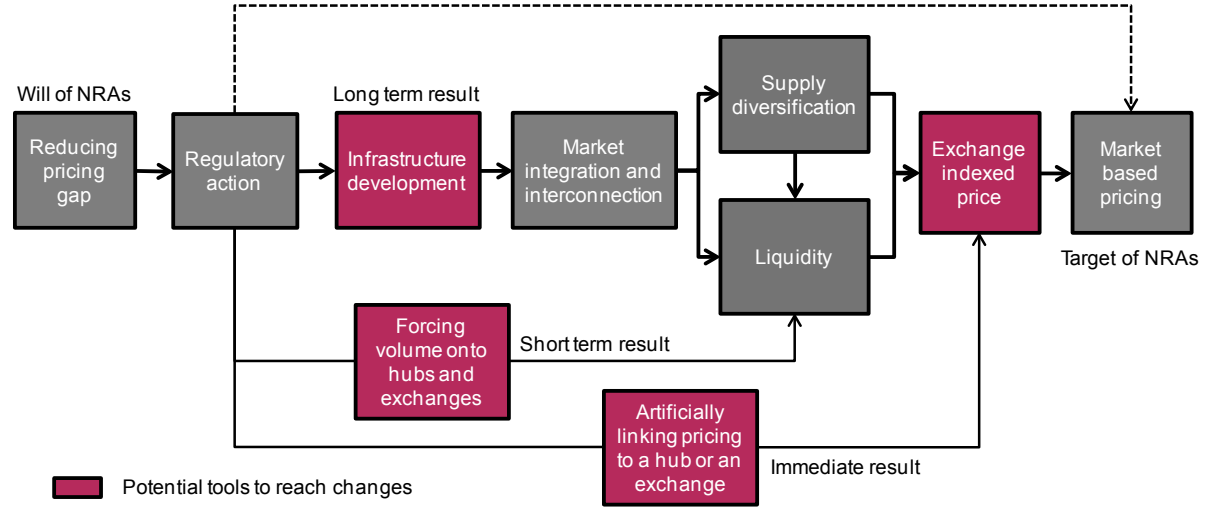
| Monopole gas market | Liberal gas market | Change requirement | Responsibility |
|---|---|---|---|
| Publicity owned Network and upstream | Unbundled Network system, upstream and down stream | Demerger of state owned companies, privatisation | Government regulation |
| Tight regulatory framework | Consumer driven regulatory framework | well defined regulation renewal | Independent gas forum |
| Government owned regulatory | Independent regulatory | Creation of independent public benefit organisations | Government regulation |
| TSO state owned | TSO privately owned | Privatisation | Government regulation |
| No exchange exist only bilateral long-term contracts. | Existing Exchange | Required by government regulation | Government regulation; Hub regulation |
| Existing barriers to entry | Easy to entry | Ease Regulations and administrative barriers | Government regulation; Hub regulation |
| Non public pricing | Transparent pricing | hub pricing, existence of exchange(s) | Hub regulation |
| Government owned supply | Diversity of supply sources | deregulation of state ownership | Government regulation |
| Regulated import/export | Free flow | market coupling, cross border capacity allocation | Government regulation; Hub regulation |
| Long-term contracts | futures market for long term trading | existing liquid exchange | Government regulation; Hub regulation |

In the best practise section, the development of a liberal gas market required these changes. The first and most important was the demergers of monopolistic government owned entities. Regulations, later the private sector, and the consumers supported this. The need for developed infrastructure the government was urged to allocate funds into this field of investment. From an organised market later with enough liquidity, a fully liberated market can develop. Long-term bilateral contracts can be substituted by standardised physical futures contracts. As a result of a developed gas market further pricing mechanism must be developed.

### 3.2.2 Possible tools for affecting pricing mechanism

Assuming that the National Regulatory Authorities realise that their market will not be able to develop without regulatory support, the following relations can be observed.

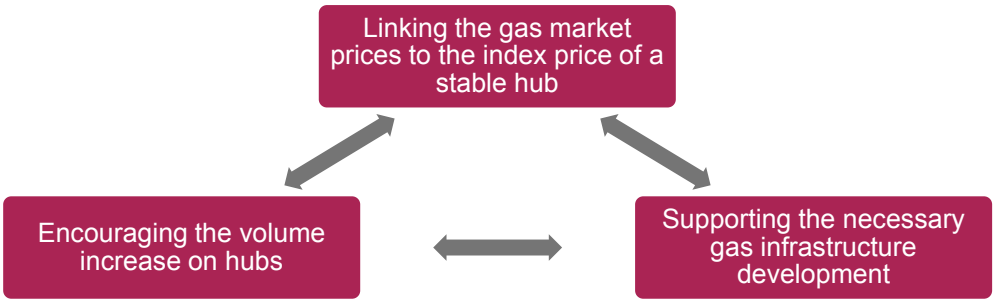
**Figure 28: Overview of potential tools to change pricing mechanisms**




*Source: author analysis*

As the starting point, the NRA should come to the conclusion that the actual pricing mechanism in their market is not appropriate and change is needed. On the other hand, the final goal has to be understood at the same time, i.e. a market base pricing has to be reached on the long term. In order to implement a healthy market base pricing mechanism in an emerging country, a linkage is required to a stable and trustworthy hub price index. As the above diagram indicates, the most important prerequisites of a stable hub price index are an adequate and transparent liquidity, the appropriate supply diversity, and a well-developed supporting infrastructure.

In the presented logic, the NRA plays a critical role, the role of a facilitator. Considering the above prerequisites, NRAs usually have three major tools to develop the market in the desired direction, however, their application have to be applied together.




## Hub price indexation

Typically, the most important conditions for a government, and hence for a National Regulatory Authority, are security of natural gas supply and considerable pricing of natural gas for residential end-users.

Guaranteeing a considerable pricing of natural gas is a challenging task, especially in case there are regulatory constraints present. This is typically the case in the European Union, where the free market and free access principles prohibit strict regulatory interventions. Even though, the well developed Western European gas markets comply with these regulations, there are a few emerging Member States that do have certain regulatory measures in place to control the residential end-user prices.

In case of Romania, the domestic gas extraction reaches about 70 percent of the gross natural gas consumption. As a political tool, the gas prices in Romania are artificially being held low, which contradicts with the EU principles.

Considering a different example of Hungary, the situation is completely different. Even though, the domestic gas extraction is around 20 percent of the gross natural gas consumption, Hungary still holds an artificial cap on the residential end-user prices by partly indexing the gas prices to a foreign gas hub. For a detailed case study on the Hungarian situation, please refer to section 3.3.1 on page 33.

Since it is against a free and liberal market to impose a cap on gas prices by any means, emerging markets have to consider to link their gas price formula to a hub. In case the respective country does not possess an own organised market and links its prices to a foreign hub index price, the corresponding supporting infrastructure has to be provided also to allow trading and hedging solutions for the market participants. On the long term, NRAs and governments have to provide adequate liquidity and diverse supply sources to make hub price indexation an efficient tool.

### Encouraging infrastructure development

Infrastructure is always a key to success in case of guaranteeing security of supply, as well as supporting hub indexation, especially in an emerging country. Market based pricing requires a gas-on-gas competition, which necessitates transportation alternatives. As such, it is not advised to link the market prices to any kind of hub index price, unless there is a will to develop the supporting infrastructure.

Both transit pipelines and LNG terminals are built either to earn potential extra profits by vertically integrating the activities, or to provide security of supply through strategic moves. Since in most of the cases extra profits are low or zero in operating additional infrastructure, NRAs have to provide incentives and compensation to investors. As such funding is usually granted through the tariffs, a careful infrastructure development plan has to be prepared and followed to avoid unnecessary costs and burdens on end-users. In case of emerging markets, it is essential to develop infrastructure to allow access to new supply sources. When foreign hub price indexation is present, access to the hub is critical for success.

### Directing volume onto hubs

In addition to encouraging infrastructure development and applying hub price indexation, liquidity is required on hub markets. When a country reached the development stage of launching their own hub market, increasing liquidity is the highest priority. Looking at the Western European practises, there are multiple instances when NRAs have guided volume onto hubs either through positive or negative incentives.

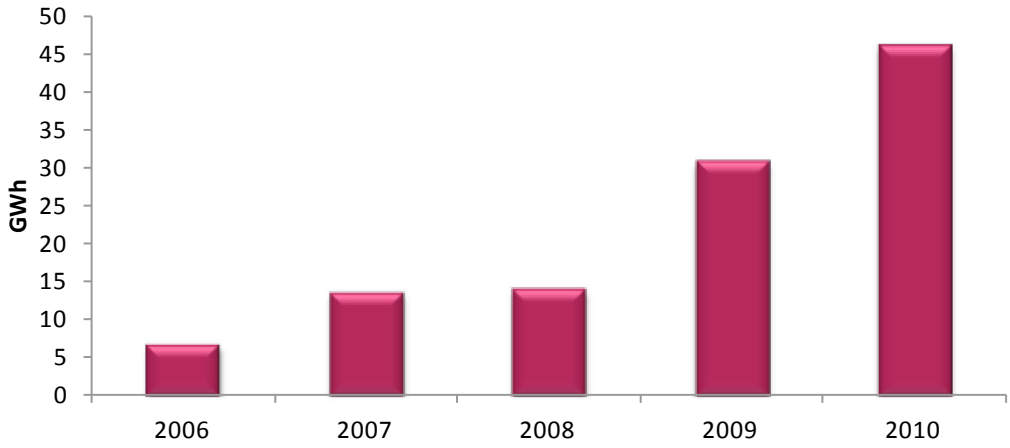
The volume directing and market development is still in motion these days. For example, in the Netherlands, where monopolistic circumstances still exist, the production sector is in private hands, while the wholesale segment is partly publicly owned. Additionally, the TTF virtual trading point was given to the exchange owner company APX-ENDEX after 1998 Gas Act.

In oligopolistic market always hard to create, a liquid liberalised market, but the continuous deregulation and privatisation of industry sections allowed other entities to compete.

The first negative aspect of hub pricing is the existence of prompt market without the possibility to hedge for the future. In the first years without long-term contracts the price fluctuations gives uncertainty. Today's example clearly shows that after the creation of a liquid day-ahead market the physical futures market easily emerges. Another example is the

creation of physical futures market the ICE futures market with NBP delivery. After 3 years of operation, it almost doubled the traded volume.

**Figure 29: ICE Futures Traded Volume**




*Source: ICE Futures Traded Volume*

In the United Kingdom practise, the OTC market fully supported and standardised with long-term contracts. With a mature OTC market for the hedging future risks can be done, until a good physical futures or financial futures could grown up.

On the regulation side, the exchanges and the country regulation as a whole should support the easy entry to the market and trading facilities.

As it was shown in section 3.2.1, the monopole situation on a gas market has to be resolved in order to develop free market competition. Restructuring of a market with one or two dominant players through legislative means is also supported in developed, Western European countries. The clear benefit of artificially establishing a wholesale market with more than one or two players brings price competition and liquidity to the local gas hub.

Besides guiding volume onto hubs, a certain level of market integration can be a useful tool to increase traded volume on the hub. In the EU either a single price zone or a market coupling approach can be observed, which are also favoured by the EU Gas Target Model initiatives.

### *3.2.3 Affects of single price zones and market coupling*

Since a gas hub is considered to play a major role in market liberalisation, if the local market is unable to develop a wholesale market another foreign hub will take over the market. This will happen by nature to make market integration possible on the long run. Natural gas markets may either form a single price zone, or enter into market coupling. Market coupling is the easiest from the two by all means, as it is shown below.

| Single Price Zone | Market Coupling |
|---|---|
| High infrastructure need | Relative infrastructure need |
| N-1 rule for hub zone together | N-1 rule for hub zone individually |
| No bottlenecks on borders | Trading up to available border capacity |
| High trading and clearing complexity | Increasing trading and clearing complexity with countries |

In case of a single price zone, the markets in question have to meet the N-1 rule together. This poses an extremely high requirement on the supporting infrastructure as no matter what

happens all demand has to be satisfied from any one supply source within the zone. As such, bottlenecks are not permitted on the borders as well as within each country.

On the other hand, a market coupling keeps up the individual hub market zones and allows trading between the zones up to the available cross-border capacities. This way not only additional supply sources can be reached and the price difference gaps reduced, but only limited start-up costs occur. As soon as the market coupling is up and running, the performance can be increased through continuous investments. This way a market coupling can even turn to be a single price zone with time.

Since gaining liquidity is the most important task of a hub in the short term, coupling of neighbouring gas markets is recommended as soon as possible. As the cross-border capacities bring an increased supply possibility to the hubs, trading activity will boost significantly. Emerging gas markets have the best chance for development, if they can speed up their market and cooperate with the surrounding hubs.

### *3.2.4 Affects of a liquid wholesale gas market*

A liberalised gas market can develop a free market competition environment through an organised wholesale market. As the observed best practises indicate, developed markets became strong and stable through the increasing utilisation of gas hubs both for balancing and organised wholesale trading. As an early step, national and regional market integration improves the security of supply and decreases the supply dependency. The more liquid a natural gas hub can become, the higher supply source diversification it offers, increasing trading and thus price competition.

Potential benefits identified are the following:

- interconnection with more mature markets
- shift from indexed pricing to gas market pricing
- transparency
- standardisation
- non-discriminative, equal treatment
- entrance of new market participants
- increase trade, thus increase number of supply sources
- consumer benefits
- regional competitiveness
- decrease the counterparty risk
- settlement services

As numerous advantages can be realised through the implementation of a gas exchange, it is highly recommended for decision makers of emerging markets to take the first step towards gas market development.

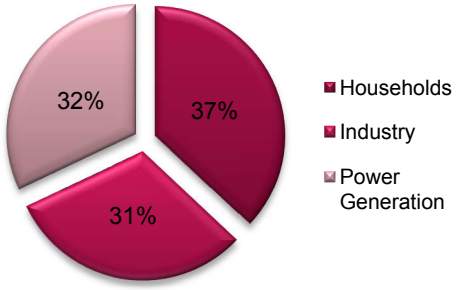
## *3.3 Gas market development in Hungary*

A liquid gas exchange is essential to improve natural gas trading due to which Hungary decided to implement a gas exchange through a regulatory obligation. It is a national objective to open up the Hungarian gas market towards the Western European free markets where gas-on-gas competition is present. The market concept for the Hungarian gas exchange is taking the best available models from the Western European more developed markets. Implementing a model that is well ahead of the actual market development stage involves risks as well as huge potentials and long term benefits. The following case study and analysis after it provides the detailed introduction of the Hungarian approach, as well as the elaboration on its potentials.

### 3.3.1 Case study of the Hungarian gas market situation[25]

Competitiveness of natural gas is measured by losing or winning market share. Following the trends, more efficient and cleaner alternative technologies, as well as cheaper available energy sources pose the biggest threat to natural gas. In today's market situation price sensitivity is a more and more dominant factor when deciding on fuel sources. In 2010-2011 gas consumption in Hungary almost equally shared between households (37%), industries (31%) and power generation (32%)[26]. As such demand of all market segments have to be satisfied in order to secure the gas market, to which the key is the right pricing of natural gas.

**Figure 30: Split of gas consumption in Hungary**



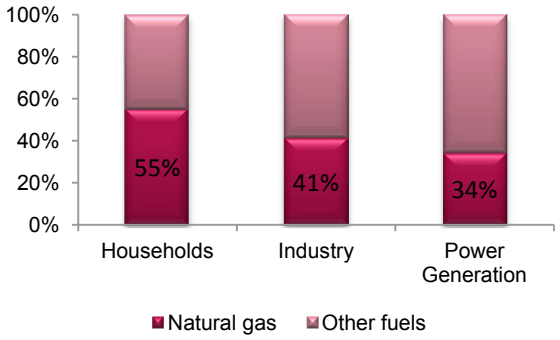

*Source: Hungarian Energy Office, October, 2011*

About 11-12 years ago in Hungary, there were huge expectations towards natural gas. Gas fired power generation solutions started to become popular, which led to a boom in the gas demand. On the other hand, natural gas supplies were already dominated by few importers. Consequently, the gas prices doubled in the last 5-6 years, which again led to a counter reaction of the market. Gas demand started to decrease. Even though, gas became an important, but expensive energy source. This brought a market restructuring with the booming of the renewable energy sources (RES) sector, the development of clean coal technology, and the renaissance of the nuclear generation, which latter is questionable looking at the recent nuclear catastrophes.

In 2010, the dominance of natural gas in the fuel mix in the three largest market segments in Hungary is clearly observable, which increases the vulnerability of natural gas to high market prices. The following critical influencing factors negatively affect the competitiveness of gas:

- Households have access to other fossil fuels and renewable energy sources
- Willingness to invest in cheaper fuel spreads
- Consumption efficiency spreads
- Limited or missing GDP growth prevents expansion and development
- The market moves towards cheaper electricity market price compared to gas price

**Figure 31: Share of Natural Gas in Hungary**




*Source: Hungarian Energy Office, October, 2011*

As a result of increasing gas prices, consumers started to consider alternative solutions, which lead to restructuring of demand. In urban areas electricity heating and/or solar panel installations spread together with the improvement of housing efficiency rates. In parallel, in rural areas renewable energy sources substitute gas as well as renewed coal heating could be found more frequently. On the other hand in the commercial and industrial sector consumption rationalisation spread, other organic fuels stepped in as substitutes to gas, as well as electricity generation from by-products or RES in own power plants increased their market share.

To prevent natural gas from becoming a secondary fuel source in Hungary as well as in the CEE region, the Hungarian government realised that the right methodology for pricing natural gas should be implemented. For this purpose, the gap between the Western European gas-on-gas competition and Eastern European oil price escalated pricing schemes should have been reduced and the interconnection of the regional gas markets should began.

The regulation on the historically oil price escalated natural gas pricing changed recently in Hungary to protect the residential end-users from high gas prices. Based on the regulation, the calculation of the residential gas price was defined considering the difference of the Dutch Title Transfer Facility (TTF) ENDEX Gas quarterly average price and the gas price set in the long term contracts. In case the ENDEX TTF Gas price is cheaper, the applicable gas price is calculated by considering 40% ENDEX TTF Gas price and 60% long term contract gas price. Otherwise, the long term contract gas price provides 100% of the price. Unfortunately, the Western European gas spot prices are not able to significantly affect the Hungarian market prices, and thus further strategic steps were required by the Hungarian government.

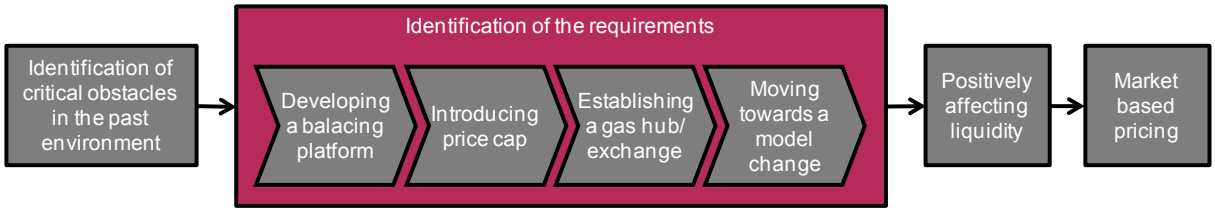
Supporting this new path the Hungarian government initiated the development of a Hungarian natural gas exchange to be launched by 1st January 2013, as well as the establishment of a Hungary-Slovakia interconnector. It is a national objective to open up the Hungarian gas market towards the Western European free markets, where gas-on-gas competition is present. To found the basis of gas-on-gas competition in the CEE region and to make the interconnection of gas markets possible, the Central Eastern European Gas Exchange (CEEGEX) Ltd. has been established to launch the Hungarian natural gas hub by the end of 2012.

### *3.3.2 Logical steps of the Hungarian authorities*

As the case study of Hungary shows, the Hungarian government realised that the natural gas competitiveness can only be maintained on the long term through a market based pricing, especially compared to the newly available alternative energy sources. Looking at the best practises and the applied tools to affect price mechanisms, it can be concluded that the healthiest solution is when the market itself evolves to a free market pricing. Even though, the market is usually not able to develop without encouragement and guidance, since the necessary supply sources and supporting infrastructure can be guaranteed through regulatory support in most of the cases.

The Hungarian regulatory authorities have taken a positive approach in encouraging the Hungarian gas market through the following logical approach.

**Figure 32: Logical approach of an authority intervention**




*Source: author analysis*

**Critical obstacles seen in the past environment**

The Hungarian government and NRAs together have examined the market circumstances and formulated a National Energy Strategy for Hungary based on their conclusions. Concerning the natural gas market, the most important obstacles also seen by the market participants are connected to the supply source diversity and the natural gas market structure.

As also referred to in the case study, Hungary can be characterised as a market having:

- limited, only 1 or 2 supply sources,
- fully oil linked pricing scheme, and
- fully bilateral, non-transparent contracting scheme.

In addition to the above market obstacles, there is a regulatory motivation to change the market structure. Intervention of the government and the NRA generates both positive and negative feedbacks among market participants. Market participants having a significant bargaining power or dominating the processes oppose the reform movements of the authorities as these new acts exactly aim to reduce the power of these dominant players.

On the other hand, the other side of the market that suffers from the dominance of only a few players welcome the intensions of the authorities to reconsider and revise the actual model. These market participants are mostly representing the smaller traders and the foreign companies that are aiming to enter the Hungarian domestic market. In general, the supporter parties are planning for the long term and are already recognising the fact that the European Union will oblige Hungary and all other Member States to make the necessary transitions needed in order to comply with the EU integrated gas market concept.

### Requirements of market development

Overall, the Hungarian authorities have identified four major factors required to develop a free market competition on the long term. These factors are:

- Balancing platform
- Supporting infrastructure, mainly cross-border capacities
- Organised wholesale gas market, i.e. own hub

In the beginning, the Hungarian TSO was obliged to establish a balancing platform in order to enhance the TSO balancing activity and to increase its transparency. Additionally, the market participants got the chance to get involved in the balancing activities through the newly formed balancing platform. However, the liquidity on the balancing platform remained relatively low as the market participants could mostly trade with the TSO, as well as the market circumstances limited the possibilities of small traders and potential new entrants.

Learning from the results, the government decided to support additional cross-border capacity infrastructure development towards the Western European supply sources. At the moment, the Hungarian government supports the development of multiple infrastructure projects, such as the Slovakia-Hungary interconnector, the Nabucco, the South Stream, as well as other smaller pipeline projects that aim to connect the CEE region with new supply sources on the long term.

A further step of the authorities was the wholesale gas market development initiative. As the Hungarian government realised that a gas hub could enhance the market activities in Hungary, the necessary obligations have been formulated in the regulation to launch the Hungarian gas hub by 1st January 2013. Description of the gas hub initiative in Hungary can be read in details in section 3.4 on page 36.

### Temporary price cap

In the beginning of the reformation process, the Hungarian government decided to implement a temporary price cap regarding the residential end-users by linking their prices to one of the most liquid gas hubs of Western Europe, the TTF in the Netherlands. For this purpose, the cross-border capacity towards Western Europe is fully booked in order to bring in the cheaper gas supplies. Intention of the government was to protect the households from the recently increasing gas prices, however, this measure can only be a temporary move on the long term as the European Union is not favouring anti competition actions within the EU.

### Development of corresponding regulation

As of today, the latest initiative of the Hungarian authorities is the examination of the actual gas market model for inconsistencies compared to the best practises and European intensions. This desire is not yet formulated, but the market participants expect the NRAs to call for expert opinions from the leading market participants in Hungary in order to identify future alternative directions for changing the market circumstances.

Expectedly the regulatory initiation to change the actual gas market model in Hungary will involve the following major milestones in the future.

- Benchmarking of best practises
- Consultation with major market participants
- Proposal on various solutions for the government that are all in line with the European Union gas target model

Considering the previously introduced best practises and EU initiations, the actual Hungarian market is expected to copy the transformation of the Dutch gas market as the past Dutch market had the most common features with Hungary. However, the EU directions point out new possibilities for Hungary, which have to be taken into consideration when deciding on the future model. Also, the British NBP could be taken as an example in terms of desired market structure with the condition that the geographical situation of Hungary and the UK are significantly different.

All parties agree that the NRAs should not go ahead with any kind of reforms regarding the technical model changes without consulting with the responsible parties on the market.

## *3.4 Development of the Hungarian gas hub*

Recently, Hungary has successfully developed a power exchange (HUPX – Hungarian Power Exchange), which resulted in an exceptional development in the Hungarian power trading by reaching 18 percent of the gross electricity consumption in 1.5 years. Partners in this initiative were the Hungarian TSO, the Hungarian government owned national incumbent, and a strong and trusted Western European power exchange provider, EPEX Spot. Based on this success, the owners with approval of the Hungarian government set new strategic goals for HUPX, among others the establishment of the natural gas exchange.

Natural gas hubs and exchanges are missing from the Central and Eastern European (CEE) region. As a result, the Western European market participants are not able to enter and efficiently trade in the Eastern European natural gas markets. A gas hub in the CEE region would encourage the national and regional markets to develop and integrate. As such, integration of smaller sub-regions, interconnections with Western European markets, increase in trade volumes, and thus increase in security of supply is expected through higher liquidity.

### *3.4.1 Potentials of a gas hub in Hungary*

### Link between East and West

Hungary is located in the heart of the Central and Eastern European region having a link towards the Eastern gas sources through the Ukraine and towards the Western European markets through Austria. Additionally, Hungary is bordered with the highest number of countries in the CEE region, which also offers excellent opportunities for international trading and transiting.

## Transit route developments

There are numerous infrastructural development projects, which are targeting gas diversification for the CEE region and Europe. These projects are all crossing through Hungary and thus increasing the transit volumes as well as the potentials to attract market participants looking for balancing activities. Additionally, the Balkan countries are working on interconnection projects to increase their gas market integration. This would further increase the gas demand in the region, for which an increased supply is required also. In providing the supply for the Balkan markets, Hungary is expected to have a key role, but for this a well functioning trading scheme is required.

### Box 1: Short overview of transit infrastructure projects in the SEE region[27]

#### *Nabucco Project*

The purpose of the transmission pipeline is to increase source and route diversification by providing access to the natural gas supplies in Azerbaijan, Turkmenistan, Kazakhstan, Egypt, Russia, Iran and Iraq. Originally, it was planned with the involvement of OMV (Austria), MOL (Hungary), Transgaz (Romania), Bulgargaz (Bulgaria), BOTAŞ (Turkey), and RWE (Germany) as well as with the support of the EU, however, RWE might reconsider its involvement, which could significantly harm the project image[28]. Initially the pipeline would provide 8 bcm of gas yearly to the European customers with a possibility of a further extension to 31 bcm.

#### *South Stream Project*

The main concern about the South Stream pipeline is that it provides a route diversification while it does not provide a source diversification option. South Stream would transport mostly Russian origin natural gas to Europe. The project developers are Gazprom and Eni, but all of the governments are invited to be partners in their national segment. The planned initial capacity of the pipeline is 30 bcm yearly with a possible extension to 60 bcm.

#### *LNG terminals in the SEE region*

Currently LNG supply in the SEE region is limited and planned projects are in a preliminary planning phase, except Adria LNG. The only regasification terminal already in operation is the Revithoussa terminal in Greece, which started operation in 2000 with an annual capacity of 2.26 bcm, but all of the imported natural gas is consumed domestically. Apart from the proposed Adria LNG terminal there are two proposed terminals, one in Fier in Albania with a planned 10 bcm capacity and the other in Constanta in Romania without any specifications yet.

## Gateway to the emerging Balkan countries

The Balkan countries are not interconnected at the moment, as well as they possess a poorly developed domestic gas network, if any at all. As a result, their gas demand level is very low, especially compared to the other CEE countries. Consequently, this leaves no other realistic option for the imported LNG gas but to be transported to Hungary for further distribution. However, the gas network development has started in the Balkan countries, which will result in an increase of gas demand as soon as the infrastructure comes online. Currently, Hungary is one of the transit countries towards the Balkan countries, which position would even strengthen with the increasing gas demand providing Hungary a key trading hub opportunity in the region.

## Well-developed gas storages

Hungary has the largest storage capacity reserves in the CEE region, which could serve the well functioning of a gas exchange located in Hungary. At the moment, the storage operators provide access to the capacities through auctions, which is to be targeted by the gas exchange as a transparent and anonym service. Recently, the overall storage capacity has been increased to above 6 billion cubic meter (bcm), which exceeds 50 percent of Hungary's

gross natural gas consumption in a year. This offers outstanding opportunities to provide services for neighbouring countries in balancing or wholesale trading.

### *3.4.2 Strategic concept behind CEEGEX*

The natural gas exchange initiative is exceptionally important for the Hungarian government, due to which the governing party dedicated a monopolistic right to the gas exchange license holder. Through the Hungary based gas exchange, the Hungarian government would like to secure its position in gas in the CEE region to take a vital role in maintaining security of supply for Hungary as well as for the other regional emerging markets, such as the Balkan countries.

Consequently, HUPX has already established the Central Eastern European Gas Exchange Ltd. (CEEGEX) in order to implement a new, efficient, transparent and regional gas trading platform located in Hungary. The major objective is to provide a market in line with the international practises that offers a secure and trustworthy long term solution for its partners, while provides cooperation opportunities in the region.

The government is highly supportive as well as the owner of HUPX and the power TSO is the state owned incumbent, which both offer an outstanding one time opportunity to establish a gas exchange and position it in a special and monopolistic market environment.

Understanding that an experienced and strong strategic partner increases the chances for success, CEEGEX started negotiations with leading natural gas exchanges either to enter into a Service Level Agreement (SLA) with them, or even team up as strategic partners. This is essential to provide a solid base for the development of gas trading in Hungary and later in the CEE region both in spot and physical futures trading.

Taking into consideration the national, regional and European market circumstances as well as the desires and priorities of the Owner, the following strategic objectives are set for the future:

- launch of the gas spot market – 1 January 2013
- launch of the gas physical futures market – 1 January 2013
- optional launch of the intraday and capacity markets – as the market develops
- development of regional expansion to the neighbouring countries – as the market develops

As a first step, CEEGEX started to approach the most dominant market participants in Hungary, and the initial feedbacks regarding the establishment of a gas exchange are very positive and well welcomed.

### 3.4.3 Opportunities and Threats

| Opportunities | Threats |
|---|---|
| ›› Still underdeveloped local market<br>› the first step towards organised trading has been taken by the Hungarian gas TSO by establishing the balancing and capacity market, which similarly to the current situation was forced by the government through legislative measures.<br>›› Chance to be the first mover<br>› in the SEE region there is no organised form of gas trading. For a long time the neighbouring CEGH was a physical hub that has recently been reorganised to be a virtual trading point.<br>›› Excellent geographical position and well developed and interconnected gas network including storage capacities<br>› with its above average storage capacity and well connected domestic network, Hungary is an ideal location to develop a virtual trading hub for the CEE region.<br>›› Available and planned interconnections with all neighbouring countries<br>› Hungary is developing its cross border interconnections in all directions, from which the first ones have already started operation.<br>›› Access to all new infrastructures that are planned to be built in the region in the future<br>› as it is justified in the first chapter of the present document, the new infrastructure projects will either path through Hungary, or Hungary is the most obvious country through which the new gas sources can be distributed. | ›› Political risk<br>› is always present, however at the moment the government is very supportive.<br>› Additionally, the state indirectly owns CEEGEX, which provides additional support from the government.<br>›› Acceptance and support of Gazprom<br>› the Hungarian gas exchange is expected to affect Gazprom as the major gas supplier in Hungary. CEEGEX is ready to initiate discussions and negotiations with key gas market participants in the CEE region through its current relationships.<br>›› Acceptance of the market participants<br>› as traders make-or-break a commodity exchange's success, CEEGEX will devote considerable amount of time and effort in negotiations and discussions with the key market participants in Hungary and the neighbouring countries.<br>›› Market concept acceptance<br>› the risk arises from the identification and implementation of a market concept that is not accepted by the market participants, who are the end-users of the trading system. This risk will be mitigated through cooperating with existing, well functioning gas hubs, who has the in depths market expertise of gas spot and physical futures trading.<br>› Additionally, the relevant authorities and major market participants will be involved in the development of the market concept.<br>› The implementation of an accepted and trusted market concept also in line with the EU target model will justify the market model and the attached trading system. |

# 4 Results

In the past, gas prices have been determined based on oil-indexation in the Eastern European region. Nowadays, the oil-indexed and gas-on-gas pricing methodologies co-exist, and thus significantly affect the development opportunities. Markets still being dominated by the long-term oil-indexed contracts have less favourable development chances than the gas-on-gas competition markets. As the oil-indexed pricing can be observed especially in the emerging economies, there is valid fear that the gap between economies might widen. Improving the price competitiveness of natural gas is a vital step not only to maintain the market share of natural gas, but also to improve the chances of emerging markets to further develop and be able to catch up to the developed markets.

Both in the United States of America and in Europe leading examples can be seen regarding the transformation of a gas market from a closed, monopolistic market into a transparent and free competitive market. The analysis have shown that first of all the regulatory support is a major requirement for reforming a market, and an important tool for successfully developing a free market competition is the establishment of a wholesale gas hub, a gas exchange. It is not enough to have proper legislation, changing the pricing mechanism on a gas market requires a well functioning gas hub, either on the domestic market, or close to the market in question, that is able to provide the required index price.

A successful implementation of a gas exchange is only the first step on the development path. Various other requirements need to be met in order to utilise the gas hub and reach a development stage where the gas pricing can be positively affected. Such requirements are:

- requirements outside of a gas hub's influence
  - the appropriate and supportive legislative background,
  - the infrastructural developments,
  - the supply source diversity, and
  - the acceptance of the new market model
- requirements dependent on a gas hub
  - the acceptance of the trading and clearing platforms, and
  - the education of market participants.

There are various outcome scenarios to be elaborated on the effects of a gas hub on the competitiveness of gas as well as economies themselves.

## *4.1 Possible scenarios for a successful intervention*

As it was shown based on the best practises and the logic of change, the most obvious scenario analysis can be performed for the level of regulatory activity and support. Looking at different outcomes from the regulatory side, the affect on the effectiveness of gas hubs can be measured. Altogether three scenarios are identified for the regulatory activity:

- Scenario A – regulatory activity and support is high, i.e. proactive
- Scenario B – regulatory activity and support is medium, i.e. neutral
- Scenario C – regulatory activity and support is low, i.e. opposing

Considering the three scenarios, the overall affects are discussed in the below table.

| Factor | Scenario A | Scenario B | Scenario C |
|---|---|---|---|
| Infrastructural developments | High | Medium | Low |
| Supply source diversity (mostly connected to infrastructural development rather than regulatory influence) | Increasing with infrastructure | Stagnating, or slowly increasing | Stagnating |
| Acceptance of market model | Medium | Medium | Low |

The attitude of the government and the NRAs highly determine the future circumstances of a gas market. Assuming a proactive and supportive regulatory attitude, the infrastructure development projects are encouraged through incentives. As a result, a high rate of supportive infrastructure establishment can be expected on the long term. Due to the long implementation requirement, it is highly recommended to initiate such projects early on. In case, the authorities are neutral towards changes, the infrastructure developments will happen in a much lower pace as well as occur at a lower rate. This highly affects the efficiency of the future trading facilities. In a passive or rather opposing legislative situation, limited or no new infrastructure developments can be expected. In such a case, the chances of blocking all future changes are high.

As mentioned above, the supportive infrastructure is the backbone of the future market reforms. As such, the chances of supply source diversity in a gas market are changing together with the infrastructure projects. Since regulation is not able to directly affect supply diversity, it is recommended to indirectly influence the supply development by providing the supporting infrastructure for imports. As such, the proactive regulatory attitude has a much higher chance to positively affect the supply diversity development, while the neutral and opposing stance will not succeed in this matter.

In addition to the previous two topics, the regulatory bodies should facilitate the evolution of the market. The gas market model is the ideal tool to set the framework for the market processes whether together with the market participants, or without them. Regarding a market model reform, a proactive and highly supportive stance makes the market participants accept the changes easier and the transition can be expected to be smoother. However, the market players are likely to go against the reforms forced by a government or NRA with neutral or opposing attitude.

In relation to the requirements to be provided by the gas hub, it is recommended to take already accepted and widely used trading as well as clearing solutions. For this purpose, the IT and clearing and settlement applications of the largest gas hub should be analysed for compatibility and acceptance among traders. Based on general trader feedbacks, simple, clear and compatible systems are preferred that allow the traders to act easily and most importantly quickly.

On the clearing and settlement side, the most important factor is the financial collateral handling. This is especially important for market participants that are actively trading on more gas hubs simultaneously.

A newly established gas hub is advised to implement the most frequently used platforms both in terms of trading and clearing, as well as to consider the future market trends when selecting the technology. This results in a well welcomed solution that is expected to be used by the market participants both on the domestic and international level. As the number of market participants increase on a gas hub, the depths of trading increases also, which stabilises the market index price.

With regards to education of market participants, it is the responsibility of the gas hub to increase the understanding of the potential market players, to build out trust and comfort towards the newly developed trading opportunity. This long process requires continuous communication and even training of the traders. In principles, the thinking of market participants have to be changed in order to be able to smoothly switch from a bilateral, OTC based trading to an anonymous and transparent trading form.

## 5 Conclusions

The establishment of the natural gas exchange can help to improve an emerging gas market in terms of pricing, source diversification, and formulating a supportive regulation. Gas hub helps to develop the national and regional markets and decreases the risks of natural gas dependency, ensure the security of supply and economic development.

As numerous advantages can be realised through the implementation of a gas exchange, it is highly recommended for decision makers of emerging markets to take the first step towards gas market development. Potential benefits identified are the following:

- interconnection with more mature markets
- shift from indexed pricing to gas market pricing
- transparency
- standardisation
- non-discriminative, equal treatment
- entrance of new market participants
- increase trade, thus increase number of supply sources
- consumer benefits
- regional competitiveness
- decrease the counterparty risk
- settlement services

Liquidity is the most important factor to have a gas exchange, which provides reliable market prices. Infrastructural developments and supply source diversity are the basis of market liquidity. However, high entry barriers could set back the increase of liquidity.

An emerging market that is targeting to reform its gas market has to identify its competitive advantages based on which the market can be developed or that could support the market development. All leading examples, i.e. the Henry Hub in the USA, the NBP in the UK, prove that physical connections and supporting legislation are the basic needs for further development.

Similar opportunities to the leading practises can be found in case of emerging gas markets. For example, the geographical conditions are excellent in Hungary to establish a well-interconnected infrastructure that could also support a regional trading initiative. Nonetheless, it also supports the rise of liquidity that is one of the key requirements of introducing a market based pricing mechanism. Based on the outstanding supporting infrastructure, together with a professional trading screen and with a well-known clearing service provider on the commodity markets, a competitive gas-on-gas market can be developed.

As a result, every market player benefit from the results of the gas market reform. The success of the reform strongly depends on the acceptance and support of market participants. Communication and discussion with the market participants can help to decrease the risk of resistance. This factor is crucial to reduce the transition time of the market model change. The process could be longer than in the United States of America or in the United Kingdom, but supportive legislative background fosters the evolution of the gas market as can be seen in the best practice countries. There is no doubt that the reform has to be started and gas-on-gas competition market is the target model of wholesale natural gas trading.

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