

Pricing Natural Gas

The outlook for the European Market

Clingendael International Energy Programme



Nederlands Instituut voor Internationale Betrekkingen
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Clingendael

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Abbreviations

bcm/y	billion cubic metres per year
CIEP	Clingendael International Energy Programme
EIA	Energy Information Agency
EU	European Union
DG	Directorial General
DGCOMP	Directorial General Competition
GTS	Gas Transport Services
IEA	International Energy Agency
IPE	International Petroleum Exchange
LNG	Liquefied Natural Gas
NBP	National Balancing Point
OTC	Over The Counter
TTF	Title Transfer Facility
UK	United Kingdom
US	United States
WTI	West Texas Intermediate

Summary

Long-term gas supply contracts contain price formulae, in which the gas price is usually linked to the price of another commodity, or to the spot price of gas in a particular market.

In continental Europe the gas price in international long-term supply contracts is predominantly linked to oil products. At the same time, spot markets for gas in which gas prices are determined by supply and demand are developing in various EU markets.

This paper addresses the question of to what extent the traditional form of oil-based price indexation is sustainable and/or will be sustained by the market players. It discusses the considerations the market players may have in favour of one or the other form of indexation, the external forces that may influence the choice of indexation in the short and longer terms and the consequences of change.

It argues that pricing systems are a fundamental part of a market organisation, and that a shift to different pricing structures only happens if and when the main actors are convinced that they understand and accept the consequences of such change.

It concludes that there is no strong evidence that the current hybrid situation, in which both forms of gas pricing co-exist, cannot continue. There are also no overriding reasons to intervene in the market practices of price formation. Both systems have their advantages and disadvantages under different market conditions, and to some extent complement each other in the current markets. Different types of risk and the appreciation thereof by the trading parties will determine particular choices of pricing rules and contracting conditions.

More importantly, in today's market, in which new supplies are slow to come forward, the choice should be left to the market parties, particularly as sellers and buyers do not seem to be in strong disagreement.

1

Introduction

Within the process of EU gas market restructuring, the issue of gas pricing and contracting is a key component, attracting a lot of attention. Market restructuring is generally associated with a transition away from the traditional gas pricing system, in which gas prices were contractually linked to the prices of fuel and gas oil, towards a system in which gas prices will be driven by the balance between supply and demand and the trading positions of participants in gas markets.

Regarding the progress of the transition, it was argued by the architects of market reform that gas market restructuring would bring about commercial rivalry between the several suppliers and traders, which would thus be forced to abandon their long-term contracts and engage in efficient competitive pricing schemes. Restructured markets with competitive gas-to-gas pricing would yield maximal efficiency and a supply of gas at the lowest cost, via an optimal allocation of resources and investments. Today, much of the restructuring has taken place. However, the market has not made the expected changes. The architects argue that the market is still far from competitive because the incumbent parties continue their past pricing and contracting practices, thus foreclosing the entry of new competitors and impeding the development of an efficient market.¹ Others in the industry argue that the expected changes were unrealistic and did not take into account either the fundamentals or the institutional forces of the gas industry.²

There appears to be no analysis in existence that demonstrates that market forces will inevitably lead to spot price indexation. Recently, the Energy Charter (2007) extensively examined possible reasons for the differences in pricing mechanisms between oil and gas. Stern, in a paper of April 2007, suggests that there was an expectation that, with the introduction of liberalised and competitive markets, Continental European markets would move to (spot) gas indexation. He infers that this has not happened due to the slow progress towards liberalisation. Both studies illustrate that the forces at play are quite diverse and complex. They do not justify the expectation of a self-evident full transition towards spot pricing, nor do they suggest the existence of failures in the liberalisation process or resistance among the incumbent players.

The aims of this paper are:

- (1) to identify the main factors that could play a role in a possible transition in gas pricing: what is the future for oil (product) indexation for gas prices in long-term contracts in NW Continental Europe; and
- (2) to discuss the implications of different price structures.

This question will be considered in the contexts of the developments within the short-term wholesale and end consumer markets as well as the long-term contracts between producers and merchant gas companies, such as the recently signed contracts between Gazprom and Eon-Ruhrgas.

¹ See “An energy policy for Europe,” EU Commission, 10 January 2007, COM 2007 1.

² CIEP (2006). *The paradigm change in international natural gas markets and the impact on regulation*. The Hague: International Gas Union (IGU)/ The Clingendael Institute.

2

Changes in pricing terms don't happen easily

It could be argued that the current discussion about gas pricing disregards a number of crucial aspects. This seems to be the consequence of diverging perspectives on the issue of gas pricing by the different communities involved in managing the gas market. Each of them has its own specific role, objectives and interests and its own perspective on, theory about and practical insights into how a market should (or could) work. These are: first, the producing countries and the upstream industry, trying to make the most of exploiting their natural resources; secondly, the midstream businesses, the merchant resellers and traders; thirdly the downstream segment, including distribution companies; fourthly, the different types of consumers; and, fifthly, the regulatory realm, engaged in establishing an “effective” market along the lines suggested by mainstream economics.

The problem is not so much that these communities have their own, naturally conflicting, interests. This is true in every market, as the actors have to compete for their share of the rents. Usually, however, they manage to find a common basis for their transactions and thus create the business models which, in evolving markets, are subject to change as agreed between the market players. The real problem arises when a new market design is unilaterally imposed. It is at this point that the different actors' perspectives, diagnoses and remedies regarding the question of how this market should work, clash.³

Different conceptual models, with different indicators, facts and figures and different experiences lead to different evaluations. This causes a lack of common understanding about the way the market works, the process of pricing and the drivers for change in such processes. Indeed, mainstream economic science – providing the fundament for the new market design – provides an ideal world analysis of the levels of prices, price-setting strategies and quantities traded, but it does not analyse why particular pricing *systems* exist and how these may change.⁴

This question is addressed by institutional economics, a branch of economic science offering insights that are less widespread than those of mainstream neoclassical economics. The institutional approach provides useful insights with respect to the nature of prices, their role in transactions and the evolution of pricing systems (see Tool, 1993, 1995). Its main elements are:

- prices reflect value to buyers and sellers in a rather specific way; value is no “natural” given, but rather is socially constructed and *institutionalised* in a particular way, as is illustrated by the alternative systems of gas pricing;
- stable pricing systems reflect (longer-term) market characteristics and the interests of main market parties;
- this implies that they adequately facilitate ongoing flows of transactions and efficient decision-making about investments in the value chain;
- these systems have to be functionally adequate, to be accepted and trusted by all market parties; otherwise no transactions take place; and

³ Aad Correljé (2005) Dilemmas in Network Regulation: The Dutch Gas Industry. In: R. Künneke, J. Groenewegen, A. Correljé (eds.) *Innovations in liberalized network industries: Between private initiatives and public interest*, Edward Elgar. Pp.115-150.

⁴ North, D.C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

- pricing systems are facilitated by market institutions, including information and reporting services, contracting practices and conflict mediation and market parties' capabilities to interpret and understand price signals.

Changes in pricing systems are thus not a *simple* transition to another way of setting the prices. In general terms it requires a redefinition of the meaning of “value” for specific goods and their attributes, including the references for their value, time and mode of delivery, quality, associated services, etc. To be accepted and trusted by the main market actors as a basis for their transactions, such changes suggest *convincing* shifts in market characteristics and in interests of market parties. Main elements in this respect are the new roles of alternative sources of gas and energy supply and access to these substitutes and substitute markets by participants. It is obvious that processes of market restructuring create winners and losers, as value and substitutability varies according to producers, regions, users. To be trusted, the new system should provide *sufficient* certainty of being able to engage in (future) transactions and investments.⁵

This also involves issues like credibility, independence of the pricing process, liquidity and equity to the several parties in the value chain. Yet, the shifts as such are *costly*, as new institutions, capabilities and points of reference have to be developed and ascertained by the market participants. So the perceived gains of changing the pricing system have to be greater than the direct and indirect costs of institutional change. Indeed, some benefits must fall to dominant actors in the system. Moreover, the question arises as to whom will invest substantially in “institution building”, including the operation of hubs, infrastructure, price reporting, contract development and support.

Indeed, among the fundamental characteristics of a functioning market are liquidity, transparency and acceptability of the market system, providing signals for both *short term* commercial gas trading as well as *longer term* investments in production, transport and treatment assets. As long as (most) crucial parties are not (yet) convinced that a new mode of market organisation will adequately provide these signals, there will be no incentive for a significant shift, despite the fact that the seeds are sown. Markets only become credible by the herd behaviour of their participants.

⁵ An interesting insight in the development of the traditional gas pricing system in the Netherlands in the early 1960s is provided by one of the Exxon negotiators at the time (Stewart, Madsen 2006)

3

Brief overview of current situation⁶

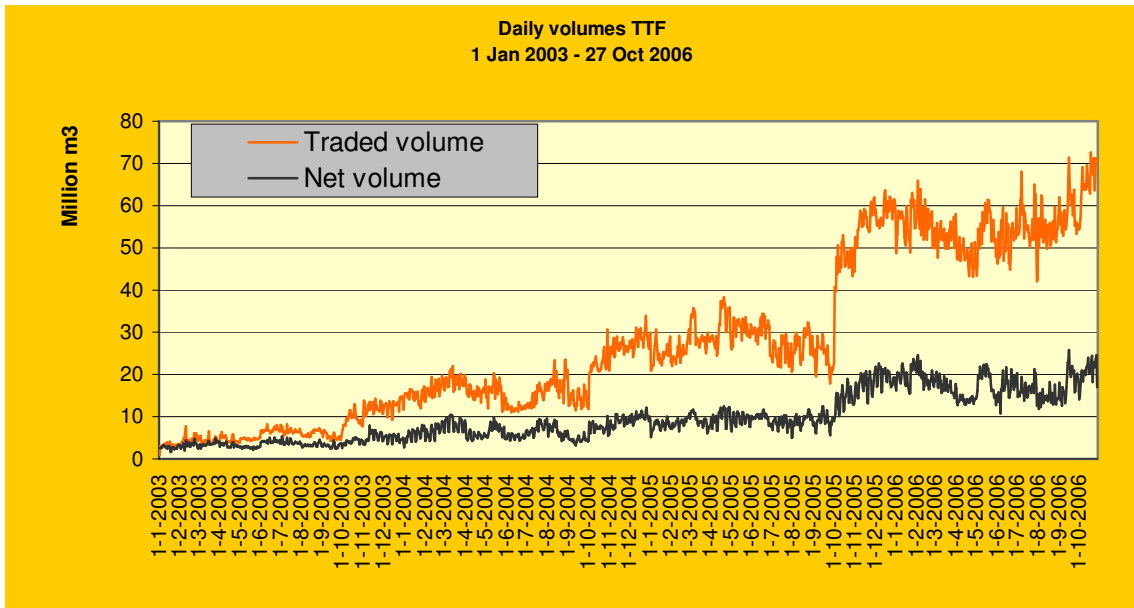
Historic and current gas supplies in Continental Europe, but also in Asia, are predominantly based on long-term contracts with oil-product linked prices between producers and gas merchant companies. This applies to pipeline gas, from Russia, Norway, and the Netherlands; and to LNG, from Algeria and Nigeria, among others. Gas pricing in these contracts follows the “net-back principle”, under which gas is priced against “market value” in the market to which it is (assumed to be) destined. This has led to an indexation to oil products, embraced by producers and marketers alike, to keep natural gas competitively priced against its main alternative substitutes in the traditional gas market segments. Further down the value chain, gas prices from marketers to end-consumers are also generally based on or derived from oil-linked prices. This is either to preserve the competitiveness of marketers or, for merchant resellers, to ensure that their margin exposure is reasonably contained.

In the UK, gas pricing has moved from oil-linked prices to different types of indexation during the ‘90s, initially to accommodate the requirements of new power generators during the “dash for gas”. Subsequently, price indexation converged to spot gas indexation, following the start of the NBP in 1996. Bossley (1999) describes the further unbundling of the UK gas market, illustrating in detail how all elements of the gas trade, like commodity trade, balancing, shipping, access to transport capacity, storage, etc., were separated into stand-alone transactions. Specific entities were established to carry out these functions, while particular markets evolved, like the bilateral over-the-counter (OTC) market and the International Petroleum Exchange (IPE) gas futures market. Although some long-term contracts with oil indexation still remain, gas delivered by producers to marketers in the UK is increasingly spot indexed, and virtually all new long-term contracts can also be expected to be spot indexed (see Maissonier 2006).

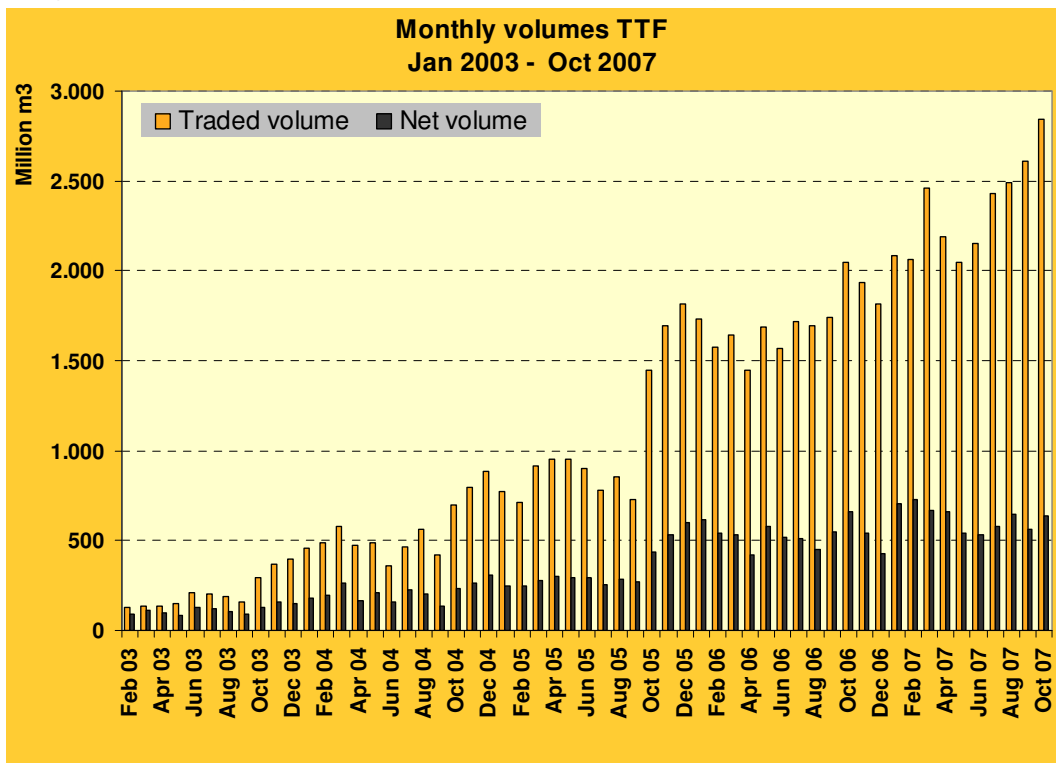
Meanwhile, on the Continent, the Zeebrugge landing point of the Interconnector developed in the late ‘90s as a physical trading hub. It now enjoys substantial trade volumes. Subsequently, facilitated by entry-exit systems for gas transportation, a virtual trading point has started to develop in many EU markets. The most advanced of these virtual markets in Continental NW Europe is the Dutch TTF, where, according to hub facilitator GTS, some 20 bcm/yr is currently traded and trade is growing rapidly.

Although the trade on the Dutch TTF is growing rapidly, the country’s re-trading ratio is still far below that of the UK.

⁶ For more extensive overview of the current situation see Stern (2007) and Energy Charter (2007).

Figure 1: Growing business for the Dutch TTFSource: GTS⁷

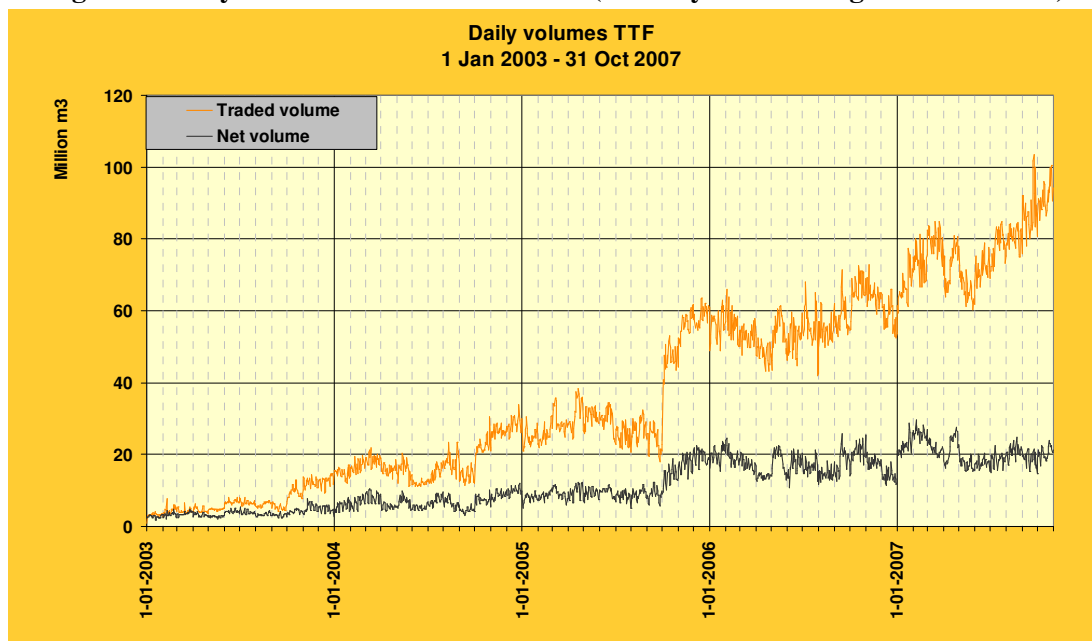
Other virtual hubs on the continent are in earlier stages of development, e.g. the BEB-VP and Eon-Choice market in Germany, the PEGs in France, the PSV in Italy and the CEGH (Baumgarten) in Austria. In effect, all these short-term spot markets show a very positive development, with traded volumes growing by 50%-100% per year.

Figure 2: Monthly volumes for the Dutch TTF (January 2003 until October 2007)

Source: GTS

⁷ Not all trades are reported to hub facilitator GTS. Dutch regulator NMa/DTe ("Gasmonitor, ontwikkelingen in de groothandelsmarkt Gas in Nederland in 2005", NMa/DTe 2006) reports that total trade volumes in 2005 surpassed the volumes reported by GTS by a factor of more than 2.

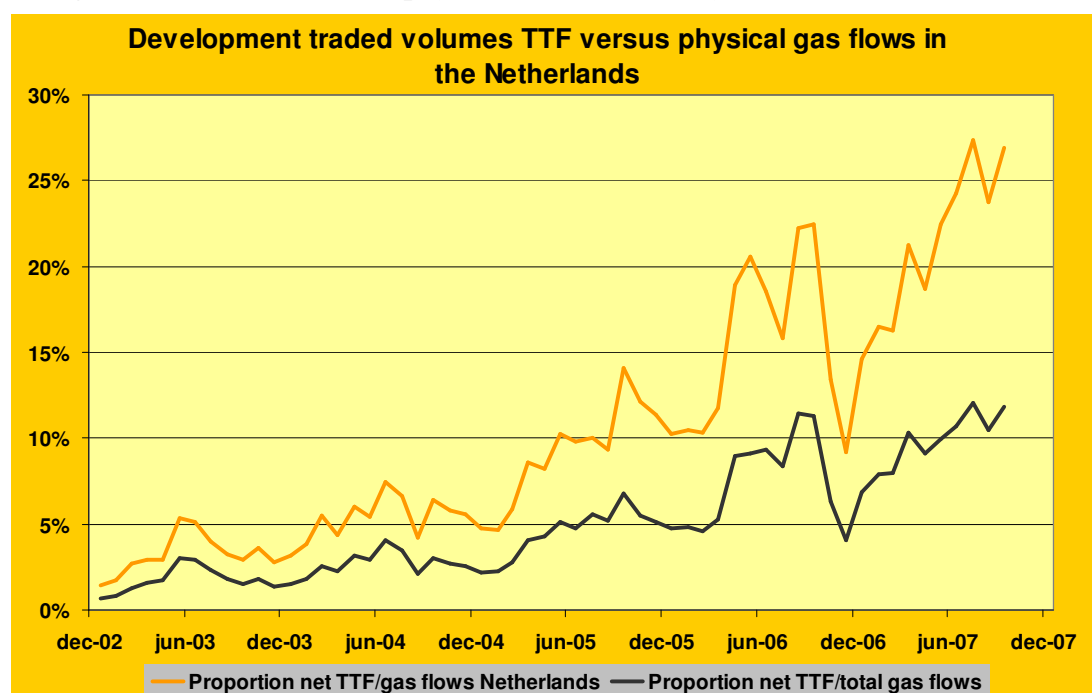
Figure 3: Daily volumes for the Dutch TTF (January 2003 through October 2007)



Source: GTS

It is widely expected that long-term contracts will continue to play a significant role in the import portfolio of Europe, for reasons of security of both supply and demand (investment security). Jepma (2005) expects that gas spot markets may eventually cover some 25% of the physical market.

Figure 4: Dutch TTF versus physical market (January 2006 until October 2007)



Source: GTS

Figure 4 shows the development of the traded volumes on the Dutch TTF versus the physical gas flows in the Netherlands. Taking into account the gas flows in the whole Dutch system, including gas export, the traded volumes on the TTF cover 12% of the physical market. Looking only at the gas flows on the home market, the Dutch TTF covers more than 25% of the physical market.

It should be taken into account that not all traded gas is presented on the Dutch TTF. Rather, much gas is traded on the grid point in Emden, for example. These volumes are not included in the TTF volumes.

This paper does not attempt to argue for or against the relative merits of long-term contracts, but builds on the assumption that long-term contracts will continue to play a role of significance. For the purpose of this paper it is not very relevant whether the share of spot markets will be 25% or even grow further. Rather, the paper investigates whether gas prices under future long-term contracts will gradually move towards adopting spot (gas) price indexation, as appears to have been the case in the UK, or whether oil indexation will prevail in these contracts.

4

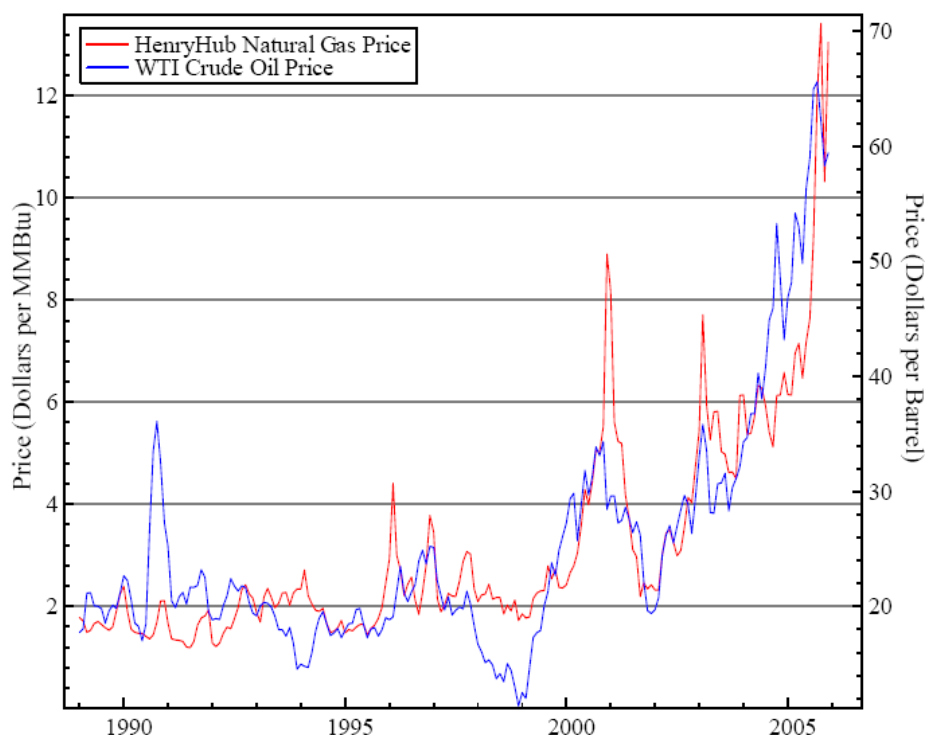
Gas- or oil indexation: What's the difference?

In a fragmented, competitive market, gas trade is needed to efficiently deal with imbalances in the market, in which it forms a quick and easy-access marketplace to trade surpluses and shortages via standard contracts for standard products. If the market is liquid and robust enough, it can also provide a short-term source for gas alongside longer-term contracts, and the price realisations can steer customers' behaviour so that they consume gas more economically where possible. Its pricing is based on gas-to-gas competition, and spot prices emerge.

4.1. Is there a difference?

It has been shown from historical data that gas prices on traded markets do not differ significantly from oil-indexed prices when considered over a period of 3-5 years, but that they can differ significantly for short periods (1 day to 1 year). (See Villar & Joutz 2006).

Figure 5: Henry Hub Natural Gas Prices versus WTI Crude Oil Prices



Source: Energy Information Administration, *Short-Term Energy Outlook*, various issues.

4.2. Will this also be the case for Europe in future?

In the short term, operational issues prevent most energy users from switching between available energy sources (oil, gas, coal, electricity) when relative prices change. The number of consumers with fuel-switching capabilities who can take immediate advantage of movements in fuel prices is limited

in Europe.⁸ On a slightly longer time horizon, however, at least some of the customers (essentially the industrial and power sectors) are able to select – and possibly switch to – their fuel of choice when facing replacement or growth of assets. Such decisions are generally based on full-cost economics, including the cost of the asset/equipment, and hence affect the demand for gas over a longer period. In theory this behaviour thereby influences the supply/demand balance of the competing fuels, and hence their prices, to the point of cost indifference [this is not just fuel cost, but also includes operational efficiency, comfort of use, environmental constraints (CO₂, NO_x, SO_x), permit restrictions, etc.]. For industrial customers, essentially, the choice of fuel will continue to be between oil products and gas. So, arguably, there is a rationale for expecting a continued correlation between gas-traded prices and oil-indexed prices in the future. However, the composition of end use gas consumption is changing towards a larger market share for power generation. Could that have an impact on the longer term relationship between gas and oil prices?

Given the level of gas prices in the recent past, it is likely that for power generators with a portfolio of generating plants, who can switch fuel by choice of plant, gas-based generation will be the highest marginal cost option in the merit order and hence the marginal choice of fuel. Oil-based power generation is disappearing from the scene. Coal and gas remain as the two competing fossil fuels. Generally, for existing power stations, only variable costs count, and coal is significantly cheaper than gas. So power is preferentially produced with coal while gas-fired power stations are used during peak demand. Fuel switching of any significance will therefore only take place from coal to gas if gas prices show a significant (temporary) fall or if CO₂ emission costs rise considerably above current levels. Consequently, a growing share of power generation in gas demand will inevitably weaken the relationship between gas and oil prices. The relationship will not disappear, however, as the choice of fuel between gas and oil products (mainly gasoil) will continue to be a feature of the industrial market, which will continue to have a substantial position in the gas market.

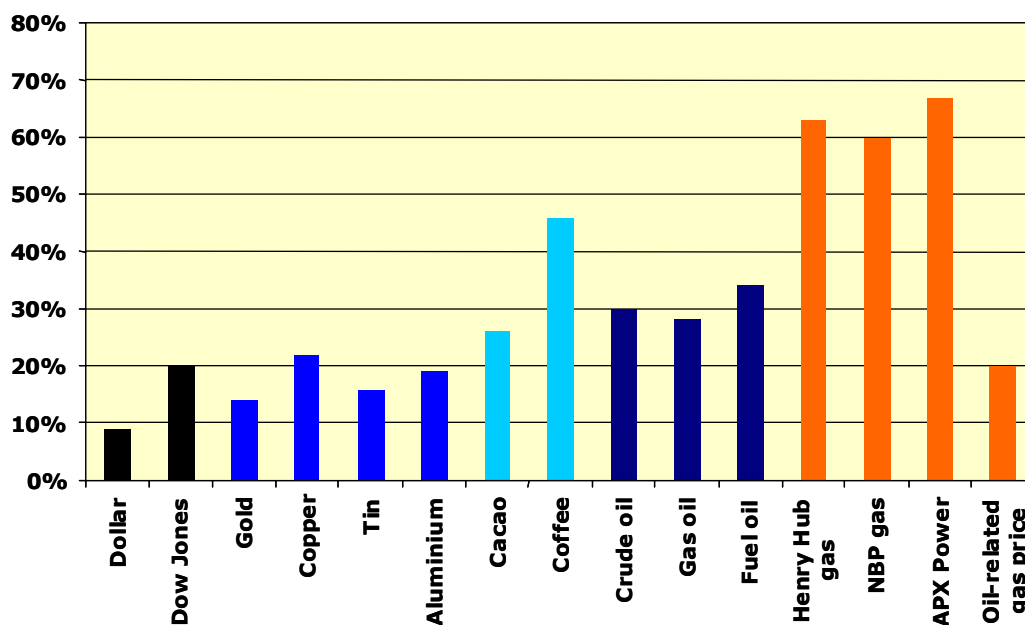
It remains to be seen whether the strong long-term correlation between oil-indexed prices and spot prices will persist in the future. Most likely, however, the factors that cause this correlation will not alter very much. Nonetheless, with a declining dual firing capacity in the market, it can be expected that short- to medium-term difference may be more significant in future.

4.3. Volatility

Gas prices on traded markets are more volatile than those in traditional oil-linked contracts. This is not surprising; clearly day-ahead/month-ahead prices on the traded market are more prone to fluctuations than time-lagged, averaged oil-indexed prices.

But traded gas prices are not only more volatile than oil-indexed prices; they are also more volatile than traded oil (product) prices and other commodities.

⁸ Dual firing capability is a more common feature in the US market but is also declining; it is expected that this will weaken the short-term correlation between gas and oil prices in this market.

Figure 6: Price volatility of gas versus other commodities

Source: GasTerra

As gas markets are more local/regional than the global oil market due to less flexible transportation methods, small deviations in either supply or demand have a bigger effect than similar upsets would have on the oil market.

Another factor why gas prices are more volatile is the fact that it is much more difficult (hence more expensive) to store gas than oil. Finding a suitable gas storage reservoir is not as easy as building an oil storage tank, and is significantly more costly (see Ilex Energy Consulting 2004). Moreover, the price volatility of individual traded markets translates itself into price differentials (geographic, summer-winter) that are even more volatile.

Empirical research on the development of Henry Hub (US) and NBP (UK) volatility and liquidity during the years 1997 - 2006 shows that price volatility does not diminish once the liquidity of the traded markets is developing (see Ilex Energy Consulting 2004).

Market players and investors, exposed to price uncertainty, will want to hedge their price risk and protect their business margins and investments. However, the more volatile fuel (natural gas) seems to be less hedge-able than crude oil and gas oil as a result of its volatility and, particularly, the lack of liquidity. Linkage of prices in long-term contracts to spot gas prices could thus create a problem of volatility which is difficult to hedge. A solution, suggested by some observers, would be to use average spot gas prices over an agreed period of time in these contracts (as is done in the case of oil indexation); obviously this would give buyers more price stability. The price spikes of the spot market may still exist, but they become invisible in an average price of the long-term contract. Consequently, averaging spot prices would largely remove the expected benefit of supplying gas at market-reflective prices, signalling scarcity and abundance.

4.4. Price signals: Too little, too late?

Oil-indexed gas prices as such do not offer the seller or the buyer any insight into the supply-demand balance of the market, neither in the short term nor the long term. They are not meant to provide signals or economic incentives to invest in new supplies, pipelines or storage. In the past these investments were made on the basis of market analysis, carried out by the main (or monopoly) merchant companies and distributors with a thorough understanding of the energy systems and the size

and pace of developments in their region. Today, this analysis is hampered by the current competitive and fragmented market structure which, paradoxically, is required to provide more information but does not necessarily offer longer-term insights, thus bringing greater uncertainties and higher risks for the investors. Moreover, following the unbundling of the industry, decision making on supply and infrastructure investments have been separated which, in turn, is leading to a loss of a global market view and to a longer travel path for market signals; all of this has the potential to delay investment decisions (see CIEP 2003).

It is widely argued that spot prices provide additional guidance for gas infrastructure investments and for gas producers in determining their preference for certain geographic markets.⁹ Indeed, this is supported by economic theory and applies to most goods and services. However, for gas the forward curve on traded markets is generally not long enough to fulfil such a role for the significant investments, which in the gas industry characteristically take a very long time to be realised. Traded markets concentrate – in terms of liquidity and reliability – on the short term (< 2 years) and do not extend beyond a period of 3 years at most,¹⁰ whilst the relevant period for investment in major assets like transmission, LNG, storage and production investments is much longer than this. The lead time itself for most investments is generally already at least four years!¹¹

It is more realistic to presume that spot prices will do better in provoking short-term signals on the demand side of the market. Generally, in the absence of dual-firing or other applications where other fuels can substitute natural gas, short-term price elasticity generally is very low.¹² High price volatility can help to overcome this low demand elasticity, particularly when it is expected that it will last for a longer time. Indeed, very large differences between prices in periods of either scarcity or ample supply will stimulate more consumers to seek alternative solutions, like dual firing or shutting down their plants temporarily, for example. Research in the supply-short UK market during winter 2005-2006 suggests a price elasticity of -0.17 . For continental Europe, with fewer options for fuel substitution, the indicative figure might be more around -0.1 or even less (see Correljé, Wempe 2007).

Spot prices offer more information on the state of the market than oil-indexed prices. For near-term business they add useful indicators to support further optimisation of business performance. Their contribution to longer-term decision making is at best limited.

To the extent that spot prices contribute to market responsive (short-term) decision making, the question could be asked whether a hybrid system that has 25% spot prices and 75% oil indexation would offer adequate information for such decisions. Or would there be a significant improvement in the quality of decision making if all gas were sold with spot indexation, as is happening in the UK?

4.5. Security of Supply

In its recent publication “Energy Security and Climate Policy” the International Energy Agency (2007) proposes that a (gradual) transition from oil indexation to gas indexation will improve security of supply conditions, on the grounds that gas-indexed prices should make the industry more responsive to the forces of gas supply and demand than prices pegged to the price of another

⁹ See Shively, B., Ferrare, B. (2005) *Understanding Today's Natural Gas Business*, Enerdynamics, San Francisco.

¹⁰ Even Henry Hub, the most developed gas market, the forward market only involves 4-5 years, of which the first 2-3 years can be considered liquid enough to have sufficient meaning in this context.

¹¹ This is recognised by, for example, Forbes & Zampinelli 2004. They argue, however, that the US industry is using effective strategies and tools to mitigate/eliminate the adverse consequences of price volatility on investments in gas production. The question remains whether these strategies are also effective in the European context.

¹² Thompson, H (2006) The applied theory of energy substitution in production. *Energy Economics*, 28 (4), 410-425.

commodity. It also projects a greater contribution of short-term trade, combined with a growing share of gas-based pricing. Against this perspective stands the argument that long-term contracts offer more security of supply to the European market than a short-term market, given Europe's dependence on supplies from a few remote sources. This is not addressed in the IEA publication. Nor does it consider the implications of linkage to oil prices if oil is a scarcer commodity than gas. Arguably, this could lead to more gas supplies coming forward than would have been the case with gas indexation.

While long-term contracts remain a cornerstone of Security of Supply for Continental Europe, there is no convincing argument in literature that gas prices, particularly in a hybrid system, contribute to or undermine security of supply (see also Crisis Resilience).

4.6. Crisis Resilience

There is a persistent suggestion that the US market is capable of coping much better with a supply crisis than the European market. By way of evidence, the supporters of this proposition point to the way in which the US dealt with the aftermath of "Katrina and Rita". According to them the US dealt with the consequence of these hurricanes without any hiccup in the market. They compare this with the short interruption of Russian supplies in connection with the Ukraine, which created havoc in the (Italian) market.

The facts are that Rita and Katrina happened in October, while the US was preparing for the next winter. The hurricanes took out 20% of the production capacity of the Gulf, corresponding to 5% of the US market. Although gas prices in the US rose considerably, causing pain to all consumers, there is no evidence of consumers experiencing physical shortages. In fact, the market went on filling the storages, in preparation for the winter (EIA, August 2007). In Europe, the Ukraine crisis did not cause a physical shortage or any serious pain. Only in Italy, the reduced flow of gas from Russia was added to very high demand from the market due to an extremely cold winter. As a consequence of the high demand, the Italian government found it necessary later that winter to release limited amounts of strategic gas stocks to deal with the situation. Prices in Europe remained essentially stable as a result of oil indexation in the long-term supply contracts. Still, the Ukraine crisis created a bigger outcry than had been the case in the US because of the geo-political aspects and concerns about security of supply.

In every market in both the US and Europe, there will be parties who cannot meet their contractual obligations in the event of a sudden interruption in supply (very few consumers in the US rely totally on short-term, day-to-day trade). For these parties, failure to supply under a contract can be remedied by the acquiring gas from the spot market. In the same way, consumers could decide to sell their supplies on the spot market rather than use it themselves, depending on the season and their alternatives. For such reasons the existence of spot markets in Europe would also be helpful.

It is not the case that oil-price indexation in the long-term contracts will cause the market to cope less efficiently with a supply crisis, particularly if this occurs in the hybrid markets that are currently developing. A crisis inevitably creates pain and winners and losers. But the indexation with oil prices has protected most European buyers from paying excessive prices as were faced by all consumers in the US after the hurricanes.

5

The drivers for changing indexation and stakeholders' interests

Pricing systems need to be functionally adequate to be accepted and trusted by all market parties; otherwise no transactions take place. To be trusted, any new pricing system should provide sufficient certainty of being able to engage in (future) transactions and investments. This involves issues like credibility, independence of the pricing process, liquidity and equity to the several parties in the value chain.

It is the view of many observers that oil-product indexation has lost its rationale, to the point that it is regarded as inappropriate (Stern 2007, p21). It has proven difficult to gauge the views of the stakeholders in the industry with regards to the outcome of the evolving pricing process. Generally no strong corporate visions or expectations of future gas pricing structures appear. Moreover, many players, particularly those on the purchasing end of the value chain, are prepared to go with the market, possibly in recognition of the current sellers' market.

It has already been observed that gas markets are more local/regional than the global oil market. Therefore, traded gas markets could be more susceptible to the influence of individual, major market players than oil markets are, particularly in the European market. This may cause other market players to be more cautious in concluding supply contracts based on gas spot prices, while governments may be hesitant to encourage it.

The following sections explore the positions, considerations and views of different stakeholders.

5.1 Residential consumers

Residential consumers are generally concerned about reliability of supply and price. Under the current metering processes, they are charged on the basis of constant prices, which are set periodically (say every 1 to 2 years) by their suppliers. Given the fact that they have very limited opportunities to change their consumption pattern in response to price signals, it is unlikely that they could behave more reactively through the introduction of dynamic metering and pricing.

Price stability thus seems to be not only in their best interest but also a practical necessity. The question is whether the distributor can best offer that stability at lowest cost in a market with spot prices, with oil-indexed prices, or a combination of both.

While a large proportion of the residential customers have become captive users of gas and the penetration of gas has in some parts of NW Europe reached the point of saturation, gas still wins market share in other parts at the expense of gas oil. Competitiveness with gasoil has therefore not lost its rationale altogether (see also Stern 2007).

5.2 Industrial consumers

Industries with relatively low energy consumption and commercial businesses generally prefer the stability and predictability of a price/operating environment. Industrial customers with major energy use may have more complex and varying purchasing objectives such as: a) protecting their business/production margin; b) ensuring cost competitiveness with respect to their (international) competitors; c) securing stability over their budget horizon; d) managing their risk and hedging their energy costs over a period of their choice. Each of these objectives may direct the energy-intensive (gas) consumer towards different indexation preferences for their gas purchase contracts.

The more suitable gas indexations in such cases could be, respectively: a) indexation with the end-product value, like electricity, ammonia, etc.; b) indexation according to prevailing customs in the

relevant industrial sector, for example to oil products if the major competition originates from Asia where oil indexation still dominates; c) fixed pricing for the budget period, possibly with floating for fixed options and *vice versa*; d) an indexation factor which allows for the most liquid and lowest cost hedging.

It should be stressed that the use of crude oil (essentially Brent)¹³ as the index factor of choice is becoming more and more prevalent in the preferences of large industrial users because of its hedgeability, rather than its competitiveness with oil products as fuel substitutes. Supply offers based on innovative price engineering have become the means for commercial distinction among competing gas suppliers, and the hedgeability of the indexation factor is a key success factor to such price engineering proposals.

5.3 Producers

In markets with increasing trading opportunities, traditional contracts with oil product indexation may allow the buyers to use both the time lag in the pricing formulae and the contractual flexibility, notably in pipeline contracts, to realise extra value in the market. Producers may not be comfortable with this, although it is not an entirely new phenomenon. For a long time dispatching departments of major buyers would optimise the off take from their purchasing contracts using the contractual flexibility. Today however, there is more potential for value creation by the buyers through the optionality provided in long-term (pipeline) gas contracts in their portfolio. If producers feel that the unintended value leakage is undesirable – because they regard it as part of their resource value – it will cause them to reduce the time lag and particularly the flexibility of their long-term sales contracts.

The main pipeline suppliers, led by Gazprom, currently appear to be comfortable continuing the use of oil-product indexation for the main part of their long-term supplies to Europe. LNG producers have historically followed the same process of selling gas under long-term contracts with oil (product) indexation. However, more recently the attention has been focussed on supplies to the US market or arbitrage in the Atlantic Basin, which by its nature is based on spot prices. This leads to more flexible contracts and interaction with US spot prices. In addition, the large volumes of LNG from Qatar, earmarked for the UK market, will use an NBP-price yardstick in their search for better markets. Some international oil companies seem to have developed a predilection for spot prices. Others remain more prepared to accept different price regimes in different markets.

5.4 Merchant gas companies/marketers

Where, historically, merchant gas companies and marketers managed their volume exposure through flexibility in their supply contracts via Take-or-Pay and contractual daily off take flexibility, in a traded market this volume exposure can now also be managed by selling or buying at traded market prices. Equally, the flexibility in long-term contracts with oil-product indexation can be used to realise extra value using spot price differences (“arbitrage”). These companies may well desire a mix of indexations in their supply contracts and a mix of short-term and long-term contracts (including blocks on the spot market) to respond to their own customers’ requirements. The merchant companies with a large “traditional” market will see their margins protected by oil-product indexation but are at the same time looking over their shoulder to other players who may have secured gas under different, more competitive conditions. Gas storage is an essential part of the “tool kit” of a gas merchant and a (large) distributor for achieving an efficiently flexible portfolio, to meet fluctuating demand in their market. Oil-linked gas prices do not offer the price information on the basis of which investments in storage can be considered and justified. The information, offered by a hybrid market, with both spot prices and oil-linked prices goes some way towards remedying this situation, but only for short-term use of storage as risk management tool. It still does not provide the time horizon to justify investments in storage for seasonal load balancing.

¹³ It should be noted that the market share of Brent is rapidly being reduced, which in a way invalidates the rationale for using Brent as a basis for indexation.

5.5 Distributors

Distributors have an interest in back-to-back protection and in offering their customers stability and competitive prices. At the same time they need the traded market to manage their supply portfolio. With regard to their need to offer their residential customers flat prices, and (for some) ongoing competitiveness with gasoil, it would appear that oil-product indexation should be their preference for most of their supplies. Large distributors will seek the same opportunities as merchant gas companies, offered by a mix of pricing terms.

5.6 Power generators

The power industry appears to be of two minds: spot prices offer more transparency, and buying in a sufficiently liquid spot market provides more flexibility, two features which the power generators have found missing in the gas business in Continental Europe. However, oil-product related prices are more hedgeable, a condition highly valued by the power industry. The continental spot markets today do not have the liquidity that would be needed if power generators were to rely totally on supplies from these markets. Indexation with coal is difficult to obtain, particularly in today's sellers market. In any case, the current gas prices, with or without oil indexation, have moved to levels that make the option to invest in gas-fired generation considerably less attractive, relative to coal-fired generation.

5.7 Traders

Traders provide short-term market efficiency, as they enable producers and marketers to optimise their supply portfolios. Traders seek opportunities in volatile markets, and their main priority is to expand the access to and the liquidity of their markets as much as possible. With respect to long-term gas contracts, pure traders generally tend to be rather indifferent between various ways of indexation, since long-term contracts are not their core business.

5.8 Governments

Governments' primary concern is generally the availability of gas supply at reasonable prices to ensure a good investment climate for industries and affordable energy for households. They are strongly committed to achieving these goals in a competitive and efficient European gas market, where no barriers to trade exist. They are generally in favour of traded markets as, in their opinion, these markets provide an opportunity to establish the lowest possible end-consumer prices. Many governments, however, also recognise the continuing significance of long-term contracts for security of supply reasons. Essentially, national governments in NW Europe seem to accept the indexation on which the market decides.

However, the European Commission and most national regulators have displayed considerable discomfort with oil-product indexation, which is considered to have outlived its purpose and to obstruct the development of a genuine competitive market for gas. Although it seems to have accepted that the market continues the use of this indexation in long-term contracts, particularly DGCOMP continues to campaign against it.

6

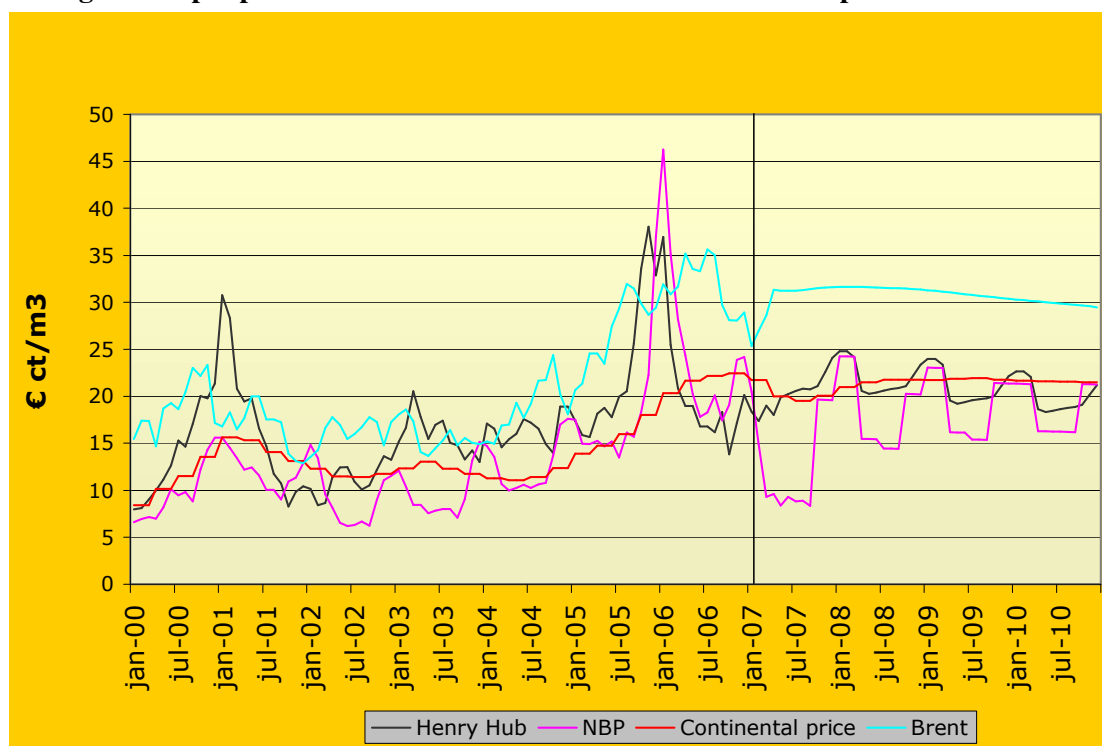
Which way to go?

6.1 Short-termism could lead to spot pricing

In an environment in which gas supply is short (and thus spot prices high) and the expectation is that this situation will continue, customers may want to contract on an oil-linked basis, but suppliers will want to sell on a spot-indexed basis or at least increase their sales price in accordance with the spot-price level. In such a sellers' market suppliers tend to dictate the prices and pricing terms.

Conversely, if the expectation is that supply is long (and spot prices low), customers will want to contract on a spot-indexed basis, while suppliers will want to sell on an oil-linked basis. In such a buyers' market the customers' influence on pricing is high. This may suggest that in both a buyers' and a sellers' market the prevailing party with the most market power tends to prefer spot pricing.

Figure 7: Spot prices versus indicative Continental oil-indexed price



Source: GTS

However, in the globalising energy market it is difficult and dangerous to predict whether the world will be long or short on gas, how this will vary over time, and how this in turn will vary relative to the oil supply-demand balance, although in our view there are more signs for a continuing sellers' market for gas for the longer term. What can be expected, though, is that the majority of gas will come from only a few large producer countries, which tend to be guided by long-term views and interests. It is therefore questionable as to whether the players who share a long-term perspective will let themselves be driven fully by speculative notions.

A development which appears to be gaining ground is that producers, notably of LNG, commit less than the full capacity of the infrastructure of a project to long-term contracts, reserving part of that

capacity for short-term trade, which by implication is based on short-term gas prices. This contributes to creating more liquidity and opportunity for arbitrage in the short-term market, and also to more prominence of spot prices.

6.2 Who wants to bet?

While there has been a strong correlation between gas and oil-product prices, this may not be the case in the future. The power sector has become a far more important market outlet for which oil competitiveness is meaningless, but for which the hedging needs are strongest. Also, gas prices have risen considerably, leaving a wide margin between the cost of supply and the market price. The recent price movements in the US and the UK illustrate that this margin is very vulnerable to changes in the supply-demand balance: higher prices definitely invite investments in supply, which take between one to three years to materialise. So, if a choice were offered to producers and buyers in NW Europe as to which would be the better bet for the longer term, spot prices or oil-product indexation, it would depend upon whether one takes the producer or the buyer perspective.

Looking at the relationship between the two sets of prices over the past few years, there is no clear winner or loser. As such, no conclusions can be drawn about which system is preferable. A few years where spot prices are ahead of oil-indexed prices would then probably be followed by several years with low spot prices, due to the expected UK glut.

In looking for future long-term structural relationship and its drivers, one of the arguments could be that, in the long run, the marginal costs of oil will differ from those of gas. Assuming that the costs of development and transportation of new long-term gas supply could be on the order of \$ 4.00/MMBtu, this would correspond to a cost of around \$ 21/boe. Costs of new development and supply of conventional oil are now considered to be on the order of \$ 15-20/bbl, and higher for non-conventional sources. So there does not seem to be a major difference today between the expected long-term marginal costs of supply for gas and oil. However, the prices of the two fuels and their relative positions are more a matter of supply and demand than of the underlying costs of supply. This is well illustrated by today's market prices, which are substantially higher than the costs of supply.

In Section 3 it is pointed out that the correlation between gas and oil prices is likely to remain. Indeed, it is unlikely that gas spot prices in the US and the UK will structurally rise above corresponding oil-product prices. Producers could expect serious demand destruction and switching away from gas, even more than today, with an ensuing reduction in demand. This is unlikely (although not totally inconceivable, if producers and producing countries fail to make up for the expected fall in production from existing sources). Thus, more likely, spot prices in NW Europe will not consistently exceed oil-indexed prices. Structurally lower spot prices would be the result of a surplus in the market, as may develop in the UK over the next few years. Even though the projected demand growth of the power sector may not materialise, it is most questionable as to whether this will result in supply surplus over the next 10-15 years, as indigenous supply seems to be gradually declining for a variety of reasons. The rumblings of a Gaspec with possibly coordinated supplies between the main producing countries don't seem to make this any more likely. This again would suggest that there is no certain winner or loser between the two forms of indexation.

6.3 New accounting rules and gas pricing

It is suggested that new accounting principles require companies in the business of buying and selling gas to "mark to market" their contractual commitments and include deviations from market conditions in their accounts. The effect could be that these companies would seek to agree on pricing terms that follow the market, and thus, where appropriate, favour gas-indexed prices. Depending on the number of businesses affected by these accounting measures, this could lead to a convergence of pricing terms, or at least not encourage the conclusion of contract prices that deviate strongly from expected market prices.

6.4 Convergence of markets and interconnection: A driver for change?

It can be expected that different European spot markets will converge for large periods of time once interconnection grows, as marketers and producers optimise and balance their portfolios across

markets. Robinson (2007) also expects gas prices to converge as the single gas market gathers pace across Europe. Yet, until recently, empirical analysis showed no clear patterns (see Robinson 2007 and Neumann *et al* 2005b). The price differential between the NBP and the TTF, however, seem to have been reduced since the introduction of BBL pricing on the 1st of December 2006. This confirms the need for sufficient infrastructure to interconnect different markets.

Silverstovs *et al* (2004) illustrate the relative independence of the gas markets in the EU, the US and Japan during the pre-2000 period. Yet as the LNG market grows, some level of convergence through arbitrage can be expected between traded markets in Europe, the Henry Hub market in the US and the gas market in the Far East. With the construction of additional LNG terminals across Europe (Spain, Italy, France, Belgium, the Netherlands, Germany and the UK) the potential to arbitrage markets via LNG could increase the convergence between European traded market prices. Much will depend on the extent to which LNG spot cargoes will become available and on how ample LNG regasification capacity on the demand side of the market will develop compared to much less abundant LNG liquefaction capacity in producing countries.

Vazquez, Josse & Neumann (2006) analyse the recent developments of spot markets for natural gas in North America and Europe, identifying LNG as the missing link in a global gas market. Using weekly data on spot prices for the North American and European markets, the analysis concludes that the split of regional markets prevails to this day. Taking into account future demand for natural gas, delivery books of Asian shipyards for LNG tankers and recently signed agreements of major gas companies allowing swaps to Europe, the authors expect that the internationalisation of natural gas trade seems to be only one step away.¹⁴

However, there is no indication in this analysis that such a convergence, were it to take place, would necessarily force the global adoption of spot prices for indexation purposes.

¹⁴ Interestingly, the authors also argue that further research should concentrate on quantifying the pricing relationship of oil and natural gas prices in order to eliminate the impact of possible fluctuations in currently politically driven trends of oil prices on price developments in international markets for natural gas.

7

The Prospects for Market Value

The outlook for gas pricing in long-term contracts could be for three different types of “market value”:

1. the “traditional” pricing with oil-product indexation;
2. pricing structures based on spot prices in the market of the purchaser;
3. pricing based on spot prices at the points where international supplies reach an outer European border.

The first two types follow the “net-back” principle: the price is based on the value in the market for which the supplies are destined, either under the traditional assessment of oil-product competitiveness or using the prevailing spot price in that market as the pricing criterion. The producer accepts the “net-back” from this market price to his source of production as the full value realisation from the sales for his resource. Under these types of contracts, therefore, producers see different netbacks from sales to different markets in Europe. For both types of gas pricing, “delivered” contracts – contracts in which the producer holds title to the gas all the way to the market of the buyer, to replace the old destination clause – are essential.

Contracts of the third type would not reflect the value of gas in the buyers’ market but rather the value of gas in the hub from which the gas is sold. For example, Norwegian sellers would sell their gas ex-Emden to any interested buyer. The price realisation of every sale is the same (at a specific hub at a given time and under similar conditions to any buyer). Producers deliver at the hubs and not further into the market.

Contracts of the third type do not exist in Continental Europe, as yet.¹⁵ In fact, producers today seem to be more interested in going deeper into the various markets. Gazprom’s objective of taking their gas to the UK market is a case in point. This may well offer them a lower net-back than other sales on the continent, if Gazprom is buying the pipeline capacity through Europe to bring their gas to this market. The strategic objective to establish downstream positions in the European market may well be the main driver. (Gazprom may also take the view that the UK will be a “premium” market due to its limited interconnection and remoteness from many sources of supply.) Other producers, like Sonatrach, seem to be following the same pattern of moving further into the gas markets.

It is suggested that, once spot prices prevail, the rationale that producers will move towards selling their gas based on prices at hubs nearer their points of supply is obscured by both strategic objectives of producers to establish positions in the European markets and the limited interconnection between individual European markets.

¹⁵ Only LNG supplies from Qatar into the Zeebrugge terminal are reported to be sold at hub price.

8

Conclusion

The objective of this paper is to examine both the likelihood and the desirability of a transition from current oil-based gas prices to spot gas prices in Continental Europe. To this end, we have identified the drivers of a possible transition in gas pricing and discussed the implications of different price structures. This analysis suggests that parties will continue to use long-term contracts based on oil (product) indexation, but will also use spot indexation.

In today's seller's market the producers are in a strong position and are able to dictate the pricing terms, and it appears that most of them are not inclined, in the current business environment, to abandon oil-based indexation in their long-term contracts.

However, this does not seem to go against the will of the buyers. Oil-product indexation has lost some of its original rationale in its traditional markets. But it may still be a reasonable option for many market parties in the absence of a better alternative. Apparently, most significant commercial parties link their preferences and their strategies to what others do. Their relative position with respect to costs, revenues and risk *vis à vis* their competitors in the market is crucial.

Nevertheless, actors new in the market, like short-term traders and the providers of derivatives, who are fully dependent on the development of new trading instruments, promote a transition to spot pricing. Apparently, the only group of actors that strongly opposes oil indexation includes DG Competition and many of the national regulators.

Standard economic theory, implicitly, suggests that deregulation and liberalisation more or less automatically lead to competition and the emergence of a spot price-based system, including the associated market institutions. The UK gas market is often used as an example, in which the expectations at the outset of the liberalisation process came through (see Roeber 1996). Of course, a transition to a different pricing and contracting system yields winners and losers, as value and substitutability vary according to producers, regions and users. Moreover, any new system should provide *sufficient* certainty of being able to engage in (future) transactions and investments. In the UK, the new pricing systems reflected new market characteristics, such as the existence of many (local) suppliers, few imports, few impediments to transport and a liquid market. The interests of new market parties, such as power producers, traders and emerging retail firms, were thus reflected in the new pricing system. Yet such radical shifts are not apparent in continental Europe. There is no dominant tendency to adopt spot price indexation in long-term contracts.

It is clear that spot markets may yield an effective mechanism for balancing residual supply and demand in the current competitive market, enhancing the efficiency of the use of gas and the supply system. So the current development of the traded market in NW Europe may improve the efficiency of the market as a whole and give an additional possibility to suppliers and consumers to manage their risks. For short-term contracts (< 2 years), the price level is likely to reflect the forward curve on the traded market, irrespective of which price indexation is applied in such contracts. For longer-term contracts (> 2 year) it is likely that the choice for spot indexation or oil indexation is governed by preference by the individual contract parties based on portfolio considerations, desired exposure, etc. Gazprom, as a dominant supplier, currently appears to favour ongoing oil-product indexation. Important as this is for the market, it does not compel other producers to follow its lead, and indeed this does not seem to be the case.

There are other arguments for and against oil indexation. Gas storage, for example, is a serious longer-term issue as an essential instrument of gas merchants and (large) distributors in achieving a flexible portfolio, to meet the fluctuations in demand. Oil-linked gas prices, however, do not offer the price information on the basis of which investments in storage can be considered and justified. Hybrid markets, with both spot prices and oil-linked prices, may provide some remedy to this, but so far this appears to be mainly for short-term use of storage as a capacity and risk management tool. However, neither oil-based prices nor spot prices are sufficient to provide the longer-term signals to justify investments in large-scale seasonal gas storage facilities, necessary to substitute the current indigenous production flexibility.¹⁶

For the market to function, choices of indexation should be made by market parties, be it for short- or long-term contracts. Based on their market position, structural market characteristics and the market institution, they will opt for an adequate portfolio of contracts balancing investments, risk and revenues over time. There is no evidence that, in today's sellers' market, sellers use their market power to impose oil-indexed pricing against the will of the buyers, as is clearly illustrated in the LNG market. Governments would risk disturbing the actual liberalised market model that they prefer, were they to interfere with the market by enforcing certain price indexation mechanisms. This could only lead to strongly fluctuating wholesale and consumer prices. Moreover, what is the advantage of gas-to-gas pricing, if up-stream supply decisions are not driven by spot prices? An effective and efficient competition policy should be sufficient to counteract abuses of market power, obviously limited to market players within the EU jurisdiction.

Whether any of the arguments for spot-based pricing will become sufficiently dominant to drive the market towards convergence on a particular pricing regime remains unclear. Most likely, the strategies of producers will be a dominant factor in this respect. Indeed, only in markets like the US and the UK, where actual competition exists between producers close to the market, has spot-based pricing become the dominant practice. As a practical point, it is worth reminding ourselves that, according to most analysts, the EU is facing a serious supply gap, which will be difficult to fill in the best of circumstances. It would seem prudent and pragmatic, therefore, to look for enabling conditions for the development of new supplies between producers and buyers. If oil-price indexation offers producers the comfort to work towards timely investment decisions for new, long-term European supplies, this should be of relevance to buyers and European governments alike.

An apparent paradox seems to emerge here. So far, the upstream suppliers to the EU do not seem particularly enthusiastic about a full-scale transition towards a spot-based pricing system. This may seem like a problem to many who favour a move away from long-term contracting and oil parity pricing. But the real problem will emerge when the producers change their strategy, at first sight, to "reasonably" give in to the EU Commission's pressure. Yet such a shift should only be interpreted as the most straightforward indication that the advantage of spot-based pricing will fall to them and that any potential down stream consumers' gain will have thereafter evaporated. The obvious way to avoid such a situation is to stop pressing for the dismantlement of long-term contracting, while recognising that without a system based on longer-term certainties and trust, the winner takes all.

¹⁶ See also: CIEP, *The European Market for Seasonal Storage*, CIEP 01/2006, Clingendael International Energy Programme, The Hague, February 2006.

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