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The European Gas Market
A Reality Check

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Executive Summary

With the approach of the 2014 deadline for the completion of a truly European liberalised energy market, there is growing concern on the adequacy of the market structure with the changed economic and geopolitical environment. Market-based and short-term approaches have been fostered for both gas and electricity markets. Energy and climate policies have therefore a primary function in designing the basic rules for these markets to develop.

This study addresses two key issues related to the market design envisaged for the gas sector in Europe. The first raises questions about the adequacy of the market design proposed for the gas market with respect to security of supply. In fact, despite a higher dependence to external gas sources, the gas system has been developing all over Europe and it is becoming a key component of the European energy mix, in particular thanks to its back-up role for intermittent electricity generation and its lower content of CO2 emissions with respect to coal.

The external dimension of the gas market is thus taking a greater place in the approach to gas supply strategies. Security of supply is a key component in the gas sector and cannot be ignored in the creation of a European gas market. Moreover, the oligopolistic characteristic of the supply side has to be carefully assessed as it is well recognized that two countries (Norway and Russia) provide up to almost 60% of total external supplies. The study therefore investigates to what extent the gas market design and its implementation rules take into consideration this dimension.

It will be argued that the gas target model envisaged by regulators and the EC, by aiming at increasing the number of market exchanges based on market hubs or virtual exchange points, will not significantly contribute to security of supply. On the contrary, a greater concentration could be an undesired outcome of this process.

The second issue thus relates to the more practical on-going reforms that establish common rules at European internal cross-border interconnection points and their impacts for the actors of the value chain.

In order to understand the transformation started by the setting of these new rules, the study explores different cases. They aim at showing the evolution of the gas value chain and the impacts for the main actors.

The results of this work indicate that:

The **oligopolistic nature** of the European gas market has specific characteristics that need to be taken into account when constructing a market model, in particular:

- High reliance on external supply;

- Imbalance on the degree of access to the external supplier markets, which are less open to European companies, with the exception of Norway;

The process might foster concentration as new comers will not be able to compete with commercial companies owned by external producers or historical incumbents that are climbing the value chain upstream.

Although the Tariff network code under elaboration tries to cope with the problem of **striking the right balance between short-term trades and long-term investments**, in particular in infrastructures, the transformation favours short-term trades with a socialization of costs that might eventually be bore by final consumers (be them industrial or residential).

The process tries to harmonize rules and create 'one-fit-for-all' measures that are not compatible with the various degrees of development of national markets. **Regional approaches** seem more realistic (as the the Prisma platform initiative among North West region with Austria and Italy shows).

Contents

Introduction

The European Council in February 2011 required Member-States and private stakeholders to accelerate the creation of the Internal energy market setting the deadline for 2014. Energy being considered as an instrument of national power and influence, the path chosen for the creation of a pan-European energy market has been peculiar. A series of regulations (that came in three packages composed of regulations and directives) were agreed with difficulties among Member States. The strong implication of States in this strategic sector did not allow an easy negotiation. The result is an unsurprisingly compromise among different stakeholders that created the basis for a European "national-based" market. This is true especially for electricity, where cross-border exchanges are a marginal part of the total flows and the national (or sub-national) dimension of the market is more adapted to the local balancing needs. In gas, however, the transnational dimension has always been central, with transit pipelines crossing several states (non-EU and EU) before reaching the final markets, bringing gas resources available in large quantities in third countries to European Member-States. As indigenous production is progressively diminishing, the "external" dimension of the gas market has taken over.

Producing fewer emissions in combustion than coal1, the appeal to gas has become more and more important with the climate change policy and CO2 emission reduction targets. Moreover, besides the role as a progressive substitute for coal in power production,2 gas is positioning itself as a back up for RES intermittent production. Furthermore, gas is used for different outputs, with residential (heating in particular) and commercial sectors taking the largest share (around 35% in 2011) followed by industry direct consumption (33%) and power production (29%).

Therefore, despite this higher dependence to external sources, the gas system has been developing all over Europe. The

[1] "1135 lbs/MWh of carbon dioxide, 0.1 lbs/MWh of sulfur dioxide, and 1.7 lbs/MWh of nitrogen oxides. Compared to the average air emissions from coal-fired generation, natural gas produces half as much carbon dioxide, less than a third as much nitrogen oxides, and one percent as much sulfur oxides at the power plant." www.epa.org

[2] This trend has been stopped by great quantities of coal put into the global market as US power production has increased gas used thanks to very low prices. Cheap coal being available, coal power production has been used more frequently as base load and marginal role in many European countries.

external dimension of the gas market is thus taking a greater place in the approach to gas supply strategies. Security of supply is central in understanding the gas sector and cannot be ignored in the creation of a European target gas market. The gas market design and its implementation rules should therefore take into consideration this dimension as one of the components of this specific oligopolistic gas market.

However, it will be argued that the gas target model envisaged by regulators and the EC only aims at increasing the number of market exchanges by developing an internal market based on market hubs or virtual exchange point. To do so, different network codes are being written with similar rules to be applied in every country and at every interconnection point whenever possible and economically feasible. However, real gas exchanges not only need a well functioning financial/commodity market, but a good functioning grid. What is needed mostly is fluidity within and among countries, in particular at the interconnections points. If the market has to function and gas to be supplied, interconnections must be able to easily handle reverse flow and allow the flexibility necessary to respond to an increasing RES power generation. However, this requirement has not to be confounded with the assumption that Europe needs (or has to create) an infinite transport infrastructure: capacity will always have physical limits (in particular if infrastructure has to be cost-efficient). Thus barriers are not only created by national regulations and market rules.

This paper will first explain the market design that has been suggested to be the target to attain for the European internal gas market, the so-called Gas Target Model (GTM). By assessing its target structure, main criteria and actors, it will be showed what are the shortcomings of the model, the risks associated with the creation of a model that does not take into account the reliance on external sources, the consequences for the actors involved in particular infrastructure operators, producers, suppliers and consumers.

In the second section, three examples of simplified value chain process will show the transition from the current market situation, composed of different transport tariff systems and several steps that have to be accomplished, to the ideal target system.

In this study, the retail market is not analysed since in many countries prices are still regulated. When talking about « market » it will refer to wholesale gas markets.

The Gas Target Model

The European gas market creation process

The creation of a European gas market is one of the instruments identified by the European Commission in order to secure gas availability and competitiveness. In fact, the creation of a common gas market should promote exchanges and help avoiding disruptions thanks to free flow of gas to where it is most needed and most valued.

Although this objective is questionable, as the European gas market is dependent on almost two-thirds to gas coming from third countries producers, it has to be reminded that the European Commission position has evolved during time.[3] While at the beginning the primary objective was to allow for lower prices resulting from an increased competitiveness among historical and new actors, the practical implementation of the internal gas market rules has brought different results. It has been widely noticed that the expected lower prices are not an immediate consequence of the creation of an internal market (neither in terms of tariffs or commodity, since price alignment does not always mean lower prices!). For these reasons, and since many external and global factors have to be taken into account regarding gas prices (oil and coal prices, CO2 prices, weather conditions, infrastructures congestion…), currently, the overall objective of the gas market integration is to create a competitive market, thanks to liquid and transparent wholesale markets. From a welfare point of view, transparency in wholesale markets would eventually benefit final consumers by giving transparent reference prices.

To do so, several reforms have been promoted through directives, regulations and other legislative process, the latest of

[3] European Commission, 'State of play in the EU energy policy', ed. Directorate General for Energy (Luxembourg: Office for Official Publications of the European Communities, 2010); European Commission, 'Guidelines for trans-European energy infrastructure', ed. Directorate General for Energy (Luxembourg: Office for Official Publications of the European Communities, 2011); European Commission, 'Making the internal energy market work' (Luxembourg: Office for Official Publications of the European Communities, 2012)

which is the Third Package.[4] Two main sorts of process have been started since.

The first one is the practical implementation of the Third Package, which launched a process for the creation of pan-European Network Codes (NC)[5] aiming at the harmonization of procedures at cross-border interconnection points in transmission systems.[6] Many barriers to market opening still exist as different rules are applied on both sides of the same cross-border interconnection point and as balancing or tariff systems[7] differ from system to system. These European Network codes try to **harmonize rules at cross-border interconnection points** in order to implement effectively reverse flows[8] measures and facilitate market access to national systems for operators. Freeing up unused cross-border capacity[9] and enhance infrastructure should allow gas to flow where it is needed most, without encountering major contractual and physical barriers. Gas transport infrastructures are now all considered as belonging to national systems, reducing or minimizing the distinction between transit and transport pipelines.[10]

The key actors in this process are (see Figure 1):

- ACER, which is in charge of establishing the Framework Guidelines that establish the basic principles and specifications for the elaboration of the NC, and of validating the content of the NC. It is important to recall that ACER has been put in place only on March 2011 (in substitution of ERGEG): its structure is still very dependent on the input coming from national regulators, who co-write the guidelines under the authority of ACER.

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[4] The Third Package (for gas markets) is composed of three measures: Regulation (EC) 715/2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005, Regulation 713/2009 establishing an Agency for the Cooperation of Energy Regulators, Directive EC/73/2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

[5] Article 6 and 8(6) of Regulation (EC) 715/2009.

[6] It has to be noted that the first step for the creation of an effective market has focussed on transmission systems, excluding storage and LNG terminals. When writing about the "new rules" the author will then refer to transmission systems only. The evolution of gas storage regulation will be discussed in another study.

[7] Kema and Rekk, 'Study on Methodologies for Gas Transmission Network Tariffs and Gas Balancing Fees in Europe' (Arnhem: 2009), p.37-38; N.Sisman, 'ERGEG's Balancing framework guideline consultation - preliminary ENTSOG feedback, Presentation ERGEG Stakeholder Workshop, Diamant Centre, 12 Oct 2010, p.9.

[8] European Commission, 'Making the internal energy market work', p13-18-19.

[9] Definition in art. 1(2) of Regulation (EC) 715/2009: 'unused capacity' means firm capacity which a network user has acquired under a transport contract but which that user has not nominated by the deadline specified in the contract'.

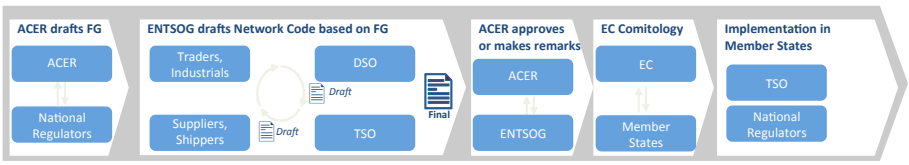
[10] For further information about the difference between transport and transit gas pipelines, see also: Nies S., 'Oil and gas to Europe', (Paris: Ifri, 2011); Parmigiani L., 'Gas routes to Europe: real needs and political jockeying', (Paris: Ifri, 2012).

- ENTSOG,[11] which drafts NC rules based on stakeholders views that are collected through the organization of public consultations and several stakeholders' joint sessions. Stakeholders are mainly producers (with their own marketing and sales activities in Europe), suppliers, shippers, distributors, TSO's, regulators, traders (in associations such as EFET), industrials (IFIEC).[12] For each NC, few national TSO's and regulators offered to take the lead and co-write the documents.[13]

- European Commission (EC), which endorses the Network codes and modifies regulations to include the new rules in the overall legislative European *acquis* (via the comitology process). Officers of the EC have actively participated to several stakeholder joint sessions.[14]

- This process, which first started with two topics on Congestion Management Procedures (CMP) and Capacity Allocation Mechanism (CAM),[15] put in evidence the wide differences in existing European systems and called for the creation of a general approach to pursue.

Figure 1. Network Code Process.



[11] Network codes already exist in several systems and are elaborated by TSO to explain the rules to access their system. It is not a new concept *per se*. The innovative aspect it is the European binding character of these new rules that apply equally to each national system, if no exceptions are introduced. It will therefore largely influence the way national market rules are elaborated and in certain cases will imply changing national tariff, balancing and capacity allocation systems.

[12] All the joint stakeholder sessions documents are available on ENTSOG website divided per Network Code.

[13] The following National Regulation Authorities helped in the definition of the Framework Guidelines: for the CAM NC, French with German BNetzA; for the Balancing NC: British Ofgem; for Tariff NC: CRE, the Belgian CREG and the Austrian EControl, while for Interoperability NC CREG and EControl..

[14] All the keynotes, presentation and participants lists are available on ENTSOG website www.entsog.eu. Framework guidelines are available on ACER website www.acer.eu. Several Transmission System Operators (TSO) and National Regulator Authorities (NRA) also published their vision or the Network Code process in their Annual Report or in regular sector reviews (www.cre.fr; www.grtgaz.com; www.ofgem.com, www.nationalgrid.com)

[15] CMP rules have already been adopted and their aim is solving "the occurrence of contractual congestion where network users cannot gain access to gas transmission systems in spite of the physical availability of the capacity." See also: 2012/490/EU: Commission Decision of 24 August 2012 on amending Annex I to Regulation (EC) No 715/2009 of the European Parliament and of the Council on conditions for access to the natural gas transmission networks Text with EEA relevance.

For this reason, the 18th Madrid Forum[16] in September 2010 invited regulators (CEER) to initiate a second, more theoretical, process to gather proposals for a non-binding Gas Target Model (GTM). On the basis of what had been done on the electricity market, European regulators (advised by the Florence School of Regulation, FSR) and stakeholders had to propose general non-binding rules and a market-based system fit for every country and region in the EU. This model would guide ACER and ENTSOG when preparing the Framework Guidelines and the Network Codes[17] to give overall consistency. The Gas Target Model is then a tool rather than an objective. Although it is a non-binding tool, ACER and ENTSOG have been largely referred to this model when drafting the network codes.

In this process, key actors were:

- CEER, headed by Walter Boltz, from the Austrian regulator EControl
- Florence School of Regulation
- Madrid Forum, which helped gathering the reactions and present the discussion papers

Partially due to the different approaches of regulators to the gas sector or to their background (jurists, economists or scholars), the first draft of the Gas Target Model revealed a strong division (or non-comprehension) between regulators and gas actors. The document[18] proposed a series of questions directed to operators in order to collect views. The way questions were formulated reflected a market model widely inspired by the electricity market, with market-coupling as a tool for exchanges, regional-wide balancing, short-term as the central temporal time-lead and low consideration for the relevance of the foreign dimension in gas supply. It had the merit to trigger reactions from the sector and an almost two-year long lively debate followed, supported by the drafting of several discussion papers by different stakeholders.[19] The distance between the first proposed model and the sector needs highlighted a widespread ignorance of European policy makers on the real functioning of gas markets

[16] The Madrid Forum, European Gas Regulatory Forum, was launched in 1999 to discuss the creation of an internal gas market.

[17] For a simplified version of the Network Code process, please refer to Box 1. For a detailed description, look at ACER and ENTSOG websites.

[18] "CEER Vision Paper for a conceptual model for the European gas market Call for Evidence" Ref: C10-GWG-70-03 3 November 2010

[19] S. Ascari, 'An American Model for he EU gas market?', EUI Working Papers, RSCAS 2011/39 (Brussels: Robert Schuman Centre for Advanced Studies); Florence School of Regulation, 'The MECO-S Model a proposed Target Model for the European Natural Gas Market Preliminary Outline', (Florence: April 2011) Frontier Economics, 'Target Model for the European Natural Gas Market Gas Market Gas Market', (London: June 2011); 'CIEP Vision on the Gas Target Model', (The Hague: Netherlands Institute of International Relations Clingendael, August 2011)

generally, and of the European ones in particular. A mutual realization of the need of discussion was finally on the table.

It remains to be seen whether the outcome of this theoretical debate produced useful deliverables that promote security of supply while enhancing competitiveness on wholesale markets.

GTM: a tool towards a competitive wholesale market

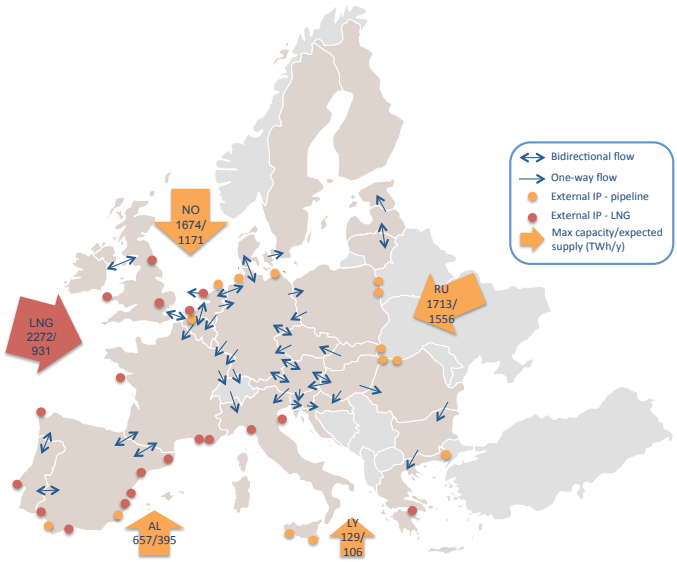
Gas markets are somewhere in between oil and electricity. As S. Ascari describes it,[20] gas markets have greater cross-border and predictable flows than electricity,[21] lower congestion and possibility of storage at reasonable costs, which gives great flexibility.

Furthermore, in Europe, from a physical point of view, infrastructure is well developed, there is large (although not infinite) capacity in both grid and interconnections and markets connection is assured through 77 internal cross-border points among Member States (not all of them with physical reverse-flow, though, see Figure 2 and Table 1) and 25 external cross-border points among Third countries and Member States. On a commercial side, according to Eurogas, one third of its corporate members are active – i.e. they buy, sell and trade gas – in five or more countries.

[20] S. Ascari, 'An American Model for he EU gas market?', EUI Working Papers, RSCAS 2011/39 (Brussels: Robert Schuman Centre for Advanced Studies), p.4.

[21] It has to be noticed that gas flows at 40.2 km/h (25 m/h), http://www.nationalgrid.com/uk/Gas/About/Keeping+the+Balance/

Figure 2. Physical gas flows[22] between European Member States (arrows indicate the direction of the flow)



Author's elaboration on ENTSOG TYNDP, European Commission data.

Table 1. List of cross-border interconnections

No interconnections	One direction points	Bidirectional points
France – Italy[23] Austria - Hungary Poland – Slovakia Czech Rep. – Austria Poland – Lithuania	Belgium → France Germany→France Austria → Italy Austria → Slovenia Slovenia → Croatia Italy → Slovenia Hungary → Croatia Hungary→ Romania Romania → Bulgaria Bulgaria → Greece Latvia → Estonia Denmark→ Sweden	France – Spain Spain – Portugal Ireland – UK Germany – Czech Rep. Austria – Hungary Austria – Germany Lithuania – Latvia Germany – Denmark Belgium – UK Netherlands - Belgium

Author's elaboration on ENTSOG, European Commission data.

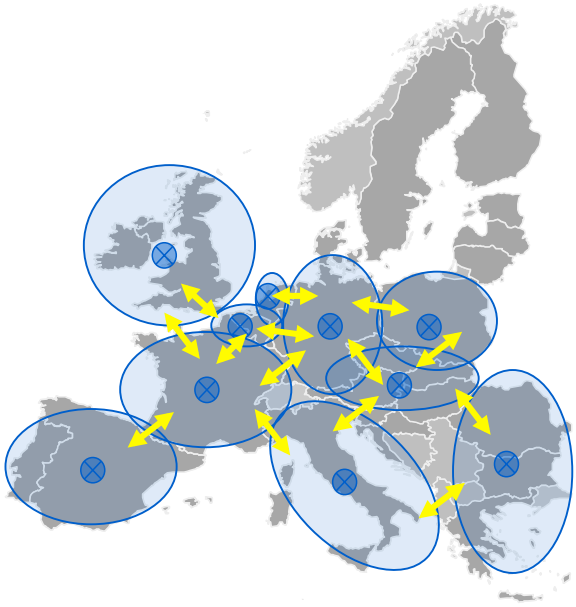
[22] This map does not represent "backhaul" services provided by pipeline operators that allow virtual reverse flows, for deliveries against physical flow via contractual and financial transactions. Another definition is ' a "paper transport" of natural gas by displacement against the flow on a single pipeline, so that the natural gas is redelivered upstream of its point of receipt', http://www.spectraenergy.com/Natural-Gas-101/Glossary-of-Energy-Terms/B/.

[23] Although this interconnection does not exist, gas already flows from France to Italy through Switzerland. As the EC communication on the Internal Market highlights as well, there will be no open season (which is a market call to test the willingness to create and use an interconnection) for this border.

Nevertheless, security of supply risks still exist in some parts of Europe, especially in Central and South-Eastern countries, while European domestic production declines every year and imports (Europe-wide) rely mainly on four producer countries (Russia, Norway, Algeria and Qatar). Europe is dependent from these four countries and cannot be considered as an isolated market. It is rather an oligopoly where the dominant actors that operate in the market pursue economic (and sometimes political) interests, which are inspired (if not mandated) by non-EU governments. In fact, diversification and multiplication of actors does not necessarily mean diversification of supplies in the gas market. So at least for the time being, despite new discoveries have been made in Eastern Mediterranean or Sub-Saharan Africa, Europe depends on the production of these four countries and the discoveries may not change fundamentally the picture.

All this being said, it is important to look closer at the way the EC and regulators conceive the Target Model and the creation of the internal market as an answer to the security of supply problem (Figure 3).

Figure 3. Vision of the GTM (CEER presentation, 3 March 2012, 21st Madrid Forum)[24]



[24] The figure does not represent reality but a future vision: there are not as many hubs/gas exchanges as showed in the picture nor flows as illustrated by the yellow arrows. Typically, if there were to be a hub in South-Eastern Europe, it would probably be in Turkey.

The wrong theoretical model?

As previously described, the European gas market is an oligopoly deeply reliant on external sources. To put it shortly: it is not an island.

As showed in Figure 3, the on-going process of creation of the internal market should result, in the view of the Commission, in a European-wide market, with entry points into the system at the external border of the EU (as the current custom union), where gas would be physically delivered, and hub-to-hub competition would be served by Entry-Exit systems (in Figure 3, theoretical hubs are represented by the blue dots, the E-E system by the larger circle and inter-hubs exchanges by yellow arrows). For this model, exchanges and transactions (either Over-the-counter, spot, futures, or within-day) will be exclusively made at the hub.

The next paragraph will explain more in detail what the Gas Target Model is, what are the criteria that have been agreed, in what way their creators think it might correspond to the model Europe needs and, most important for the objective of this paper, how (or whether) it satisfies the prerequisite of security of supply. Network Codes creation process and content will be detailed in a separate focus (Box 1).

Criteria of the Gas Target Model

The creation of the European gas market is based on several regulations that have been introduced through different "packages". In these legislations, the legislator has introduced some principles in order to progressively achieve an integrated internal market. The Third package, and in particular Regulation 715/2009, indicates that Member States have to implement "entry-exit systems".[25] Moreover, through their system operators (ENTSOG) and national regulators (ACER - CEER) they have to co-operate to create network codes that facilitate cross-border exchanges. In fact, until now, the European gas market has been composed of more than 27 isolated areas[26] with specific national rules with exchanges concentrated on some (north-western) markets (such as National Balancing Point in the UK). These two bricks of the internal market (cross-border co-operation and E-E systems) add to the unbundling process and facilitate Third Party Access rules to become a reality.

On the basis of the regulatory requirements and after a consultation period, CEER proposed a target model for the European gas market:

[25] Entry-Exit systems will be explained more in details in the next paragraphs.
[26] To be exact, ENTSOG represents TSO from non-EU countries. On the contrary not all of the EU27 TSO are inside the organization.

'(…) regulators see a competitive European gas market as a **combination of entry-exit zones with virtual hubs**. Their vision suggests that the development of **competition** should be **based** on the development of **liquid hubs across Europe** at which gas can be traded (these may be national or cross-border). Market integration should be served by **efficient use of infrastructures**, allowing market players to freely ship gas between market areas and respond to price signals to help gas flowing to where it is valued most. The **target model has to allow for sufficient and efficient levels of infrastructure investment**, in particular where physical congestions hinder market integration.'[27]

The GTM structures itself around liquid, functional markets. For this purpose, it identifies several criteria to define what a functional market is.

First of all, every market region (be it national or cross-border) has to be an entry-exit zone. Of course, the implementation of an E-E system does not automatically enables functioning wholesale markets. In fact, an entry-exit system might still have a dominant operator and supplier, no exchange or virtual hub, no market-based balancing and only one entry point with no reverse flow. Consequently, other criteria have been introduced by the GTM.

CEER considered that functioning 'wholesale markets require a sufficient presence and low concentration of players active in the wholesale market, availability of gas from diverse sources, multitude of customers (i.e. sufficient demand for gas, N.d.R.) as well as a certain level of trade in terms of the total volume of gas traded compared to the volume of gas consumed (i.e. churn ratios, N.d.R.).

The definition of a functional wholesale market quoted above has been translated into measurable index and criteria:

- 'a sufficient presence and low concentration of players active in the wholesale market':
- Herfindahl-Hirschmann Index (HHI) below 2000
- Residual Supply Index (RSI10) of more than 110% for more than 95% of days per year are desirable[28]

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[27] CEER Vision for a European Gas Target Model, Conclusions Paper, Ref: C11-GWG-82-03 1 December 2011.

[28] "When RSI is greater than 100 percent, the suppliers other than company i have enough capacity to meet the demand of the market, and company i should have little influence on the market clearing price. On the other hand if residual supply is less than 100 percent of demand, company i is needed to meet demand, and is therefore a pivotal player in the market." Definition found in: "A Review of the Monitoring of Market Power: The Possible Roles of Transmission System Operators in Monitoring for Market Power Issues in Congested Transmission Systems", by P. Twomey, R.Green, K. Neuhoff and D.Newbery, Journal of Energy Literature, Vol. 11, No. 2, (Oxford: Oxford Institute for Energy Studies, 2005) p. 3, 54.

- 'availability of gas from diverse sources': gas has to be available from at least 3 different sources

- 'multitude of customers (i.e. sufficient demand for gas)': total gas demand to be at least 20bcm

- 'certain level of trade in terms of the total volume of gas traded compared to the volume of gas consumed (i.e. churn ratios)': churn rate of 8

Although these parameters have been criticized either for being too general (and applicable only to spot markets[29]) or not appropriate to measure liquidity[30], it is nevertheless interesting to understand why the Target Model insisted on this definition. In particular, it is important to identify in what way this model could foster security of supply with respect to the current situation and therefore satisfy one of the three pillars of the European energy policy.

Why was this model necessary? How does the market work today? What are the obstacles that hamper flows and exchanges in the European gas market having an impact on security of supply?

Practical implementation and limits of the model

Before entering into a description of the current market process through case studies (see next chapter), it is important to further explain some key elements that underline the GTM. This model will be implemented if two fundamental evolutions take place: one on the transmission side and the other on the commodity one.

First, the existence of Virtual platforms that will be able to collect and make accessible information on transport capacity availability and propose 'entry' offers on entry points or a combination of them will considerably simplify and improve market access for users of the transport system: suppliers, shippers, traders, producers and industrial with a direct access to the wholesale market.[31] Through the bundling of capacity at cross-border interconnection points as proposed in the CAM Network code – exit capacity from a system and the entry capacity into the other system are included into one single product (see next chapter case 2) – the process will be reduced of some of the steps currently needed to pass from one country to the another. From the traders' perspective, a virtual point has the advantage of not having to deal with transport and other logistic problems when exchanging gas. Furthermore, freeing up unused

[29] Spot markets still represent a minority of the gas exchanges, being them mostly Over-The –Counter (OTC).
[30] C. Jepma and S. Katz, 'The European Gas Target Model: how it could be improved', Energy Delta Institute, 3 September 2012
[31] For a definition of each of the network users, please refer to section

capacity will allow interconnection capacity access to a wider range of competitors and eventually enlarge access to national markets, increasing competition.

The second evolution would apply to gas contracts. The majority of gas contracts is based on long-term deals (10-25 years). These can be indexed either on oil or on spot markets, or both. Only a minor part of this contracted gas is currently traded in spot markets or through OTC deals (roughly 95% of trades) in order to sell (or buy) gas that exceeds (or lacks) demand needs. 'Conventional trading'[32] is then a marginal activity[33] that helps optimizing portfolios, hedging risks and complying with balancing rules.

In order to develop the model envisaged by the EC and by regulators, spot trade should increase thanks to the end of the long-term contracts (reducing their duration to 3-5 years) and large consumers (shippers, suppliers, industrials) would buy directly on the wholesale market the best offers from suppliers.

Although this vision might be applicable, it won't solve security of supply problems.

First of all, the core of the European market is focussed in 6 countries: UK, Germany, Italy, France, Belgium and the Netherlands. These countries alone represent roughly 360 BCM out of the total 492 (in 2010). Austria is an important hub but it has mostly a transit position. In other words, Eastern and Central European markets, most vulnerable to security of supply risks, represent a small part of the European market. Since these markets are not attractive for competitors, liquidity, competitiveness and security of supply problems will likely be solved only with State or European intervention. In this sense, creating a Europe-wide market makes less sense than the regional approach of the Gas Regional Initiatives.[34]

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[32] The author distinguishes 'conventional trade' – as the normal activity of risk management handled by suppliers - from other forms of trading, which aim mainly at financial speculation.

[33] Trading activity has been growing steadily in recent years, especially thanks to the abundance witnessed in gas markets starting from 2008-2009.

[34] Gas Regional Initiatives are promoted by the Third Package and represent a key element of regional co-operation among private and public actors. Gas regions have to present a Ten Year investment Plan together. The composition of regions varies based on issues. First three regions had been identified (North West, South, South South-East). Afterwards, other compositions have been created, such as the BEMIP (Estonia Eesti Gaas, Denmark Energinet.dk, Finland Gasum, Latvia Latvijas Gaze, Lithuania Lietuvos Dujos, Poland GAZ-SYSTEM, Sweden Swedegas), The North South Central Eastern Europe (Bulgarian Bulgartransgaz EAD, Croatian Plinacro d.o.o. the Czech Republic NET4GAS, s.r.o, Hungarian FGSZ Natural Gas Transmission, Polish GAZ-SYSTEM S.A., Romanian Transgaz SA, Slovakian (eustream, a.s), German and Austrian BOG GmbH), South – North Corridor (Swiss FluxSwiss, Belgian Fluxys TENP, French GRTgaz, French GRTgaz Deutschland, German Open Grid Europe, Italian Snam Rete Gas and Swiss Swissgas), Southern Corridor (Bulgar Bulgartransgaz, Greek DESFA, French-Italian Edison Stoccaggio, Slovakian eustream, Hungarian FGSZ, GAS CONNECT AUSTRIA, Slovenian

Furthermore, in the six states mentioned above, the efforts to create a more liquid market have already been put in place. For example, co-operation between TSO's such as Fluxys and GRTGaz on the secondary transport capacity market between France and Belgium, or primary capacity market between Germany and France or Belgium and Germany, already makes available bundled capacity products on a virtual platform since 2009.[35] More recently, this experience has been transformed in the Prisma initiative, where 19 TSO from Austria, Belgium, Denmark, Germany, France, Italy and the Netherlands assure an early implementation of the CAM Network Code.[36] This means that Europe-wide rules implementation is trying to tackle a regional problem.

Second, diversification of competitors might not mean diversification of supply sources. As described above, four main sources supply Europe and are likely to remain four for another six – ten years. This situation will be encouraged as short-termism prevent market actors from taking investment decision in long-term infrastructures (40 years), whether it be in transport or in supply. Out of 45 LNG projects, only 10 have entered a final investment decision phase (FID) according to the new Ten Year Network Development Plan (see Table 2).[37]

On the contrary, the model towards which we are heading to might facilitate sales and trades of those known producers Europe is trying to diversify from. As it will be largely explained in the next chapter, producers and shippers have to pass through different systems to reach their customers. The implementation of common interconnections rules will therefore make it easier for suppliers (but for producers too!) to directly buy and sell gas on different European markets. They might adapt their business models to the new market design by creating marketing companies in the European markets where they wish to operate. But as dominant producers own the largest volumes of gas, even with a liquid market there might be distortion, or a minor diversification.[38]

Plinovodi, Italian Snam Rete Gas, Italian TAG, Romanian Transgaz, Croatian Plinacro, North West (Belgian Fluxys, French GRTGaz, British National Grid, German Open Grid, GRTGaz Deutschland, Netherlands Gasunie), South (Spanish Enagas, Portugese REN). http://www.entsog.eu/publications/gas-regional-investment-plan-grips.

[35] Capsquare platform: http://www.capsquare.eu

[36] 'Prisma European capacity platform' was launched on April 1st 2013. For further details: https://www.prisma-capacity.eu/; Deliberation of CRE of 29 March 2013 "on rules for the early implementation of the CAM Network Code for the sale of monthly capacity products at the entry point Obergailbach and of daily capacity products at the entry points Taisnières H and Obergailbach".

[37] http://www.entsog.eu/events/TYNDP6/

[38] A scandal has touched the most liquid European wholesale market recently, NBP, as some sort of manipulation of gas prices might have occurred on September 28 this year (2012). Liquidity does not necessarily mean transparency.

Finally, long-term contracts will not disappear as they serve an important target: retail final consumers.39 As retail consumers cannot hedge risks by using sophisticated contracts that the market offers nor can they negotiate terms with suppliers, as they do not have enough leverage, they must be protected by regulatory measures against price fluctuations. What's more, retail gas demand should be constantly supplied, which implies that it cannot rely entirely on spot markets. Regulated tariffs served these purposes. As the liberalisation process implies their phasing out, other forms of guarantees should be maintained. Long-term contracts of commodity (gas) and transport (capacity) guarantee that the right level of investments is maintained in order to supply final consumers.

Table 2 Projects of gas infrastructure with total energy output increase.

	Transmission		LNG (send-out)		UGS (withdrawal)	
	TWh/d	Projects	TWh/d	Projects	TWh/d	Projects
Existing	35		6		19	
FID	5 (+14%)	50	1 (+17%)	10	3 (+14%)	14
Non-FID	16 (+46%)	144	4 (+62%)	35	2 (+11%)	28

Source: TYNDP 2013-2022

Towards a security of supply risk?

The previous analysis leaves room for investigation on whether the present development in the gas system might raise security of supply risks. These risks could generate from a 'commercial' or market perspective and from a future infrastructure gap.

« If you build it, it will come »[40]

For some representatives of the sector,[41] the GTM may endanger the security of supply of the European gas market. The reasoning behind this concern is that if delivery can be made at the hub, producers can decide to deliver only to certain hubs and leave others out of gas. In this way, manipulation of prices can still be

[39] T. Bros, 'After the US shale gas revolution', (Paris: Edition Technip, 2012)
[40] Field of dreams,1989.
[41] This is mainly the position of traditional incumbents (position shared with the author through interviews). However, this concern has been raised by experts and is known among regulators. The main problem for regulators is the cost at which TSO will pay the gas for balancing the system. Since the model propose market-based balancing solution, TSO might be affected by price distortions and therefore reflect high gas prices on tariffs, socializing costs for users and customers.

possible and, worse, it could even been much easier since producers can exchange directly without intermediaries on the market. In this sense, recent movements on the market reflect the change in the market model and the repositioning of producers. In fact, from one side, producers are moving downstream, creating their own marketing companies or buying distribution and marketing assets from suppliers. On the other side, suppliers are moving upstream to participate directly in exploration and production activities (when market conditions in producing countries allow for it). Recent examples are the deal between Gazprom and BASF[42], which allowed Gazprom to have access to 20% of the German market but also to consumers in Belgium, France, the Netherlands, Denmark, the UK, Austria, the Czech Republic, Romania and Bulgaria. BASF has obtained 25% stake in a gas field in Urengoy. Last year, Eni and Gazprom agreed to sell 50% of their Joint venture Promgas to Gazprom Schweiz.[43] Promgaz already allowed Gazprom to directly selling gas to the Italian market, having as main client Edison.

European utilities, in response, are moving upstream to diversify their purchasing portfolios. This does not necessarily mean that gas will flow to Europe. In fact, European utilities are increasingly seeking new opportunities to invest in Asian and Latin American markets to diversify prospects, lowering investments in an uncertain Europe.

To what extent this trend might represent a risk? Will competition rules and dominant position abuse suffice to avoid market distortions? The investigation case initiated by the EC against Gazprom might have revolutionary impacts that will affect the way the gas market is currently organized.[44] Although gas supply can be assured, other concerns might arise on the way to ensure efficient transport.

Building a future for infrastructure

The GTM and the Third Package suppose as well that interconnections and grid capacity are very large (since exchanges will be made without considering real physical flows). This is currently not the case in many countries, where some bottlenecks exist (for example in Germany or between North and South routes in France). It is then necessary to address the problem of new capacity and how its construction and access has to be regulated. Studies on this issue are undergoing as current Network Codes and GTM only consider existing capacity.[45] New capacity creation will be linked to transport

[42] 'Gazprom boosts presence in European gas,' Chris Bryant, Financial Times, 14 November 2012.
[43] "EC greenlights Gazprom buying stake in dealer Promgas from Eni," Interfax, 12 December 2011.
[44] Riley A. 'Commision v. Gazprom; the antritrust clash of the decade?', No. 285, 31 October 2012, CEPS Policy Brief.
[45] Since the writing of this paper, several improvements have been made and incremental capacity issues are now the object of workshops and stakeholders

tariffs structures. In fact, as transmission system operators are regulated actors, their revenues are fixed and/or guaranteed and therefore reflected in transport tariffs.[46] Moreover, as cross-border interconnections fall under two regulatory systems (two regulators and very often two different tariff systems), problems on costs divisions and recovery has often restrained operators to invest in this type of infrastructure.[47] Tariff design will then be essential to foster long-term investments. Political will, as previously explained, will be another key component as market operators will invest mainly in the core gas market, neglecting the more fragile zones. However, any system should minimize costs for users and final consumers,[48] keeping the market attractive and competitive. Nevertheless, E-E systems (especially in the framework of the GTM) already imply a socialization of costs, since no difference should be made among transports routes based on distance or entry points. If no distinction is made, then each route is equally important and should be promoted and developed, leading to the construction of capacity that might not be eventually used and therefore not economically viable. The current discussions on the FG on Tariffs are trying to answer these challenges.[49]

Policy makers are confronted with a dilemma between encouraging market forces and having to deal with structural problems in some parts of the European market. Reverse flows projects will help South-Eastern and Central countries in case of distress situations. However, markets will not create and develop by themselves nor with more regulation. Unless infrastructure is created, it seems quite impossible that countries such as Bulgaria, Romania

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discussions. Cf. B. Esnault, 'Gas Target Model follow-up-Work on incremental capacity', CEER Gas Infrastructure and Finance Task Force Co-Chair, 22nd Madrid Forum, 3 October 2012, Madrid. ENTSOG/ACER, 'Capacity Allocation Mechanisms (CAM) Roadmap for early implementation of CAM Network Code via pilot projects,' p.9.

[46] CRE, 'Le fonctionnement des marchés de gros de l'électricité, du CO2 et du gaz naturel', (Paris: November 2012); P. Hunt, 'Entry–exit transmission pricing with notional hubs can it deliver a pan-European wholesale market in gas?', (Oxford: Oxford Institute for Energy Studies: 2008); ACER, 'Draft Framework Guidelines on rules regarding harmonised transmission tariff structures for gas', (Ljubljana: September 2013), p.8.

[47] This is particularly true in electricity infrastructure. In the gas system these issues have been sometimes overcome with good co-operation between respective TSO's and NRA. A good example is the open season procedure to develop the French-Spanish interconnection point held by TIGF and Enagas with the support of CRE and CNE.

[48] It is important to recall that transmission tariffs are a component of the final gas prices (representing approximately 34% in France for retail consumers, for example). Higher tariffs will then be reflected in the final price too. CRE, 'Le fonctionnement des marchés de détail français de l'électricité et du gaz naturel - Rapport 2011-2012', (Paris: December 2012), p. 95.

[49] "Draft Framework Guidelines on rules regarding harmonised transmission tariff structures for gas," 4 September 2012, ACER. For further information on tariffs structures and challenges, see also: "impact assessment for the Framework Guidelines on harmonized transmission tariff structures," 6 August 2012, The Brattle Group.

might be able to develop their own internal hub. However, gas prices might start to give credible signals in some big hubs (Dutch TTF, British NBP, French PEG, Austrian CEGH)[50] and be considered as a reference for South-Eastern and Central Europe too. In this way, even low diversified markets could profit of transparency elsewhere.

Thanks to case studies, the next chapter will explain more in detail the current market access process compared to the Gas Target Model, focussing on the entire value chain, from the producer to the final consumer.

[50] P. Heather, "Continental European Gas Hubs: Are they fit for purpose?",(Oxford:The Oxford Institue for Energy Studies, June 2012), p.5-6.

From models to reality: how the European gas market functions today

In order to give a vision of the actors and of the functioning of the European gas market today, three cases of a simplified gas supply process are assessed. These intend to represent how the European and national systems functioned until now, in particular when gas is supplied from an external (to the EU) source to European consumers. The cases show what are the main differences in cross-border trade related to distinct transport capacity tariffs systems and to physical or virtual hubs. This simplified version is meant to help comparing the current situation with the Gas Target Model assumptions.[51]

Demonstrating the complexity: analysis of some practical cases

The main criteria that will distinguish the cases are transportation tariff systems, the presence of a physical or virtual hub and the final destination of the contracted gas.

Transportation tariffs systems influence the way gas can flow in a system. Basically, there are two main types of tariffs: 'entry-exit' (E-E) and point-to-point. The E-E implies that there is little notion of distance and flows and exchanges are based on a system level, usually thanks to the existence of a virtual exchange point. Therefore, an 'entry – exit' type tariff allows the transmission system operator to market separately the entry capacities at each of the entry points of the network and on the exit capacities at each exit point (or exit zone) of the network. The point-to-point type is based on a distance and specific route scheme which implies that network users have to select (and will be charged for) one route among established entry and exit paths.[52] Studying the difference in tariffs systems is particularly

[51] The cases are over simplified and do not take into account all the types of tariffs mechanisms and other technical elements (such as balancing or nomination procedures).

[52] For a detailed description of the existing systems in Europe, see the report made by Kema and Rekk for the European Commission, DG TREN in 2009, 'Report

interesting in the case of market integration. Although tariffs' main objective is to remunerate regulated the costs bore by TSO for the development and maintenance of the grid or for the provision of balancing services, different systems can have an impact on competitiveness of routes and therefore national systems.[53]

Virtual and physical hubs help understanding the gradual disconnection between physical transport of gas and commercial activity (eased by the unbundling process) and the construction of reference markets. Hubs serve two main objectives. The first is to be a delivery point of gas entering a system. The second is to offer a place for balancing portfolios, as hubs help companies to sell gas if they are "long" (gas in excess with respect to demand needs) or to buy if they are "short" over the balancing period.[54] Hubs are then important as they offer a counterpart for transactions and give a price signal to market participants.

Each subcase will increase the complexity of the examples in order to explain the current functioning of the European gas network and help understanding some of the choices made by the Gas Target Model and the Network Codes.

General Case 1 will show a simplified delivery process based on a contract between a supplier[55] and an external producer for the delivery of gas to a physical cross-border interconnection point. It has to be noted that the interconnection point for the delivery can be either between a Third country and a Member State or between two Member States.

- In a subcase 1.a, the gas, which is delivered to a physical point, is destined to the consumers of the Member Country where the point is located. In this case, the border and the physical hub correspond to the same physical point.

- These basic assumptions are taken:

Study on Methodologies for Gas Transmission Network Tariffs and Gas Balancing Fees in Europe', p. 8-10

[53] D. Harris, P. Wilson, "Impact Assessment for the Framework Guidelines on Harmonised transmission tariff structures", The Brattle Group, 6 August 2012, p.9

[54] As the Balancing Network Code states: "The Network Users shall take primary responsibility to balance their Portfolios in order to minimise the need for TSOs to undertake Balancing Actions defined under this Network Code". The balancing period now varies from system to system and corresponds to the limits for a company to match off-takes and inputs. If there is excess or shortage of gas in a company portfolio, this means that the TSO had to buy or sell gas to re-establish the equilibrium of the system, therefore providing a service that has to be remunerated. The Balancing Network Code reached a definition of a daily balancing system for interconnection points. A company has to balance its portfolio on daily base: at the end of the gas day (5:00 p.m. UTC or 4:00 daylight saving), the company will be notified by the TSO if its off-takes and inputs were balanced or imbalanced with respect to the announced positions. See also: "Balancing Network Code BAL350-12 26 October 2012"

[55] For a definition look at section "Definition" at the end of the paper.

- Supply contract between one producer and one supplier, where total supply equals total demand;
- Delivery to a physical point;
- Physical hub is the interconnection point
- Supplier has transport capacity in every country

- In subcase 1.b, the gas is delivered to the physical hub in one Country, but the consumers of the supplier are in another one. Two more countries are introduced, with different transport tariffs system for suppliers, in order to exemplify how tariffs can have an impact on routes and market integration.

  These basic assumptions are taken:
  - Supply contract between one producer and one supplier, where total supply equals total demand;
  - Delivery to a physical hub;
  - Supplier has transport capacity in every country
  - Countries have different transport tariff systems: Country A and B have Point-to-Point tariffs while Country C and D have E-E tariffs.

It has to be noted that in these simplified cases, traders are not considered as actors in the process. In fact, we assume that the entire quantity of gas that is delivered is consumed and correspond exactly to the volume required. In reality, gas is often traded either at cross-border interconnection points or at virtual or physical hubs before being delivered to the final consumers. In the next case, a transaction will be therefore introduced exemplifying trading activity. Its role for the Internal gas market and GTM will be explained in more detail in the next paragraphs.

General Case 2 differs from case 1.b as the hub is not physical but virtual, there are two suppliers and two producers and total gas contacted by Supplier 1 is greater than demand (unbalanced portfolio). We assume that a transaction will take place between two counterparts in order to balance the position.

These basic assumptions are taken:
- Supply contract between Producer 1 and Supplier 1, where total supply is more than total demand;
- Delivery to a virtual point;

- Suppliers and Producers have transport capacity in every country

- Supplier 2 and Producer 2 are both present on the gas market of Country C at the Virtual Hub C and are 'long' (they have gas to sell)

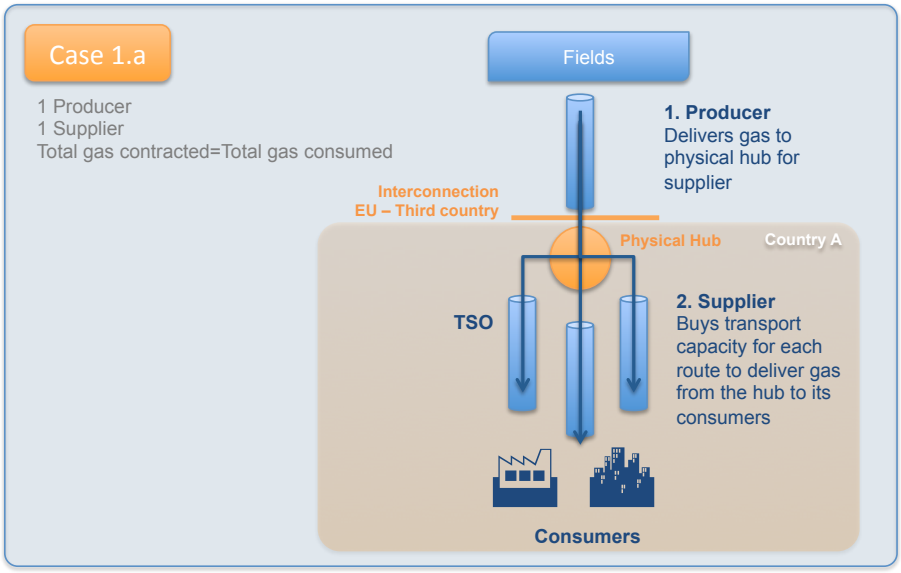
Case 1.a

The Supplier of Country A needs a quantity of gas for its consumers. For this, and since it does not have its own production, it contracts gas from Producer. They decide that the delivery point will be the physical gas hub in Country A (as shown in Picture 1).

In this case, since Country A is the final destination, Supplier A will assure that the exit capacity at the physical hub, which coincides with the entry capacity in the transport system, is booked in order to deliver its gas to its consumers. Producer will book the entry capacity at the external cross-border interconnection point that will allow it to deliver gas to the hub (as the hub corresponds to the cross-border interconnection point). If the tariff system is point-to-point, then Supplier A has to pay the tariff (probably based on volumes and distance) corresponding to the route that connects the physical hub to the consumers exit points. The TSO will take care of physically transport the amount of gas required to the exit points in its system. If the tariff is entry-exit, then supplier will pay an entry tariff and exit tariffs that maybe are partially irrespective of whether its consumers are close or far from the physical hub and which are probably the same at each entry or exit point, avoiding discrimination.[56]

[56] ACER, 'Draft Framework Guidelines on rules regarding harmonised transmission tariff structures for gas', (Ljubljana: September 2013), p.4.

Figure 1. Case 1.a



In this overly simplified case, the tariff system and the locational delivery do not influence market flexibility, since gas stays in market A. What it can be influenced is the liquidity of the market, if access to the physical capacity at the interconnection point is contractually or physically congested (i.e. there is no possibility to access the market since the entire capacity is booked and is not released in a secondary market).

In fact, if a second supplier wants to enter the market, it should have the possibility to buy capacity at the entry point corresponding to its commercial needs. Historically, vertically integrated companies (VIC) provided the investment necessary to construct the pipelines connecting their national market to the producer infrastructure. By this mean, the VIC assured that the entire transport capacity was booked for itself along with the interconnection capacity to enter the market. In this situation, it is impossible therefore for competitors to enter the market unless relying completely on the gas made available by the VIC (at the price set by it) on the wholesale market.

However, capacity at interconnection point is not always entirely used. Selling this unused capacity fosters opportunities to enter the market. It is for this reason that Regulation 715/2009 in its art.6 (g) identifies, among other areas of harmonization, congestion management and capacity allocation rules at interconnection points. Congestion in Europe is more “contractual” than “physical”, as Regulation 715/2009 admits in its introduction:

‘(22) Although physical congestion of networks is, at present, rarely a problem in the Community, it may become one in the future.

It is important, therefore, to provide the basic principle for the allocation of congested capacity in such circumstances.'

Congestion Management Procedures is the first set of harmonized rules that has been incorporated into European legislation.[57] A more controversial Capacity Allocation Mechanism Network Code has ben approved by the EC via the comitology procedure and awaits publication at the Official Journal.[58]

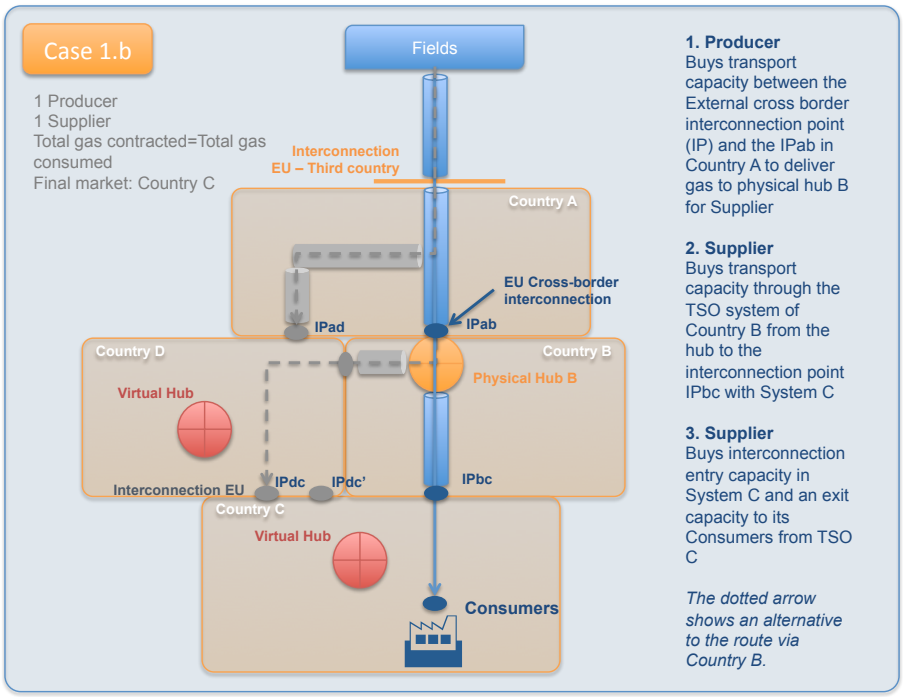
Case 1.b

In this case, Country A is just a transit country and the final destination for gas supplied by the producer is Country C (Picture 2). Supplier C has no domestic production, so it imports gas from a third producing country. In Country C there is no hub or transit pipeline directly connected between Country C and Producer's fields, so Supplier C and the Producer agree for delivery to the physical hub in Country B. In order to reach its consumers, Supplier C has to buy transport's capacity in Country B and C and it has to ensure the booking of entry and exit capacity at System C cross-border interconnection point. The Producer as well has to be sure to have access to the transport capacity in order to honour its supply contract. This is the reason for the opposition of main producers and suppliers like Gazprom to the unbundling process and Third Party Access (TPA) procedures. Being owner of the pipeline, as mentioned before, is (was) the best way for assuring capacity rights.

[57] DÉCISION DE LA COMMISSION du 24 août 2012 modifiant l'annexe I du règlement (CE) no 715/2009 du Parlement européen et du Conseil concernant les conditions d'accès aux réseaux de transport de gaz naturel.

[58] CAM NC has been approved on April 15. The main controversies of this NC are explained in box 1.

Figure 2. Case 1.b



It might as well be possible that Supplier C and the Producer agree for delivery at the border between country B and C. This is currently the case in some of the contracts between the main European suppliers and producing companies. This option allows for more discretion in the price determination (especially if there is no hub or reliable market price signal in the country) and the way gas is used (being a frontier, gas can be used at either sides of it). In this case, it is the Producer that brings the commodity to the border and reserves the capacity in each country and at each cross-border interconnection point.

Moreover, in this example the assumption is that different tariff systems are applied. Countries A and B have a point-to-point system while Countries D and C have E-E tariffs. As a result, the selection of one specific route in Country A determines the path that gas will follow regardless of the tariffs systems in Country D and B. In other words, booking one route in a point-to-point system can diminish the flexibility that is offered by an E-E system.[59]

In case 1.b, it was chosen to represent virtual and physical hubs. In fact, delivery can be at a virtual, or at physical hub or border. Hubs are mostly used for exchanges for they gather transactions and create more liquidity at a specific point. The delivery at the virtual hub is not very different from that of at a physical hub when transport

[59] D. Harris, P. Wilson, "Impact Assessment for the Framework Guidelines on Harmonised transmission tariff structures", op.cit.

tariffs are Entry-Exit, as it will be the case in Europe. The Third package chose an Entry-Exit system[60] model with transport tariffs not calculated on distance but rather on volume[61].

Point 19 in Regulation 715/2009 explains the reasons behind this choice:

'To enhance competition through liquid wholesale markets for gas, it is vital that ***gas can be traded independently of its location in the system****. The only way to do this is to give network users the* ***freedom to book entry and exit capacity independently, thereby creating gas transport through zones instead of along contractual paths****. The preference for entry-exit systems to facilitate the development of competition was already expressed by most stakeholders at the 6th Madrid Forum on 30 and 31 October 2002.* ***Tariffs should not be dependent on the transport route.*** *The tariff set for one or more entry points should therefore not be related to the tariff set for one or more exit points, and vice versa.'*

In the example, Country A has a point-to-point tariff system that imposes a specific route to reach Country B. The grey dotted arrow shows that with an Entry-Exit system another route would have been possible if, for example, the interconnection point IPab was congested. Let assume that Producer has the only choice of interconnection IPab. Once it has reached the border, it has to enter System A by buying transport capacity to IPab. After having bought entry capacity in system B, it delivers gas to the Physical hub B by communicating the delivery to the TSO through the nomination procedure. Supplier C has the quantity delivered to the Physical hub B, so it has to buy transport capacity from the hub to IPbc from TSO B and then entry capacity at the same interconnection point from TSO C. In order to supply its consumer, Supplier C buys exit capacity at consumer connection point.

The difference between entry-exit system and point-to-point is fundamental in understanding the functioning of a delivery to a virtual point. Delivery at the virtual point does not prevent the TSO responsible for the balancing of the system to know where and how much gas comes into the system. System users have to nominate[62] their entry and exit flows[63] to the TSO. In this way, gas enters the

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[60] Regulation (EC) No 715/2009 of the European parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC).

[61] Tariffs calculation varies from country to country and can adjust the Entry-Exit systems with an element of distance and volume. Including these elements is an answer to the real costs incurred in the system and the need for investments on both Exit and Entry points.

[62] The definition of nomination is given in Regulation (EC) No 715/2009: ' 'nomination' means the prior reporting by the network user to the transmission system operator of the actual flow that the network user wishes to inject into or withdraw from the system'.

[63] Also called in the gas jargon 'intakes' and 'offtakes'.

system via the payment of the entry tariffs related to the entry point and exits through the payment of the exit tariffs of the selected point.[64] It is the role of the TSO to optimize the route for the delivery inside the entry-exit zone system. The entry in the system is thus not mandatorily associated to an exit.[65]

Transport tariffs systems partially reflect the historical dimension of the existing systems. 'Stamp-type' systems[66] or pure entry-exit systems (without locational elements) show the predominance of transit flow in a country and its small geographical surface. In fact, the stamp model for transit countries allows for revenues being generated by network users (suppliers, shippers, big industrial consumers or producers) that simply pass through the network to transport gas from the EU external borders into their country system. These network users will not benefit of the extensive use of the system regardless of the route, as a stamp mechanism allows, since it is not their final market. This mechanism generates cross-subsidies for the network users that operate inside the transit country. On the contrary, those countries having an important physical hub, such as Austria or Belgium, usually used a point-to-point system.

'Sink states', as opposed to the 'transit' ones, are those states that are usually big consumer markets, such as Italy, Germany or France. They will apply both an entry-exit system and a locational dimension.

Furthermore, the tariff system has to reflect the costs incurred to maintain and develop infrastructure. While the exit-entry system has the advantage to give greater flexibility in the choice of the path to be followed, it can have impacts on the infrastructure development as transport tariffs only partially reflect real costs (this point will be further discussed in the following paragraphs).

Case 2

Case 2 introduces Virtual hubs in markets B, C and D and include two more actors than in case 1.b. It will try to exemplify what happens when there is a transaction (purchase of gas) between two actors in a market structure similar to what the GTM describes. The aim is to

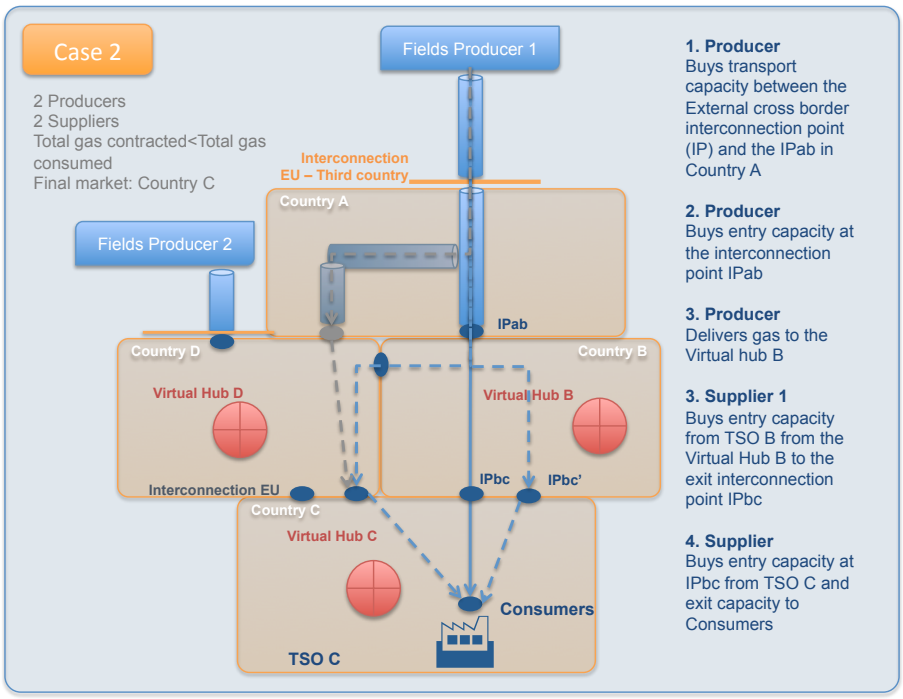
[64] Usually each entry point has the same transport tariff as well as all exit points have the same tariffs values. However, values between entry and exit points may differ.

[65] This is particularly true when transport capacity is abundant and there is not physical congestion. When infrastructure is not well developed and abundant, however, physical bottlenecks can distort the E-E system. In Germany, for example, since current tariffs do not foster investments, there are physical bottlenecks that force suppliers and shippers to exit the gas system in order to stay in balance.

[66] The stamp model implies that the payment is only once. This is the model used for example in the Swiss highways: the payment of a stamp gives access to the entire highway network. However, a non-resident is probably going to use less the system than a Swiss resident, therefore contributing to the financing of network without benefitting from it.

explain the role of trading and hubs with a benefits and concerns analysis.

Figure 3. Case 2



Producer 1 has to deliver gas to the Supplier 1 in market B. It can deliver it to the Virtual hub through the E-E system existing in Country B. Supplier 1 has then to buy exit capacity IPbc to bring gas to its consumer in Country C. Assuming that CAM NC has been applied (see box 1), Supplier 1 will now be able to buy, in one time, both the exit capacity from system B and the entry capacity in System C. In market C, however, it witnesses an unexpected rise in demand and has to buy more gas. Traders of Supplier 1 will then look at gas availability on the market, in particular at Virtual Hub C. This action can be of two types: either the trader look on the exchange for standardised products or it contacts brokers and other traders to obtain an Over-the-counter (OTC) deal. On the market it finds Supplier 2 and the trading company of Producer 2. If market price signals at the Virtual hub are reliable, Producer 2 and Supplier 2 will have little margin on the price to apply. However, if market prices are not transparent, then Producer 2 might be able to make a price by counting on its producer position, assuming that all the actors have the same market share.[67]

[67] This assumption over simplifies the reality, where historical incumbents still have the greatest market share in their respective countries. However, Europe-wide, it is known that three main producers, namely Russia, Norway and Algeria, supply most of the imported gas. If they have equal access to transport capacity and therefore to

This case shows that another difference between delivering to a physical point or to virtual hub is the commodity price creation. In fact, delivering to a hub means associating the commodity price to the main price at the destination hub. A big price differential could not be tolerated and would raise questions about the fairness of the transaction. Consequently, the Virtual hub gives a more transparent price signal to the Supplier and the Producer. Furthermore, with market liberalisation and integration, Producers are progressively entering downstream markets, as mentioned in the first chapter. Will transparency and market regulation be able to avoid collusions and market abuse?

Another risk that has to be monitored is the increasing volume of trades on the exchanges. Although they represent a marginal part of the overall trades (purchase of gas is still mainly based on long-term contracts and spot trades are by 95% OTC rather than on exchanges),[68] Virtual hubs foster trades and spot markets for classical traders (trading activity inside an oil & gas company consisting in hedging risks and balancing portfolios) and for pure financial actors too (banks, hedge funds). Is dealing with gas futures and derivatives the same as with pure financial instruments? Perhaps yes, but the clamorous collapse of Amaranth Advisors[69] hedge fund and cyclical financial crisis might increase volatility with a risk that customers (or citizens) will bear the costs in the end. Since (exchanges or OTC) markets are increasing their importance, regulation should look closely to their evolutions and provide the right framework to avoid speculative behaviours. Relying exclusively on spot markets might not be the good policy measure for final consumers on the retail market who do not have the instruments to adjust their consumption in a very short time to market signals.

each national market, their market position will probably be stronger than a national supplier.

[68]P. Heather, 'Continental European Gas Hubs: Are they fit for purpose?' (Oxford:The Oxford Institue for Energy Studies, June 2012)

[69]S. Hamilton, M. Turner, 'The rise and fall of Amaranth Advisors', www.efinancialnews.com, 23 July 2009; K. Cooney, 'Top 10 Biggest Trading Losses in History', http://newsfeed.time.com, 11 May 2012

BOX 1: Network codes

The process of creation of NC is described in Regulation (EC) No 715/2009 in its art.6. Regulation 715/2009 describes the objectives, main domains that the NC should cover, main steps and the actors involved. NC's apply only to cross-border interconnection points (and in some cases it has been specifically requested by network users and stakeholders to exclude cross-border interconnection points with third countries although the Regulation does not mention it specifically).

Four NC have been identified as priority:

Congestion management procedure:[70] it is the only NC adopted so far by Commission Decision 2012/490/UE, 24 August 2012 modifying annexes I of Regulation 715/2009 (Third Party Access rules). It applies to contractual transport capacity congestion only (for example, capacity contracted but not used), it allows TSO to free up unused capacity and to offer more capacity than technically possible in order to satisfy network users requests. Main actors concerned: TSO (neutral), new suppliers (favourable), historical suppliers (favourable), industrial consumers (favourable), traders (favourable).

Capacity allocation mechanisms: it is a very controversial NC as it aims at modifying the way transport capacity is allocated at IP's: auction has been considered the fairest way of allocating capacity.[71] Key controversy is the duration of capacity products and the way existing capacities rights should be treated ("sunset clause"). The duration of capacity products has been reduced to five year, therefore creating an asymmetry between capacity and commodity contracts, whose duration is usually longer (3-5-10-15 or 20 years). Another relevant change is the mandatory creation of 'bundled-products' at cross-border IP's. This means that TSO have to sell a product that allows a network user to buy entry capacity to the system with a guaranteed exit capacity. Today, matching the two transport capacities is not always assured. Main actors concerned: TSO (afraid of losing revenues and short-term vision not suitable for long term infrastructure investments), new suppliers (favourable), historical suppliers (against, short-term vision against historical long-term commodity contracts), industrial consumers (favourable), traders (favourable, especially if modification of existing rules is costless).

Balancing: it sets out provisions for harmonizing gas balancing regimes across balancing zones (this differs sometimes from entry-exit systems as

[70] The CMP is not a 'real' Nework Code as the others as these rules have been proposed by the EC in a separate process. However, it is included in the topics' list found in Regulation 715/2009.

[71] Other forms of allocation are: First Come First Served (FCFS) and Use-it-or-lose-it (UOILI). The second mechanism is used for congestion management.

there are entry-exit systems with several balancing zones).[72] The most relevant elements are the introduction of market-based mechanisms for TSO in order to buy or sell gas needed for balancing purposes, the shift of balancing responsibility from TSO to network users. Main actors concerned: TSO (requesting intermediary steps to implement new rules; afraid of system reliability), new suppliers (against), historical suppliers (against), industrial consumers (favourable), traders (favourable).

Tariffs: harmonization of transport tariff systems is most difficult part of the process of harmonizing rules at cross-border IP's. In fact, transport tariffs are set by national regulators and are based on historical, geographical and physical characteristics of the gas network. They remunerate TSO's. Key controversial provisions of the NC under elaboration are: possible discrimination between transit and transport flows (by allocating different tariffs to entry and exit points between IP's and inside the national system);[73] tariff calculation method (since it varies from country to country) and cost allocation (since physical distance and infrastructure is not the main cost measure). Main actors concerned: TSO (requesting tariffs that remunerate their costs), new suppliers/historical suppliers (favouring lower tariffs but differentiating transit and transport), industrial consumers/traders (favouring lower tariffs and no difference between entry/exit tariffs, tariffs not on real costs but rather on willingness of the market to pay for it).

Interoperability and data exchange rules: it deals with specific operational issues such as the units to be used (Gwh for example), gas quality (as standards and requirements can differ), odourisation (which is mandatory in some transmission systems but not in all of them), data exchange (format, kind of information, IT provider) and the harmonization of the interconnection agreement contract.[74] TSO's and National Regulators are mainly concerned by these changes since regulations differ on cost allocations, requirements. The main issue is how to allocate operational costs that might be remunerated by one legislation but not by the other side of the border.

[72] France has 3 balancing zones and two entry-exit systems, on for GRTGaz and one for TIGF. GRTGaz has two balancing zones, PEG (Point d'échange gas) Nord and PEG Sud. Germany has two gas quality zones (L-Gas and H-Gas) and one balancing regime (that has been artificially created in April 2011 since gas qualities remain different but have to be managed by TSO).

[73] This issue has been raised during the ACER Consultation workshop on Framework Guidelines on Harmonized Transmission tariff structures on Januray 23rd 2013. It emerged that only 7-10 countries have large transit and small consumption. These countries could therefore have big reforms to implement.

[74] ENTSOG, 'NC Interoperability and Data Exchange Supporting Document', (Brussels: 27 February 2013), p.7,16,17.

Changes ahead on the gas value chain: who wins?

The simplified cases show that impacts can be expected on the entire gas value chain.75

In order to analyse the evolutions that will involve each segment, it will be necessary to first identify them. The gas chain value will be divided as follows:

- Infrastructure and infrastructure manager (TSO)
- Supplier
- Traders
- Producer
- Consumer

The actors involved in the process of the creation of the internal gas market have expressed their positions in several ad hoc meetings that allowed all the stakeholders to share their views on the model.

Understanding these views and interests means clarifying the inevitable compromise that the GTM represents, with its strengths and shortcomings. It also allows a deeper assessment of the inevitable costs of the transformation. For TSO, major costs will derive from organizational and operational changes (process restructuring, IT update, new technical requirements), commercial and contractual modifications (long-term transport capacity contracts have to be modified). These costs will be reflected in final consumers bills, as TSO revenues are regulated and guaranteed by national laws. Will these costs be compensated by diminishing gas molecule prices and higher efficiency in network and capacity management?

Infrastructure operators

Transmission system, storage and LNG terminal operators require that the any model will attract investment and secure supply through market-based signals and a stable regulatory framework. Moreover, a long-term vision cannot be constructed unless long-term gas supply is ensured along with infrastructures that are based on long-term capacity rights. However, optimization on the short-term system use must be improved. Finally, another important aspect for infrastructure operators is to see the results of the implementation of the first

[75] Distribution, although highly concerned by the definition of common balancing rules, Entry-Exit systems and the future GTM, will not be considered in this analysis.

Network Code before starting new legislations. A first evaluation of the costs and benefits of the reforms will be necessary before continuing the process.[76]

The most relevant impact on infrastructure that might endanger security of supply is the short-term accent that underpins the GTM. Short-term capacity products might not guarantee returns on investments. As TSO are regulated actors, if the tariffs and the capacity selling cannot remunerate investments made over several years (30-40), higher transport tariffs will be need. Notwithstanding the need to incentivise an increase in efficiency and cost allocation for these actors, transport tariffs alignment with previous and future investments will be required.[77]

This issue points to another important element: TSO are regulated at national level. How can they coexist with one another at European level if they present different remuneration models based on national regulation? To what extent national regulation will favour the development of one company over the other? In fact, although transmission is considered a natural monopoly, thanks to the opening and unbundling of the energy national markets, TSO companies can buy networks in other parts of Europe. Many examples already exist: Snam (Italy) and Fluxys (Belgium) have recently acquired a participation stake in the Interconnector pipeline between UK and Belgium; GRTGaz (France) with GRTGaz Deutschland posses 60% of Megal capacities; Snam is the leader of a consortium that will take over TIGF (France) transport system.[78] What's more, how to incentivise more regional efficiency and cross-border activities if National Regulatory Authorities are still responsible for determining their revenues? The target model does not provide an answer to these questions as the entry-exit systems are mainly national and since ACER competences do not cover this dimension.

Shippers/Suppliers

A shipper is "a party negotiating for the transport of gas on its own behalf or as an agent for another".[79] A supplier, which is a company that supplies gas to final consumers, either industrial or households, can provide the services of a shipper as well. Suppliers are "midstreamers", as the gas jargon calls them, as they are placed in the middle between the upstream producers and the downstream consumers.

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[76] GIE views on Gas Target Model, Jean-Claude Depail, GIE President, 22 March 2012

[77] Striking the right balance between short-term trades and long-term investments promotion is one of the main objectives (and key challenge) of the Tariffs Framework Guidelines for the future Tariffs NC.

[78] 'Total in Exclusive Negotiations on the Proposed Sale of TIGF to Snam, EDF and GIC', www.total.com (Paris: February 5, 2013).

[79] http://www.gasstrategies.com, Industry Glossary

Typical midstreamers are Eni, GDFSuez, Gasterra, Centrica, E.On Ruhrgas, RWE, OMV, PGNiG, the historical incumbents in European countries.

Historically, as each country is responsible for its security of supply and since energy markets were national, these companies (often partially or totally state owned) managed internal domestic production or, when this was not enough, the relationships with the producers thanks to bilateral agreements and contracted gas on a long-term basis. Through regulated tariffs, gas was sold to national consumers. They were the intermediaries between national consumers and foreign producers (either EU, such as the Netherlands or UK, or non-EU).

With the creation of the internal gas market, the historical role of the incumbents has been challenged in two ways: from one side, unbundling has required the vertical integrated companies to sell their infrastructures and distribution business (or find a way to create independent structures, as the ITO model under the Third directive).[80] This has been coupled with anti market abuse and competition rules with the Treaty of European Union.[81]

Consequences have been both positive and negative for these incumbents. If from one side they had the opportunity to develop in other European markets, they had nevertheless to give up some of their historical dominant position.

This is all known history. What it is yet to be understood is the further impacts that a model based on hub-to-hub exchanges and open markets in an oligopolistic world such as the European gas market can imply for these actors. As domestic production lowers, increasing imports will imply a stronger reliance on producers. Liberalisation weakens the position of incumbent that climb the ladder of the value chain to obtain more upstream sources in order to compete with main companies coming from producing countries (as described in the first chapter). Although this trend is not entirely new,[82] the magnitude of upstream investments is becoming impressive as domestic production is decreasing. Midstreamers have been investing not only in pipelines and storages that connect gas fields to their national markets, but also directly in exploration and production of gas fields. What's more, as suppliers increase their upstream activity, they diversify their markets and consumers strategies too. With spot-LNG, gas is not anymore lined to the

[80] Art 9 Directive 2009/73/CE.
[81] Treaty on the Functioning of the European Union - Part Three: Union Policies And Internal Actions - Title Vii: Common Rules On Competition, Taxation And Approximation Of Laws - Chapter 1: Rules on competition - Section 1: Rules applying to undertakings - Article 101 (ex Article 81 TEC), Article 102 (ex Article 82 TEC).
[82] The presence of European companies in gas fields in producing countries such as Libya, Algeria, Egypt or Norway sometimes dates back to the 1950's.

European market only. More interesting Asian gas prices[83] have attracted important quantities of LNG previously destine to the European market in 2011 and 2012.[84]

This strategy cannot be applied by smaller companies, bringing to a paradox in the creation of the internal market: more integration will mean access by the same actors (former incumbents, producer companies) to the European market.

Traders

Trading activity has to be distinguished between the two forms as previously mentioned: pure trading based on price differential (as main activity) and "classical" trading made by trading structures in Oil &Gas companies to balance and hedge their portfolios (as a marginal activity).

There is a clear trend on the use of market and trading instruments in the gas sector. Traders' needs reflect the short-term timeframe of their activity. In fact, they tend to foster liquid markets, with no physical constraints to deal with, a more transparent and complete to information such as gas and transport capacity availability, harmonize rules at each cross-border interconnection point in order not to bother with transport capacity management that should be exclusively managed by TSO. All this should be made, if possible, without increasing transport tariffs.[85]

The Gas Target Model largely answer traders' needs, in particular the decoupling of hub-to-hub trades from physical flows.

Producers

Producers with historical commercial relations with Europe have reacted differently to the changes taking place. While some adapted quickly, by establishing more flexible supply contracts (based on more spot indexed prices)[86] or opening a European marketing branch (as Statoil did in Brussels and Gazprom in Paris and London), others have still to take the appropriate measures.

The creation of European common rules and the opening of highly protected markets, such as the Italian, French or German markets, represent a great opportunity for producers. Why bother contracting gas to midstreamers when they can directly sell their gas to the hubs and consumers? If producers companies respect the rules of unbundling and competition rules set by EU legislation, they

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[83] For a good chart of price differential among regions, please refer to Roger Carvalho presentation at Ifri Energy Breakfast Roundtable on March 21: www.ifri.org
[84] GIIGNL, 'The LNG Industry in 2012' (Paris, 25 March 2013) p.7,8
[85] EFET, 'Towards a single European energy market', Ed. Peter Styles, Jan van Aken, 2012 p.5.
[86] Statoil has increasingly indexed prices on spot markets and aim at increasing the spot indexation to 70% of its overall contracts.

can participate to the European gas market. It has to be reminded that no reciprocity (i.e. access to producers' markets as a counterpart to the access to the European one) is still need or required by European legislators yet. The creation of a well-connected, harmonized European gas market can represent therefore a good opportunity for entering more aggressively the downstream marketing and trading activities. On the other hand, more transparent price formation and more reliable spot market price signals produced by better organized hubs will hinder the divide et impera strategy of companies such as Gazprom.

And consumers?

The changes described in the first and second chapter can have indirect consequences for consumers. There are two categories of consumers, retail and wholesale consumers.

Retail consumers are connected to the distribution grid (low pressure) and receive their gas from a supplier through a supply contract. The price at which retail consumers receive their gas is established by regulated tariffs. Regulated tariffs differ from country to country as they are based on formulas that include many components: the commodity price (which can be calculated, for example, on long-term oil indexation, spot markets, or both), taxes (VAT and other taxes), transport (high pressure and low pressure). These three components all contribute to the final price paid by consumers. In this respect, it has been demonstrated that the Gas Target Model can produce two different trends. From one side, it is expected that wholesale market, by increasing liquidity, will create more competition and therefore lower prices. The second trend that has not been anticipated by the GTM is that greater flexibility and rules harmonization at the infrastructure level will require big investments and higher uncertainty that will inevitability increase transport tariffs. As both components affect the final consumer bill, it is **important to follow the evolution of these components and assess whether the lowering of the molecule price will be able to offset the increase in transport tariffs**. What's more, as retail consumers are not able to hedge against the risks of price volatility, which is expected by an increase in short term exchanges, it is the role of National Regulators to create pricing (regulated tariff) mechanisms that protect vulnerable retail consumers from price spikes.[87]

[87] An interesting case is the recent change introduced in January 2013 by the Italian regulator (AEEG) to the retail tariff formula (Delibera 28 dicembre 2012 581/2012/R/com available on the website: http://www.autorita.energia.it/it/docs/12/581-12.htm). In order to make retail consumers benefit of the lower spot prices witnessed from 2009 in the European and Italian markets (due to a combination of low consumption and large gas offer based on binding long-term contracts), AEEG modified the gas price indexation determinant by increasing the influence of spot prices. This has already produced a decrease in

Industrial consumer connected to the high pressure gas grid participate sometimes directly to the wholesale market. Their good knowledge of their consumption patterns allow industrial consumers to take advantage of the new markets and market rules by arbitrating on transparent prices and having access to a larger number of counterparts. However, they still tend to subscribe to long-term offer (3 years, mostly spot-indexed now) as they need a security of supply only guaranteed by longer contracts. Therefore, industrial consumers will benefit from the creation of a more integrated and transparent market, but on the other side, they will witness a possible increase in infrastructure costs that sometimes are going to weigh on the final bill.

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the final price paid by the consumer, which will total around 6-7% over a year (EUR90).

Conclusion

The 2009 gas disruption showed the limits of the internal gas transmission system and the role interconnections could play as back up in countries under supply constraints. This was particularly true in Central, Eastern and Southern Europe, where increase in Norwegian gas supplies could not reach final consumers. What's more, it showed that where markets were effectively functioning and supplies where truly diversified (either in terms of origin and type of infrastructure, LNG and pipeline) the system was more resilient.

Despite the lack of a transparent and functioning gas market, it was the need of mutual assistance and solidarity that showed the limits of the current European gas system, fostering the creation of a better interconnected grid with reverse flows where gas was only 'one-way'. When a transit country or a producer country interrupts flows, gas has to come from somewhere else, the closer the better. Commercial mechanisms such as backhaul have showed not suitable for crisis management. Gas has to be physically transported to final consumers and that cannot be replaced by commercial expedients. That is why Regulation 914/2010 on Security of Supply imposed that physical reverse flows measures were to be implemented at each Interconnection point.

This assumption lacks in the Gas Target Model that has been proposed by European regulators. In the GTM, as it has been described in the first chapter, the creation of a functional and transparent market will both solve the problem of diversification of supply (as more transparency should attract more actors) and therefore availability.

It has been demonstrated that the creation of a financial and market-based instrument alone, such as the gas wholesale market, cannot by itself change the fundamental characteristic of the European gas market: 85% of the total gas consumed is imported. This will be true for the foreseeable future as exploration and production of conventional and unconventional gas sources (which are not immense but still a source of domestic gas) in Europe is encountering public and political resistance.

What's more, it has been argued that the creation of hubs where all actors can exchange gas freely (from EU and non EU countries) might even restrain competition instead of fostering it. As all actors do not start from the same basis, distortions will be emphasized instead of being reduced. Can a supplier with no

production fields and relying only on quantities available on the wholesale market make a competitive offer compared with a big producer company?

Furthermore, another contradiction has been mentioned, which is the increasing gap between national regulations applied to transnational actors. The GTM is still based on national perimeters, which clashes with the cross-border dimension of actors and Network codes rules.

Finally, modifications to current gas and capacity contracts associated to the short-term vision of the GTM will lead to increasing volatility and uncertainty. The uncertain framework and visibility on revenues will be translated in higher transport tariffs and eventually to a lack of investments. On the contrary, the GTM is based on the assumption that interconnections are very large but it does not provide the means to foster investments.

The ongoing harmonization process should be encouraged but not pushed too far before having assessed the results of the first implemented measures. Reverse flows at key IP's in Eastern and Central EU countries have proved right. Maybe it is not necessary yet to look for a European model. A first step based on a regional approach could prove more efficient than trying to make a tabula rasa of geographical, historical and local differences.

Annexe 1

Definition

Network user: 'a customer or a potential customer of a transmission system operator, and transmission system operators themselves in so far as it is necessary for them to carry out their functions in relation to transmission' (Art. 1(11) Regulation 715/2009). Network users are: shippers, suppliers, industrial consumers that have access to the wholesale market.

Shipper/Supplier: 'A party negotiating for the transport of gas on its own behalf or as an agent for another'.[88] It ships gas from the EU border to suppliers. Suppliers differ from shippers as they sell gas to final consumers.

Producer: A company that produces gas from its own fields. It might be a network user in the European system; in this case it can be considered as a supplier (see above definition).

Consumer: consumers can be on the 'retail' market, that is to say they are connected to the distribution network (low pressure) and are managed by suppliers and distributors; or industrials, which can be connected directly to the transport system (high pressure) and can sometimes operate on the wholesale market without intermediaries or directly invest in infrastructure and production.[89]

Abbreviations and Acronyms

ACER	Agency for the Cooperation of Energy Regulators
BNA	Bundesnetzagentur (German Energy Regulator)
CCS	Carbon Capture and Storage
CPI	Current Policy Initiatives (EU Energy Roadmap)

[88] http://www.gasstrategies.com/industry-glossary#S
[89] German chemical group BASF typically represent a consumer that is active in the upstream and transport of natural gas through its subsidiary Wintershall created with Gazprom. For more information: http://www.wintershall.com/en/company/investments.html.

EEPR	European Energy Programme for Recovery
ENTSOG	European Transmission System Operators for Gas
ERGEG	European Regulators' Group for Electricity and Gas
ETS	European Trading Scheme
EU	European Union
GHG	Green House Gas
GTM	Gas Target Model
IEA	International Energy Agency
IP	Interconnection Point
NBP	National Balancing Point, UK
NC	Network Code
RES	Renewable Energy Sources
TPES	Total Primary Energy Supply
TSOs	Transmission System Operators
WEO	World Energy Outlook, IEA

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