Pre-Release Gas Target Model: The MECOS Model

Status: 04-04-2011

DISCLAIMER:

This paper is "work in progress".
Further work may lead to changes in the model as contribution to the FSR project.

Contents:

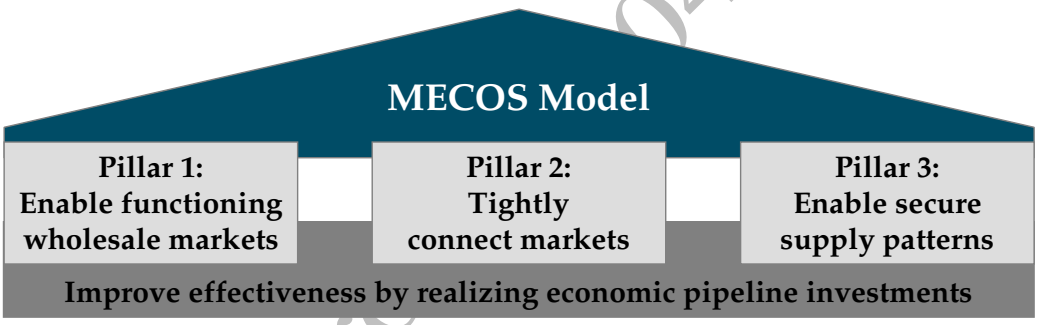
1 THE MECOS MODEL: AN ARCHITECTURE FOR THE TARGET MODEL

1.1 THE MECOS MODEL IN A NUTSHELL

The MECOS Model is a Market Enabling, Connecting and Securing Model describing an end-state of the gas market to be achieved over time.

The MECOS Model rests on three pillars that share a common foundation, the latter making sure that economic[1] investments in pipelines are realized:

- Pillar 1: Structuring network access[2] to the European gas grid in a way that enables functioning wholesale markets so that every European final customer is easily accessible from such a market.
- Pillar 2: Fostering short- and mid-term price alignment between the functioning wholesale markets by tightly connecting the markets through facilitating cross-market supply and trading and potentially implementing market coupling as far as the (at any time) given infrastructure allows.
- Pillar 3: Enabling the establishment[3] of secure supply patterns to the functioning wholesale markets.



The MECOS Model aims at the creation of a number of functioning wholesale markets within the EU (together enabling easy access to all European final customers of gas) at connecting these markets tightly in order to maximize short- and mid-term price alignment between those markets, at enabling secure supply patterns to those markets and at making sure that all economic pipeline investments are done.

[1] We are aware of the fact, that there are other than economic reasons to invest into pipeline capacity, especially security of supply. The latter is dealt with under pillar 3.

[2] I.e. the "commercial network model"

[3] By shippers

1.2 OPERATIONALISATION OF OBJECTIVES FOR THE MECOS MODEL

1.2.1 Introduction

The MECOS Model is a target model for the "big picture" architecture of the gas market.

As a target model it describes a future state of the gas market. The discussion of the way that leads to this state is postponed to a later chapter. The goal of the MECOS Model is to specify a European vision of an internal gas market that can serve as a common beacon for further implementation work.

When talking about market architecture in this paper, we especially focus on issues that are relevant for implementation in the ACER framework guidelines ("FWG") and subsequently in the ENTSOG network codes for gas transmission systems ("netcodes"). In addition to that, the MECOS Model addresses some issues that go beyond the planned scope of the FWG, e.g. in the area of new infrastructure. Where required some hints are provided that even surpass the realm of the regulation of network access (e.g. when it comes to describing preconditions of market coupling[4]).

We chose the term "market architecture" to differentiate our contribution from the broader topic of market organisation that would include e.g. the issue of unbundling or aspects of retail market organisation.

The development of the MECOS Model starts out with an operationalisation of the political goals.

Those operationalised objectives – which in our opinion are essential for a well functioning internal gas market – are:

1. every European final customer shall be easily accessible from a functioning wholesale gas market; and
2. the alignment of short- and mid-term wholesale gas prices between those functioning wholesale markets shall be fostered as much as the (at any time) existing transport infrastructure allows; and
3. the establishment of secure supply patterns from gas sources to every functioning wholesale market shall be enabled; and
4. the effectiveness of pillars 1 to 3 shall be improved continuously by realizing every investment into pipeline capacity (new and extension) that is economic.

The following sections will elaborate on each of these objectives. Means to realize the ends will be discussed further down in this document.

[4] Market coupling requires (among other things) a certain standardisation of the contracts traded on gas spot exchanges. This is clearly not an issue for FWG or the netcodes, but a corollary of the application of market coupling for implicit auctioning of day ahead capacity in the MECOS Model.

1.2.2 Functioning wholesale markets

Objective 1: Every European final customer shall be easily accessible from a functioning wholesale gas market.

We assume that a functioning wholesale gas market is an essential prerequisite of a functioning retail gas market. The rationale for this assumption will be provided later in this section.

Due to the scope chosen for the MECOS Model (mainly FWG, netcodes) the MECOS Model focuses on the wholesale side of gas markets. I.e. the MECOS Model does not immerse deeper into the issue of competitive retail gas markets than supporting their emergence through fostering functioning wholesale gas markets.

This focus is also in line with the black letter wording of Article 1: "Subject Matter and Scope" of Regulation EC 715/2009 (i.e the so called Gas Transmission Regulation), where it says in paragraph one that this (EC 715/2009) regulation aims at "… *facilitating the emergence of a well-functioning and transparent wholesale market …*".

We define a **functioning wholesale gas market** (for brevity also termed "market" in the rest of this paper) as a single price zone that is accessible for incumbents and new entrants on equal (i.e. non-discriminatory) terms[5] and where trading liquid (i.e. vivid and resilient at the same time), so that it creates reliable price signals in the forward and spot markets which are not distorted, even if substantial volumes are bought or sold in this market (in other words: no single transaction shall distort the market price).

As can be seen from the definition above, a functioning wholesale gas market involves the criterion of liquidity but goes beyond that. We therefore prefer to use the term "functioning" instead of the narrower term "liquid" to denote the desired market properties.

We believe that a functioning wholesale gas market requires the following success criteria:

- a sufficient presence of wholesalers active in the market that "inject" gas into that market from national production and outside sources (e.g. from other markets within the EU or from outside the EU) and that engage in liquid trading among each other and with other market participants, optimally entailing an HHI[6] below 2000; and
- the combined portfolios of those wholesalers comprising gas from at least three (3) different producers[7] (directly or indirectly); and naturally
- a multitude of final gas customers in that market.

Of course, regulation of gas networks can not oblige wholesalers to enter a market or to shape their portfolios in a certain way, but it can create structural conditions regarding network access that make it more likely that they will do so.

[5] Such a market could also be called an „open market". To avoid any doubt: This part of the definition of functioning wholesale markets does not hint at gas release programs.

[6] HHI is the Hirschmann-Herfindahl Index that is calculated by adding the squared market shares (in %points) of relevant industry participants. Therefore, a HHI of 2000 could e.g. be achieved by five wholesalers with each having a market share of 20%.

[7] Which shall not only be different sales outlets of the same producer but distinct (groups of) companies.

We assume that implementing the following set of structural conditions would fertilize the later emergence – driven by market forces – of functioning gas wholesale markets:

- organising the market as an entry/exit network with a virtual point, the virtual point being the single place of trading induced change of ownership within that market (This pools trading activities and thus adds to liquidity and the relevance of the price signals generated.); and
- making sure that the market caters to final customers with a combined annual consumption normally[8] not below 20 bcm (This should ensure that the market is sufficiently attractive for a large number of wholesalers); and
- making sure that the market is linked to at least three entry points[9] originating from substantial and different EU or non-EU[10] gas sources or other functioning markets (or any combination of those). This ensures that the required diversity of gas sources is available so that gas to gas competition is spurred.

The MECOS Model suggests (see below in this text) two optional models to realize the structural criteria listed above.

It is important to note, that all of these criteria focus on the development of a functioning *wholesale* market. We assume (and there is also evidence to that in the market) that a functioning – and therefore competitive – wholesale market that is easily accessible for incumbents and new competitors alike also drives competition in retail markets. This will at least to a certain extent be facilitated by new entrants into the retail market using the wholesale market on the virtual point as a point of price reference (for pricing of offers), as a point of piecemeal procurement (i.e. synchronised with sales activities), as a source / sink for physical portfolio balancing and for risk measurement and risk management purposes. In that regard, a functioning wholesale market may be considered as fertilizing retail competition.

An additional advantage of a functioning wholesale market deserves recognition. Every wholesaler draws on a portfolio of supply contracts and optimizes the use of these contracts according to cost within certain constraints. A functioning wholesale market provides wholesalers with the opportunity to not only optimize their supply contracts (and other assets) within their own portfolios, but also against the portfolios of others – mediated by the market. This yields economic efficiencies that in a competitive market will eventually trickle down to final customers as well.

The question may arise why the MECOS Model suggests structuring Europe into more than one functioning market? The answer is quite simple. Entry/exit networks are not a physical reality, but a commercial overlay over those physical realities (the physical reality being gas pipelines, not market zones (aka "gas lakes")). Depending on the degree of interconnection of the existing pipelines, maintaining this commercial overlay causes cost[11] (e.g. for constructing improved interconnection and for procuring flow commitments or system energy[12]). The lar-

[8] The 20 bcm are not a hard criterion. If the required number and quality of wholesalers is attracted by a market with lower volumes this market may also qualify as a functioning market.

[9] In this regard interconnection with gas storage would not count as an entry point.

[10] I.e. EU-import points.

[11] We do not discuss the possible scenario here, that upon the creation of larger markets, existing firm capacity is reduced or deteriorated in its quality, because this runs the risk of thwarting the goal of creating functioning markets.

[12] These cost are sometimes termed „debottlenecking" cost.

ger an entry/exit network becomes, the higher this cost usually gets[13]. On the other hand, the creation of entry/exit zones is a precondition for the creation of functioning markets. We think that this dilemma is solved best by designing entry/exit zones as large as is required in order to enable a functioning market,[14] but to avoid the extra cost attached to going beyond that size (unless there is a specific reason to do so – e.g. a small market that is not yet a functioning market may (in order to become part of a functioning market) merge with an adjoining market that already qualifies as functioning before that merger).

Two more interesting questions in the context of creating functioning wholesales markets shall be briefly discussed:

a) Could a number of smaller markets that are tightly connected by bookable cross-market capacity also qualify as a functioning wholesale market?

b) Could a smaller market become functioning by simply "attaching" it via bookable cross-market capacity to a functioning wholesale market?

In our view the correct answer to both questions is "no".

In case (a) wholesale trading is split between various markets that are only connected by time-consuming and costly booking (or bidding) processes with uncertain outcomes which will in the future[15] only be available during given booking windows (e.g. once a year for yearly capacity). This neither enables the liquid trading patterns required to qualify as a functioning market nor does it create the sort of environment that really drives retail competition.[16] It would also prevent the implementation of market coupling since the most fundamental precondition for market coupling is a functioning market in *all* of the coupled markets. Therefore – even if it was physically possible – full price alignment is less likely in such a setup. Just about the same is true for market based balancing, because this concept is also based on a functioning wholesale (spot) market in *every* market where it shall be applied (and not only in the neighbouring market).

In case (b) the situation is better insofar as a functioning market exists in the larger market, but the problems for retail competitors in the smaller market (and in a similar way for all other market participants in the smaller market that are interested in structured procurement or trading – e.g. the operator of a gas fired power plant) remain the same. In fact, in this case the

[13] Additionally, the calculation of entry-exit tariffs always entails some regulatory decision about cost allocation that sometimes trigger disputes as some areas may feel discriminated. As the zones get bigger this risk is enhanced.

[14] Implicitly this means assuming that the value of a functioning market is higher than the cost of achieving it.

[15] After implementation of the principles laid out in the current draft of the FWG on capacity allocation management.

[16] From a retail competitor's perspective being trapped in a non-functioning market is a serious complication of business. Consider a retailer whose risk-aware business model involves the regular purchase of small quantities of gas, in every case including products for the full duration (e.g. one year) of the sales contracts that were successfully concluded. In a functioning market this could rather easily be accomplished at the virtual point of the market. In a bundle of well connected smaller markets the retailer would either have to settle for the smaller number of sellers in his home market or take the risk of setting up a portfolio of cross-market capacities that – if there is a booking window – he can book only once a year. So the retailer finds himself in a position where – before the booking window – he is in a risky position because he does not know if he will get sufficient capacity to fulfil his procurement contracts in adjoining markets or (if the capacity is auctioned off) at what price. Then – in the course of the booking or auctioning process – he has to decide if he books more capacity than he already needs in order to leave headroom for future sales (and therefore procurement) growth (taking on risk) or waive all respective prospects for the coming year. This is not exactly an attractive position to be in.

smaller market would not properly work as such, but all trading would occur in the larger one, to which the smaller one would be attached as if it was some sort of distribution zone that is segregated by bookable capacity. Also the comments made above on market coupling and market based balancing apply to case b) in the same way.

1.2.3 Price Alignment

Objective 2: Alignment of short- and mid-term wholesale gas prices between those functioning wholesale markets shall be fostered as much as the (at any time) existing transport infrastructure allows.

We define price alignment as the conformity of traded[17] gas prices prevalent in the wholesale markets that Europe is structured into under the MECOS Model.

Full (also termed: absolute) price alignment would be achieved, if traded gas prices[18] (spot and forward, i.e. the full so called "price forward curve" aka "contract curve") would be identical across all markets at all times. To avoid any doubt: This does not mean that the curve shall be flat, but merely that prices would be equal for every delivery date. This means that full price alignment is more than just a high correlation of prices[19] in neighbouring markets.

It is important to note, that conformity of European gas wholesale prices would not mean that retail prices become identical all over Europe. These may still differ[20] due to e.g. different local tax regimes and network cost.

Since we focus on the traded wholesale market here, price alignment will by and large be limited to the time horizon that is (actively) traded, i.e. the short- and the closer portion[21] of the mid-term markets. We expect this to suffice in order to achieve the economic benefits outlined below.

The limits to wholesale price alignment are transmission capacities and to a certain extent also transmission tariffs.

If prices are higher in market "A" and lower in an adjoining market "B", then the degree to which price alignment can be achieved is on the one hand determined by the available (i.e. yet unused) transmission capacity. The higher the available unused transmission capacity for flows from market "B" to market "A" is, the higher the chances for full price alignment are.

On the other hand, it appears that the applicable transmission tariff sets a technical limit to price convergence that can be achieved by cross-market arbitrage. In practice, this is only partly true. Consider e.g. the case of a shipper that has booked capacity for a medium term, say a year. Such a shipper could be inclined to use the capacity (as far as it is not required for other purposes) for cross-market arbitrage deals in the spot markets as long as there is a price spread a little above[22] zero.[23]

[17] We are not talking about pricing formulas in long-term supply contracts here but about prices for standardized gas products bought and sold in the traded wholesale market.

[18] Net of all taxes that do not reduce the profit of the seller.

[19] This correlation with an intermediate spread might be termed "relative price alignment".

[20] Retail prices would then be subject to the "relative law of one price".

[21] Trading activity drops quickly for delivery periods lying more than say two years in the future.

[22] To make the effort worthwhile.

The benefit of price alignment is an increase in allocative efficiency. Consider that the gas transport business is to a very large extent a fixed cost business. In such a world, the "connection" of wholesalers' portfolios via the market and their efficient use (brought forth by cross-portfolio optimization via the market) will be best, if the market prices (along the curve) are equal for all markets within the EU. As is well known, this also leads to an increase in total welfare (measured as grand total of consumer and producer rent over all connected markets).

The efficiency of the European wholesale market would be maximized, if gas wholesale prices within the EU were identical at all times for all traded products. This condition is apparently not[24] fulfilled at present, despite the (in some places) availability of unused cross-market capacity that could be utilized to this end. Therefore the MECOS Model foresees measures that enable the best use of the (at any time) existing infrastructure in order to maximize price alignment between markets.

The expansion of pipeline capacity in order to improve price alignment even more than the existing capacity allows, is dealt with in the section on new investment.

1.2.4 Secure supply patterns

Objective 3: The establishment of secure supply patterns from gas sources[25] to every functioning wholesale market shall be enabled.

In recent years there has been an intensive debate about the necessity and benefit of long-term supply contracts in the gas industry.

In such a contract a gas wholesaler would buy a substantial volume of gas for a long term (e.g. 10 to 20 years) usually directly from a producer.[26]

By now, it is generally agreed that in the gas industry long-term supply contracts will maintain an important role. Important reasons for this are:

- Due to decreasing indigenous production, Europe will likely[27] have to import an increasing quantity of gas in the future. In many cases this increase in import quantity will have to be procured from new production sources. Developing these production sources (and the sometimes required new pipelines) involves enormous investment. Consequently producers (and in some cases their banks) insist on risk allocation between producers and their customers, to risk investing into new production sources and the pipelines required to transport the gas from the well head to a European border point (their argument goes: "no long-term contracts, no investment, no supply").
- Some producers are increasingly faced with alternative options to sell their gas outside of Europe; long-term supply contracts bind them to Europe which in turn secures supplies.

---

[23] If the transmission tariff includes a variable element, the price spread per unit would have to be a little higher than the variable cost for transmission per unit.

[24] Despite the remarkable tendency towards relative price alignment that has occurred in North-Western Europe in recent years.

[25] Indigenous production, EU border points interconnecting (directly or indirectly) to extra-European production, LNG terminals.

[26] In some cases also from another wholesaler.

[27] Depending on the demand scenario one assumes.

- Some suppliers are selling gas to certain final customers (e.g. gas-fired power plants, chemical industry) on the basis of long-term supply contracts (with tenure of e.g. 5 or more years).

When analysing the issue of long-term supply contracts in the context of network access in a gas target model, the question arises, what a shipper needs from the transport sector in order to underpin his long-term supply contract?

The answer is straightforward. If long-term supply contracts shall be enabled, long-term transport contracts must be enabled too.

The corollary question is, whether these long-term transport contracts need to be enabled only at EU import points or also at cross-market points within the EU. It appears unrealistic that wholesalers will settle for the opportunity to enter the first EU market "behind" the EU import point, hoping that they will find sufficient buyers in that market or hoping to be able to transport the gas into other markets by means of short- or mid-term capacity (which they would need to secure in the future at acceptable prices). Therefore we assume that long-term transport contracts also have to be permitted at intra-EU cross-market points. One has to be careful though to not foreclose entry into the short- and mid-term markets by allowing all of the available capacity to be contracted long-term.

Unfortunately allowing long-term transport contracts on all EU border points and intra-EU cross-market points is not enough. For several Member States at least part of the gas that they consume has to be transported through other Member States before, leading to approximately 30% of European gas consumption crossing at least two Member States' borders before it reaches the place of final consumption.[28] This creates a serious challenge for structuring network access.

Take the example of a supplier buying pipeline gas from an eastern source for a member state in central or western Europe. This supplier will have to cross a number of market border points in order to deliver the gas to the market where he intends to sell it. For this supplier only a "chain" of entry-/exit transport products will provide the security he needs to underpin his long-term supply contract. At first glance this issue seems to be at odds with the principal of entry-/exit networks. On the other hand, if Europe is not structured into a single entry-/exit network (which is not foreseen in the 3rd package, in the MECOS Model and by no other source we are aware of) one has to deal with the issue of cross-market transports while of course avoiding any "captive transports" as they were practiced in many countries in the past (and to a certain extent even nowadays).

The MECOS Model therefore foresees measures to deal with long-term, long-distance transportation into and within Europe. Regarding long-distance products, these measures shall ensure, that shippers interested in long-distance transport have occasion to simultaneously book (or bid for) whole packages[29] of cross-market capacities[30] at different border points on their intended transport route while still making sure, that every cross-border point may be used separately and gas may be dropped[31] and bought on all virtual points en route.[32]

[28] Estimation based on own calculations.

[29] The packages shall be allocated for several years at once.

[30] In this process, shippers requesting a package (aka "link chain products") would either be allocated with capacity on all requested border points or with no capacity at all in order to avoid shippers having to put up with capacity fragments unusable for them.

[31] E.g. to be sold on the respective virtual point.

A completely different issue regarding secure supply patterns is the issue of redundant transport routes to a market. Some principles for this (esp. the n-1 criterion) were laid out in Regulation (EU) 994/2010. The MECOS Model devotes a brief section to this issue presenting some further thoughts on the practical realization of international network redundancy.

1.2.5 Improve by investing into pipeline capacity

A common foundation of the MECOS Model is, that every investment into pipeline capacity (new and extensions) that is economic, shall be realized. There are various economic reasons for investing into transmission pipeline capacity, the most important being:

- to connect a non-European gas source with a European market ("upstream connection");
- to connect gas markets with each other ("interconnection");
- to overcome congestion within a gas market ("intraconnection");
- to create new capacity for delivering gas to additional final customers ("downstream connection").

As can be deduced easily, all of these investments are not isolated in the sense of being objectives of their own, but they serve other objectives. That is why we consider investment a common foundation of the MECOS Model.

For instance upstream connections, inter- and intraconnections can serve the creation of a functioning wholesale market, interconnection can help to reduce price spreads between markets and downstream connections cater to the needs of physically supplying more end users. Downstream connection is insofar a special case, as it may also require investment in one or more of the other categories.

In theory we would expect widespread approval for the idea of realizing any pipeline investment that is economical in order to create markets that function better, or to align prices better, and so on.

In practice we repeatedly observed widespread disagreement on the actual implementation of investment appraisals and decisions.

Therefore the MECOS Model (while not trying to completely solve the investment conundrum) provides some hints on structuring and evaluating investment decisions in the areas of interconnection and intraconnection, both of which are of special importance to the creation of functioning markets and price alignment.

We conclude this chapter with some brief notes on the relation of "security of supply" type of investments in pipelines and "economic investments" in pipelines. At first glance, these investments appear to serve different purposes.[33] This is true only to a certain extent. Since "security of supply" driven investment creates extra capacity, it will in most cases have an impact on the market and therefore contribute to e.g. creating functioning markets or reducing

[32] To avoid any doubt: This is not a reintroduction of captive transports through the backdoor, but a reflection of the practical problems of shippers that have to cross several market borders in order to reach the market where their customers are.

[33] Since security of supply criteria as defined by Regulation (EU) 994/2010 focus on peak capacity, or cater to the needs of selected customer groups under extreme conditions. These are not necessarily the priorities of market oriented infrastructure developers.

price spreads between them. In other words: Security of supply investments creates redundancy, and redundancy increases competition.

1.3 OUTLINE OF THE MECOS MODEL

The MECOS Model rests on three pillars that share a common foundation. It aims at the creation of a number of functioning wholesale markets within the EU (together enabling easy access to all European final customers of gas) at connecting these markets tightly in order to maximize short- and mid-term price alignment between those markets, at enabling secure supply patterns to those markets and at making sure that all economic pipeline investments are done.

The following chapter is devoted to describing the instruments used by the MECOS Model in order to achieve its objectives. Unless explicitly stated, these measures are not a tool box to be chosen from but essential elements of the MECOS Model that in combination realize the stated objectives.

It is worth reiterating that this paper describes the MECOS Model as a desirable end state of the gas market architecture. The following sequence of representation of the MECOS Model's pillars and foundation does not imply that this is necessarily a sequence of implementation. On the other hand, permanently omitting one pillar would lead to a different model with different properties. If for instance the pillar of "functioning wholesale markets" would be skipped, large groups of final customers would be excluded from the benefits of functioning wholesale markets and the adoption of market coupling (which could be the capstone of price alignment as will be presented later in this section) would also be prevented for several Member States.

1.3.1 The creation of functioning wholesale markets

There are two ways of organizing the entry/exit zones that are (see above) an essential element of functioning gas wholesale markets:

1. Entry/exit zones that comprise a number of transmission and distribution systems in a single balancing zone (termed "market areas" in the rest of this document).
2. Entry/exit zones that comprise a number of transmission systems in a single balancing zone which in turn is closely linked to one or several end user zones with their own balancing systems (this model will be termed "trading region model" in the rest of this paper).

Both of these models feature a virtual point (or "hub") where changes of ownership can be effected. Both of these models fit perfectly well into an overall picture of hub-to-hub-trading based on large hubs as has been discussed for a while now in the regulatory community.

The MECOS Model incorporates these two models as options that may co-exist in Europe. They may be chosen at will in the course of implementation with some need of regional consistency. European consistency is not required though. Markets that implement the market area model can be connected perfectly well with other markets that are organised according to the trading region model.

1.3.1.1 The market area model

In the market area model transmission and distribution networks that are situated in the same geographical area and that are well interconnected, are forged into a single entry/exit system.[34]

From a structural perspective this entry/exit system (i.e. the market area):

- stretches from the entry points into the combined systems to the end user exit points on those systems; and
- integrates distribution systems[35] into the joint entry/exit area (likely involving some cost allocation from TSOs to DSOs and requiring DSOs to send allocation data to the market area balancing entity so that balancing accounts can be settled); and
- features a single virtual point being a fictitious point in the market area where all gas that has entered the market area and that leaves the market area is accounted for and changes of ownership can be effected; and
- does not support any other place than the single virtual point of the market area for changes of ownership (i.e. no flange trading) with the exception of flange trading at EU import points; and
- features a single balancing system[36] with a single balancing entity and a single set of balancing rules for the whole market area (i.e. regarding: balancing period, prices for balancing energy, tolerances, rights and obligations of shippers regarding the management of their balancing accounts, …); and
- is based on a single set of rules for the measuring of (a) final customer consumption and (b) the exchange of gas with other markets and storage; and
- is based on a single set of rules estimating small final customer consumption during the year (i.e. standardized load profiles) and the treatment of related estimation errors.

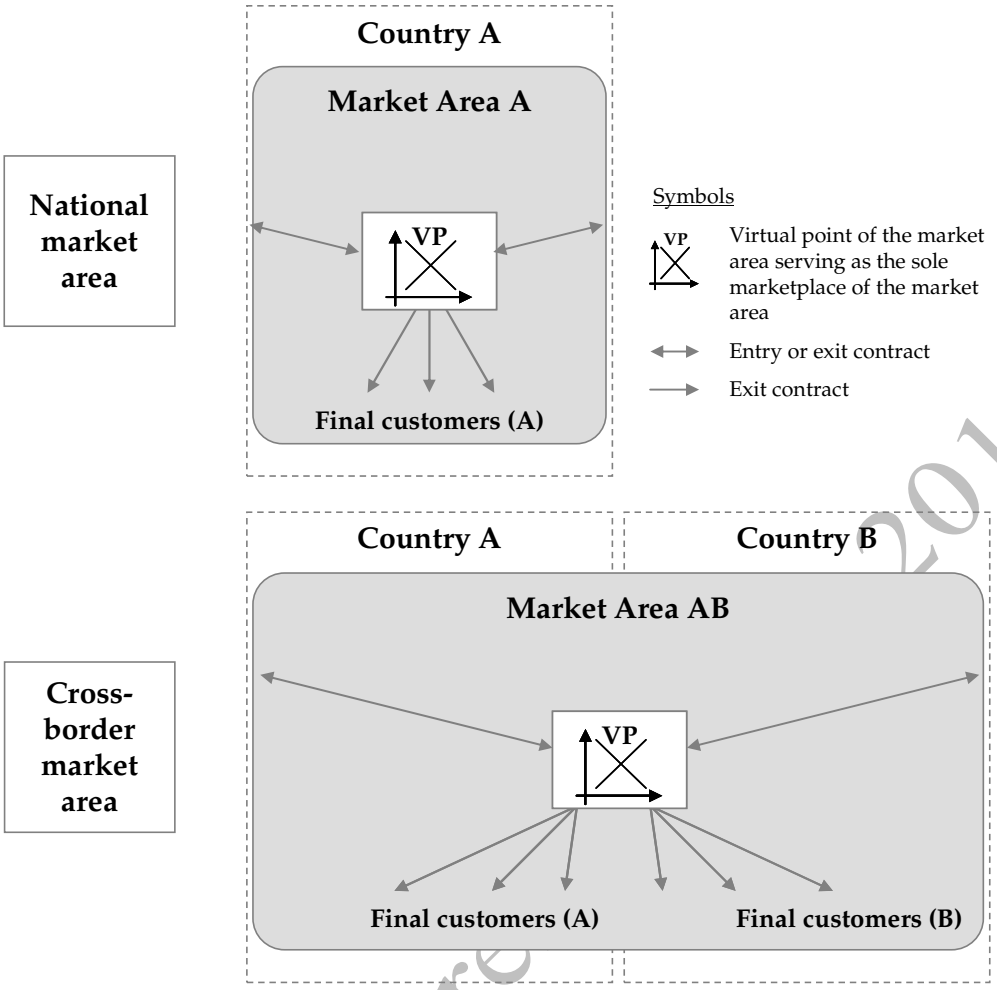
In the market area model the virtual point of the market area would be the focal point of the wholesale gas market.

The market area model can be implemented within a member state or cross-border. The following graph visualizes one scenario where a member state implements a (one) national market area and a second scenario where two adjoining Member States implement a cross-border market area.

[34] To avoid and doubt: The market area model (as well as the trading region model) does not prejudice any choice of unbundling model.

[35] These obligations of distribution system operators can not be achieved based on the current EU legislative framework alone. Therefore, the creation of a market area (as of a trading region) requires additional, e.g. national legislative action.

[36] To avoid any doubt: In the market area model the entry/exit system reaches from entry points to all exit points including exit points to final customers on TSO and DSO networks and is therefore identical to the balancing zone.



The structural description above underlines that market areas can be realized better within a single jurisdiction (i.e. member state), and that creating cross-border market areas that span more than one member state requires substantial legal alignment between the participating countries.

Therefore the market area model might be considered the model of choice for larger Member States, where especially the gas consumption is large enough to create functioning wholesale markets within their own borders.

This does not mean that Member States with smaller gas consumption may not implement the market area model. They only have to be aware that the following cross-border merger of their market area with other Member States, that will normally be required in order to enable a functioning wholesale market, necessitates alignment of national legislation and the agreement on a single entity[37] for balancing all final customers in the cross-border market area. Ensuring proper legal protection for the citizens of all participating Member States and establishing clear regulatory competence are special challenges regarding such common balancing entities. Summarizing, the creation of a cross-border market area is likely an onerous and time consuming process.

[37] For some Member States also the issue of different currencies would have to be dealt with.

1.3.1.2 The trading region model

The trading region model picks up on the difficulties of cross-border market areas. It reduces the requirements of legal coordination between participating countries as much as is possible while still creating a functioning gas wholesale market. In the following text, the trading region model is thus described in the context of a cross-border application.

In a cross-border trading region the TSOs of a number of Member States establish a common entry/exit zone on the level of their transmission systems (the eponymous trading region) with closely connected national end user balancing zones (each comprising all final customers of the respective member state), with entry/exit zone and end user zones sharing the same virtual point.[38] In other words, the trading region is put on top of the national end user balancing zones to serve as a common wholesale market for all Member States being part of the trading region.[39]

From a structural perspective the cross-border trading region model:

- creates a trading region as an integrated entry/exit system that stretches from the entry points into the participating transmission systems (crossing several countries) to virtual exit points[40] to each national end user zone; and
- integrates distribution systems[41] into the respective national end user (exit) zone (possibly but not necessarily[42] involving some cost allocation from TSOs to DSOs and requiring DSOs to send allocation data to the national end user zone balancing entity so that balancing accounts can be settled); and
- features a single virtual point that is shared by the trading region and all attached national balancing systems and where changes of ownership and the accounting of gas flows in the trading region as well as to the national end user zones are effected; and
- does not support any other place than the single virtual point of the trading region for changes of ownership (e.g. flanges or further virtual points in the end user zones) with the exception of flange trading at EU import points; and
- structures the trading region as a fully nominated[43] system involving a trading account kept per shipper to ensure an even balance of his nominations in the trading region; and

[38] To avoid and doubt: The trading region model (as well as the market area model) does not prejudice any choice of unbundling model.

[39] In the straightforward case, where no final customers are directly connected to transmission systems, the trading region would simply be a joint entry/exit network including the transmission systems of the participating TSOs.

[40] The capacity from the trading region to an end user zone is automatically allocated to shippers in the course of the change of supplier process in the end user zone (→ capacity backpack; i.e. no booking required).

[41] These obligations of distribution system operators can likely not be achieved based on the current EU legislative framework alone. Therefore, the creation of a trading region (as of a market area) requires additional, e.g. national legislative action.

[42] An alternative to allocating the cost for the virtual exit down to DSOs would be to charge it directly to the shipper. This would be possible in the trading region model because the amount of exit capacity from the trading region to each end user zone that is allocated to each shipper is known in this model.

[43] Including the implementation of allocation according to the "allocated as nominated" principle also known as "allocation by declaration".

- assigns all national final customers to national end user balancing zones ("end user zones") that may be operated by a national balancing entity according to national balancing, SLP and metrology regulations;[44] and
- allows the shifting of gas from the trading region to an end user zone via a single (i.e. bundled) nomination at the common virtual point.[45]

In the trading region model the virtual point of the trading region would be the focal point of the wholesale gas market.

Since the trading region model is an innovation in the ongoing discussion, some additional remarks are in order:

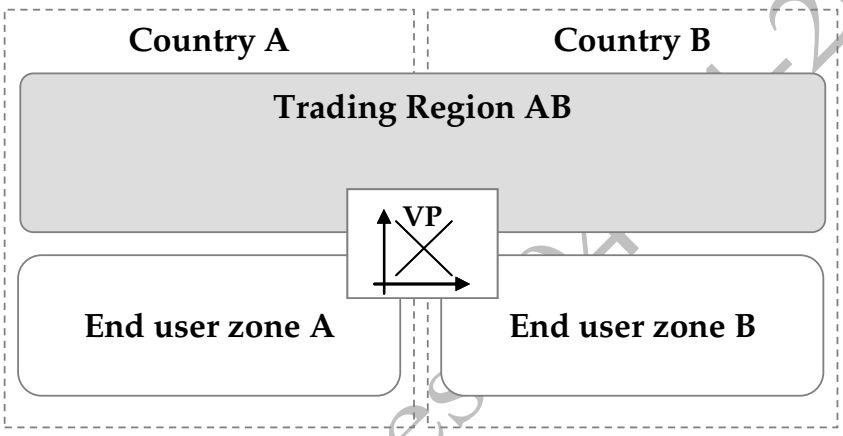
- The trading region model does not withstand the harmonization of national balancing regulations or the mandating of common cross-border end user balancing entities. But – as opposed to cross-border market areas – it does not depend on it.
- There are various ways to structure trading regions in detail (see an example below). The most important principle in creating a trading region is to merge the wholesale market horizontally across several markets with separate national end user balancing zones that are closely connected (via a virtual exit) to the trading region.
- There are two ways to organize roles in the trading region itself. In one model, the involved TSOs establish a central balancing operator for the trading region. As in the cross-border market area model, such cross-border entities raise some (but fewer) questions of legal alignment among the involved Member States. In the second approach all (interested) TSOs offer to keep an account (the "trading account") for the shipper in the trading region and effect the necessary exchange of information in the background based on cooperation contracts. The second model appears feasible because the trading region is a fully nominated (aka allocated as nominated) system; balancing of shippers' imbalances involving the use of system energy is therefore not required. Problems due to the interruption of capacity in or out of the trading region can be sorted out between the TSO who interrupted the capacity and his customer, the shipper, or alternatively by the TSO chosen by the shipper for "balancing" his transports in the trading region.
- The choice of the national end user balancing entity involves a degree of freedom for implementation. It would be expected that Member States task TSOs at least with the physical balancing of the national end user zones. The keeping and settling of the balancing accounts for the national end user zone may be tasked to another entity. If another entity is mandated with that task, it will require close cooperation with the national TSO(s) in order to account for the use of system energy for purposes of the national end user zone.
- The trading region model foresees that all final customers in a member state – including those connected to transmission systems – are balanced in the national end user zone. This raises the legal question, if not every final customer that is connected to a TSO system must also be balanced by that TSO? In that regard Regulation EC

[44] Some harmonization of the balancing regime (e.g. the gas day) is still in order, even if the trading region model is applied.

[45] This nomination would designate the shippers trading account (an instrument kept for every shipper to ensure that his nominations balance to zero in every hour) as the source and the shippers balancing account (in the respective national end user zone) as the sink.

715/2009 stipulates in Article 1 (4): "*The Member States may establish an entity or body set up in compliance with Directive 2009/73/EC for the purpose of carrying out one or more functions typically attributed to the transmission system operator, which shall be subject to the requirements of this Regulation*." Therefore we see no legal obstacle in mandating a special entity for the balancing of all national final customers, even if they are connected to transmission systems.
NB: From a physical perspective the inclusion of final customers attached to TSOs' systems into the balancing mechanism of an end user zone is fairly trivial. It simply means that the exits to those final customers are integrated into the virtual exit to the end user zone and thereby into the competence of the end user zone balancing entity and its usual balancing activities. The rest is only an issue of proper bookkeeping of gas in the trading region.

The following graph visualizes the trading region model in a cross-border application:



Legend and Symbols

Trading Region AB = Cross-border entry/exit system including all nominated points on the transmission systems of countries A and B

End user zone = National balancing zone for national final customers, no matter the system (distribution or transmission) they are connected to

Virtual point of the trading region serving as the sole marketplace of the trading region and the attached end user zones. Shifting of gas between trading region and end user zone is done by nominating a virtual exit on the VP.

Since the capacity on the exit points from the trading region to the end user zones is allocated in the course of the change of supplier process, the switch from the trading region to an end user zone poses no market entry barrier for retail competitors[46]; instead it is a simple technicality in the nomination management processes. Therefore we expect the impact of the trading region model on retail competition on the same level as with the market area model.

As can be seen from the structural description above, the trading region model entails lower realization hurdles than the market area model, if – in order to achieve a functioning wholesale market – the wholesale markets of a number of Member States have to be consolidated.

Therefore the trading region model might be considered the model of choice for Member States with smaller gas consumption, not big enough to host functioning wholesale markets

[46] The national requirements for supplying end users have to be fulfilled in the different Member States.

within their own borders. This does not mean that larger Member States may not implement the trading region model. The rationale for this would require scrutiny though.

Of course, nothing in the trading region models prevents a group of Member States that went for a trading region model in the first place (in order to speed up the development of a functioning wholesale market) to evolve their model into a full merger based on the market area model in a second step. Nevertheless, before this step is actually taken, the additional cost and benefits should be evaluated carefully.

1.3.1.3 National/regional policy options for the creation of functioning markets

How can Member States that do not host a functioning wholesale market yet utilize the two models for the creation of functioning wholesale markets? They can either:

- wherever this is possible create market areas that fulfil the criteria for functioning wholesale markets within the borders of their own country (this may require investment in order to improve interconnection with other European or non-European markets); or
- act jointly with adjoining Member States in creating trading regions that fulfil the criteria for functioning wholesale markets; or
- act jointly with adjoining Member States in creating merged market areas that fulfil the criteria for functioning wholesale markets; or
- accede (based on mutual consent) to the market area of a neighbouring country that has already succeeded in creating a functioning wholesale market within its own borders.

1.3.1.4 Two parallel concepts for the creation of functioning markets in Europe?

The question may be raised, whether the co-existence of the market area and the trading region model in Europe is an obstacle to market integration rather than an asset?

In our view, the trading region model is a clear asset. It:

- has the potential of substantially speeding up the development of functioning wholesale markets;
- can be evolved into fully merged market areas in a second step after all problems (especially legal alignment and legal protection) regarding this matter have been solved;
- makes no difference in the methods (see next section) that may be used for market connection. Every single one of the methods described in the respective chapter of this paper that works between two market areas also works between a market area and a trading region or between two trading regions;
- does not require much differentiation in framework guidelines and the ENTSOG netcodes (e.g. all provisions regarding cross-border capacity, gas quality, network connection, interoperability, etc. will be identical for both models).

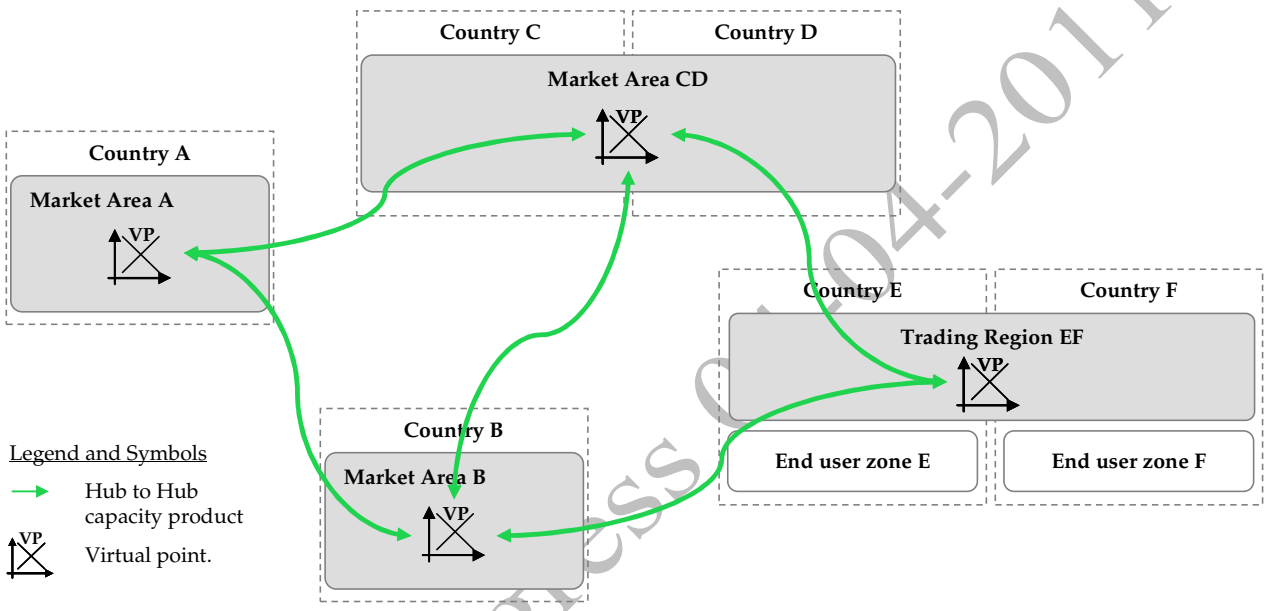
1.3.2 The connection of markets

In order to achieve the maximum degree of short- and mid-term price alignment possible, markets have to be connected as tightly as the given transportation capacity between markets allows.

The connection of markets takes place between the transmission systems of adjoining markets using the (at any time) existing interconnection capacities. The methods used for connecting

(and the results achieved for price alignment) are the same, no matter if the markets to be connected are organised according to the market area or the trading region model (or mixed). This is due to the fact that the connection always takes place between the two (or more, if more markets are involved) virtual points using the existing physical interconnection capacities. Now, since the virtual points are the "location" of the markets,[47] market connection is achieved in both cases.

The following graph shows connections between adjoining markets that are organized according to different principles. It has to be reiterated, that this picture would only display a proper application of the MECOS Model, if each of the connected markets qualified as a functioning wholesale market.



When it comes to connecting markets, one has to consider, that the gas market is not one but several markets that exist simultaneously along the time axis.

For simplicity we split the gas markets into the following time segments:

1. Long-term market (i.e. more than 4 years ahead)
2. Mid-term market (from more than 1 year to maximum 4 years ahead)
3. Short-term market (from two days ahead to maximum 1 year ahead)
4. Day ahead (spot) market
5. Intra day (spot) market

[47] Remember that „market" is used as an abbreviation for "wholesale market" in this paper.

For price alignment we focus especially on the time segments 2 through 5. As was already discussed in this paper, the issue of long-term (and long-distance) transport poses special challenges and is discussed in a separate chapter (see below).

Regarding the means to achieve price alignment there are two essentially different ways to connect markets that may be applied differently on different time segments.

a) Cross market supply and trading by shippers

b) Market coupling

In the following chapters these means ways will be defined and described.

The following table lists the market connection method foreseen in the MECOS Model per time segment of the gas market (excluding the long-term market for reasons given above).

Time segment	Connection Method
Mid-term market	Cross-market supply and trading fostered by enhanced supply and trading conditions
Short-term market	Cross-market supply and trading fostered by enhanced supply and trading conditions
Day ahead (spot) market	Market Coupling[48] *As long as market coupling is not implemented:* Cross-market supply and trading fostered by enhanced supply and trading conditions
Day ahead (spot) market – remaining capacity[49]	Cross-market supply and trading fostered by enhanced supply and trading conditions
Within day (spot) market	Cross-market supply and trading fostered by enhanced supply and trading conditions

1.3.2.1 Cross-market supply and trading by shippers

The theory behind connecting markets by cross-market supply and trading effected by shippers is, that traders will always be inclined to do a cross-market deal. if the deal is economical, and they are given the opportunity to (more or less) safely do so. The more of these deals are done, the more the price differences between the affected markets will vanish.

We explicitly include supply activities here, because price alignment will be furthered by any activity of buying gas in a lower price market, shipping it to the higher price market and selling it there, even if the gas is directly sold to final customers in the higher price market.

Of course (as was the case with functioning markets above) suppliers and traders can not (and shall not) be forced to do cross-market deals. But again, structural conditions can be put in

[48] The implementation of market coupling is subject to conditions, see the respective chapter below.

[49] I.e. not required by a market coupling process (after its implementation) because full price alignment was achieved without fully using the available day ahead capacity in the market coupling process.

place that make it safer and easier for suppliers and traders to do such deals. We term these structural conditions "enhanced supply and trading conditions" or "ESTC".

At lot of the issues regarding the establishment of ESTC are already being addressed by the currently ongoing framework guideline process and the CMP annex to Regulation EC 715/2009 undergoing comitology at the time of writing this paper.

Among those, the most important principles regarding ESTC in the context of the MECOS Model are:

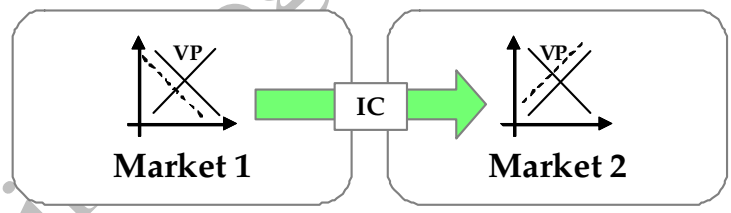
- The implementation of hub-to-hub capacity products between the virtual points of the market areas and trading regions.
- The implementation of efficient capacity allocation mechanisms.
- The harmonization of essential elements of the balancing system[50] (e.g. the gas day used for balancing and capacity products).

1.3.2.2 Market Coupling

When it comes to market coupling, the connection of markets is effected by an administrative process that, acting as a principal arbitrageur between markets, is vested with special powers (especially monopoly access to some or all interconnection capacity of a time segment) in order to effect an "as much as is possible" connection of markets and thereby price alignment for the respective time segment of the market.

There are various ways of organising this administrative process (price or volume coupling, etc.) including in relation to the allocation of roles between the participating TSOs and gas exchanges. An in depth discussion of this goes beyond the scope of this paper.

The following graph provides a brief introduction to market coupling.



- Markets (organised as exchanges on the virtual point) are connected by an administrative process in the course of which gas is bought in the cheaper market and sold in the pricier market with the goal of price alignment and within the capacity limits of the interconnection capacity available to the administrative process.
- A central design element is the amount of capacity made available to the administrative process.

Legend and Symbols

IC	Interconnection capacity between markets
	Virtual point of the market

[50] Note that from a perspective focusing on fostering cross-market trading, the amount of harmonization to be done in the balancing system is much smaller than from the perspective of creating market areas.

The implementation of market coupling has a number of prerequisites, the most notable being the existence of viable and resilient (i.e. liquid) wholesale spot markets operated by gas exchanges in both markets. These exchanges must operate on the same schedule and deploy largely harmonized contract specifications, what in turn requires some of the balancing rules in the connected markets to be harmonized (especially the gas day, its time basis and the use of daylight saving time).

The application of market coupling in the MECOS Model is another reason, why functioning wholesale markets are an essential element of the model. Without a functioning wholesale market, market coupling with its substantial price alignment merits would not be an option.

For a number of reasons we conclude, that market coupling is only an option for the short-term (i.e. spot) end of the market. The most important of these reasons being the apparent negative selection[51] by market players of exchange organised futures markets at least in some markets, leading to far lower liquidity on these markets than on spot markets.[52] Well, and without much liquidity in these markets, market coupling is not even an option for time segments with delivery further ahead than day-ahead spot markets.

Therefore, the MECOS Model foresees market coupling only for spot markets. An interesting question is, whether market coupling should be implemented for the day-ahead market only or also for a potential within day market? The answer to this is quite straightforward. If there is a liquid within day market (e.g. organised as a "balance of day" market) then market coupling can and should be implemented in order to improve price alignment even further. Since achieving liquid within day markets can be quite hard,[53] we do not elaborate further on this question.

Another interesting question regarding market coupling is, how much (if any) capacity shall be reserved for the coupling process. A detailed analysis of this goes beyond the scope of this paper. One thing in that regard is already clear though: If market coupling is applied for coupling the day ahead spot markets, then all capacity that is technically available and not required by shippers should be used for market coupling in order to maximize the price alignment effect. The legitimate interest of shippers being party to a longer-term transportation contract to not fully lose their renomination rights[54] should be considered when implementing this policy.

Two further merits of market coupling deserve mentioning.

For one thing, as can easily be shown by arbitrage arguments, price alignment in spot markets also drives price alignment in forward markets. Therefore, market coupling need not be implemented for all time segments in order to foster price alignment on the whole price forward curve. For the MECOS Model we assume that price alignment in spot markets suffices to create satisfactory price alignment in the forward markets as well.

For another thing, market coupling most effectively inhibits any conceivable scheme by market participants to influence market price differentials by not using cross-market capacity they purchased by FCFS or by auction. If the market coupling process is endowed with (basically)

[51] Instead, market players seem to favour OTC deals.

[52] Where such markets exist at all.

[53] Which is the reason why within day markets are not a core element of the MECOS Model; they would fit in nicely though.

[54] Which they may require to react on changes in their load e.g. due to changes in weather conditions.

all unused capacity, the process will always use it as long as more price alignment can be achieved. A prior restraint by market participants on the use of capacity would therefore be rendered ineffective.

Concluding, market coupling has a number of prerequisites that will take time to realize, especially when it comes to the prerequisite of functioning spot markets for all Member States (or groups thereof, forming e.g. a joint trading region). From then on, it can contribute significantly to price alignment between markets, and even (where there is sufficient capacity) achieve full price alignment.

Although the theoretical benefits of market coupling are evident there is currently a lot of uncertainty about the optimal design and the resulting cost/benefit ratio of market coupling for gas. Therefore, before market coupling is considered an official element of the gas target model, pilot studies on market coupling should be conducted. In such studies alternative designs of market coupling (e.g. based on auctioned spot markets or on continuously traded spot markets) should be tried out. Also the issue of reimbursement of TSOs for capacity they provide to the market coupling process against a congestion charge[55] (which may be lower than the regulated tariff) needs to be addressed.

If the pilots prove that the theoretical benefits of market coupling can also be realized in practice, market coupling should be made an element of the gas target model.

1.3.3 The enablement of secure supply patterns

1.3.4 The implementation of economic investments

Please be aware that we also work on what we call "the enablement of secure supply patterns" – which will discuss long term and long distance transport, security of supply investments, implementation of economic investments (in interconnectors, intraconnectors).

[55] The congestion charge is basically the profit made by the arbitrage process from buying in the cheaper market and selling in the pricier market.

2 ABBREVIATIONS

Abbreviation	Explanation
ACER	Agency for the Cooperation of Energy Regulators
aka	Also known as
bcm	Billion cubic meters
CAM	Capacity allocation management
CMP	Congestion management procedures
DSO	Distribution system operator
DST	Daylight saving time
ENTSOG	European Network of Transmission System Operators for Gas
ERGEG	European Regulators' Group for Electricity and Gas
ESTC	Enhanced supply and trading conditions
FCFS	First come, first served
FWG	Framework guidelines
MWh	Megawatthour
NRA	National regulating authority
OTC	Over the counter
SLP	Standardized load profile
SoS	Security of supply
TPA	Third party access
TSO	Transmission system operator
UIOLI	Use it or loose it
UTC	Universal time coordinated

3 GLOSSARY

Term	Explanation
Netcodes	The European transmission netcodes to be drafted by ENTSOG based on the framework guidelines provided by ACER.
Shipper	A company or individual contracting capacity on a gas transmission system.
Spot Market	Markets (OTC or exchange) for standardized gas products that are delivered at the day of the trade or one or two days thereafter (in case of weekends and bank holidays the time period between the trade and actual delivery may extend to a few days).
Storage	Means as defined in DIRECTIVE 2009/73/EC: "'storage facility' means a facility used for the stocking of natural gas and owned and/or operated by a natural gas undertaking, including the part of LNG facilities used for storage but excluding the portion used for production operations, and excluding facilities reserved exclusively for transmission system operators in carrying out their functions"
Wholesale market	The OTC or exchange based market where wholesalers buy (and other wholesalers sell) gas in order to be resold (e.g. to final customers). Large so called "self-trading" final customers (e.g. a large steel producer) may also participle in the wholesale market.
Wholesaler	A company or individual active on the wholesale market.