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Improving gas transmission network regulation in Ukraine by implementing Energy Community rules - a tailor made proposal

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Improving gas transmission network regulation in Ukraine by implementing Energy Community rules - a tailor made proposal

Executive Summary

Gas transit through Ukraine and gas imports by Ukraine are decreasing. The pipeline system is ageing and the current regulatory framework does not meet the European standards. In this context, the current organisation of the Ukrainian gas transmission system is revealing its substantial weaknesses: The high degree of government intervention in determining access conditions and tariffs is scaring off (potential) users and the lack of a sufficient and predictable income stream prevents long-term investments into the infrastructure. One key question when discussing reforming the regulatory framework is how gas transmission tariffs are structured and determined. The tariffs determine the business case for the operator and provide incentives for modernisation and efficient operation.

To enable efficient usage and investments into the infrastructure we suggest that Ukraine should transpose the 'entry-exit system' – which is obligatory in the EU. This will provide an anchor for a credible regulatory framework that will help to encourage investments and continued usage of the transit system. It fulfils the commitments required by its membership in the Energy Community and allows Ukraine to become an integral part of the European energy market in the longer-term. Furthermore, if properly implemented, the 'entry-exit system' represents a significant improvement over the current Ukraine situation in all aspects of gas transmission (third party access, transparency, investment incentives, …).

In all EU member states the implementation of the entry-exit system differs according to national specificities. The Ukrainian gas transmission network will also require very specific provisions to (1) take into account that transit and transmission are interwoven. (2) That too low transit revenues are politically unacceptable, while too high transit tariffs or the risk of political interference in the transit system might encourage the construction of by-pass pipelines by Gazprom. (3) That the system is in need of investment.

Accordingly, we propose to split Ukraine's gas transmission system into two market areas that are to be separately privatised. The first market area comprises the entry-points from Russia and is essentially a vehicle for generating predictable transit revenues. It could hence be sold to a financial investor, which would be allowed to recover its acquisition-price through regulated tariffs. The second market area would be a 'normal' market area comprising all other parts of the transmission system. An independent system operator will decide on investment and operation. Tariffs, investments and access conditions will have to be approved by an independent regulator.

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1. Motivation

Ukraine's natural gas transmission system is one of the most valuable infrastructure assets for the country. The pipeline system serves three main purposes: (1) transit of gas from the Russian border to the Western borders, (2) connecting domestic natural gas consumers and producers and (3) enabling the import of natural gas. In the future, a fourth purpose – exporting Ukrainian gas – might be added. In addition, the substantial gas storage capacity of Ukraine creates value by flattening seasonal demand patterns.

The gas transmission system operator Ukrtransgaz employs 28,000 persons and had a total turnover of UAH 15.7 bn in 2013. This corresponds to 1.1% of GDP. But, the turnover might underestimate the importance of the gas transmission system as the tariffs for gas transmission services are comparatively low - in 2013 they were 93.90 UAH/tcm (2013: 11.50 USD/tcm), compared to 10 USD/tcm in the much smaller Slovakian system (see Box 3). For gas transit the tariffs were set in the 2009 agreement– jointly with import prices – for ten years. As the agreement emerged after Russia stopped gas supplies in the middle of winter, its terms (~2 USD/tcm/100km) are seen as very unfavourable for Ukraine[1]. Consequently, the nominal transit tariff terms might understate the value of the service. The tariffs for gas transport to domestic customers are also likely to understate the value of this service - as they are below the cost of corresponding services in other European countries.

But, the importance of the gas transmission system is declining. Gas transit through Ukraine has been steadily falling. While in 2004 137.1 bn cubic meters (bcm) of gas were transited through Ukraine, in 2013 only 86.1 bcm flowed through the country. And should the South Stream pipeline and/or the third and fourth branch of the Nord Stream pipeline be completed in the future, Russia could entirely bypass Ukraine as a transit country. This could translate into a substantial reduction in gas transit volumes and transit tariffs. Furthermore, domestic gas transmission is shrinking as natural gas demand has been continually falling from 76.3 bcm in 2003 to 50.4 bcm in 2013. This also implies that gas imports are declining.

In this context, the current organisation of the Ukrainian gas transmission system is exposing its substantial weaknesses: The high degree of government intervention in determining access conditions and tariffs is scaring off (potential) users, the lack of a sufficient and predictable income stream prevents long-term investments into the infrastructure, and the lack of incentives impede the necessary adaptation to potential changes in usage profiles (e.g., from importer to exporter, from transit country to balancing provider).

A reform of the organisation of gas transmission is not only economically sensible to overcome these weaknesses. It is also required by the commitments Ukraine engaged in vis-à-vis the Energy Community and the European Union. Both, the Energy Community Treaty and the Association Agreement[2] foresee that Ukraine reforms the regulation of its gas transmission system (see Box 1).

Finally, a reform of the regulatory system is also called for by the need to attract investments into the aging infrastructure. Official estimates put the cost of modernising the transit system at USD 3-5.5 bn.[3] The state of Ukraine public finance will make it difficult to finance such a modernisation only with own resources. Correspondingly, the

[1] Pavel and Naumenko (2009).

[2] For example, Article 273 of the Association Agreement stipulates that "As regards transport of electricity and gas, in particular third party access to fixed infrastructure, the Parties shall adapt their legislation, as referred to in Annex XXVII to this Agreement and in the Energy Community Treaty [of 2005], in order to ensure that the tariffs, published prior to their entry into force, the capacity allocation procedures and all other conditions are objective, reasonable and transparent and shall not discriminate on the basis of origin, ownership or destination of the electricity or gas."

[3] www.naftogaz.com/www/3/nakweb.nsf/0/3375A8575C8884D0C22571010035B9D2

Verkhovna Rada on 14.08.2014 approved a law to reform Ukraine's gas transportation system which enables a minority ownership of the gas system operator and the gas storage operator by Western investors.

So there is ample reason for a deep reform of the regulation of the gas transmission system of Ukraine. One key question when discussing reform is how gas transmission tariffs are structured and determined. The tariffs determine the business case for the operator and provide incentives for modernisation and efficient operation. In this paper we want to elaborate how such tariffs might be designed based on international experience and taking into account the international commitments of Ukraine and the specificities of the gas transmission system in Ukraine. In the next section we will present how gas transmission systems are regulated in the EU. This is important, both, to benchmark which arrangements might be best suited and as Ukraine has to implement EU legislation under the Energy Community Treaty and the Association Agreement. In the subsequent section we will present the regulatory choices Ukraine has and will discuss which options will be in the best interest of the country. We conclude with policy recommendations.

Box 1: The Energy Community

The Energy Community, established in 2005, is based on a Treaty signed between the European Union on the one hand, and Contracting Parties from South-Eastern Europe on the other (European Council, 2006). Its objective is the creation of an integrated energy market based on a stable regulatory and market framework, where competition can develop and supply security be improved. Contracting Parties commit to harmonize their regulation with European standards by implementing the relevant EU Regulations and Directives. The objective is thus to create open and transparent national energy markets in the first step, and to then fully integrate the Contracting Parties' markets into the EU Internal Energy Market in the longer-term. Ukraine joined the Energy Community with effect from February 2011.

Unlike other existing regional initiatives of cooperation, the Energy Community is built on an international treaty, which in turn creates an institutional framework for legally enforceable rules. Contracting Parties committed themselves to implement the provisions of the EU's Second and – recently also Third – Energy Package. Different studies investigating past achievements of the Energy Community, however, identified a wide gap between political commitments and the full implementation of the respective legislation and enforcement of the rules adopted (see EC, 2011; Dixi Group, 2014). So far, open, transparent and competitive national energy markets for all Contracting Parties have not yet been achieved. Necessary secondary rules complementing new legislation, as well as supervision and enforcement mechanisms are often missing.

2. Regulatory approach in the EU

2.1 Background: The EU's Third Energy Package

The Third Energy Package (see also Box 2), adopted by the EU in 2009, aims at completing the internal energy market.[4] Major reforms include the strengthening of national regulators' powers and independence, the implementation of stricter unbundling rules for grid and storage operators in order to ensure an effective separation of system operation and competitive activities, as well as the enhancement of market transparency. Moreover, ACER, the agency for the cooperation of energy regulators has been established as a new body to coordinate regional and cross-border issues. And all

[4] For details see: http://ec.europa.eu/energy/gas_electricity/legislation/third_legislative_package_en.htm

transmission system operators (TSOs) shall cooperate within ENTSO-G, the European network of gas TSOs.

Box 2: The EU's Third Energy Package and gas-related legislation

The process of liberalizing energy markets in the European Union (EU) started with the adoption of the first Directives concerning common rules on the internal market for electricity (in 1996) and gas (in 1998), and continued with a more ambitious package of legislation adopted in 2003. Industry restructuring and regulatory mechanisms provided so far, however, did not show the expected development of competition. A sector inquiry launched by the European Commission revealed that insufficient separation of network activities from energy supply and production did result in discrimination against new market entrants. National regulators did not have sufficient independence to carry out their duties.

With the EU's so called Third Energy Package, adopted in 2009, therefore, a number of new Regulations and Directives aim at further opening up energy markets. For the gas sector this concerns:

Directive 2009/73/EC (Gas Directive) "concerning common rules for the internal market in natural gas" aims at introducing common rules for the transmission, distribution, supply and storage of natural gas. It lays down the rules related to the organization and functioning of the gas sector, access to the market, the criteria and procedures applicable to the granting of authorizations for transmission, distribution, supply and storage of natural gas, and the operation of systems.

Regulation 715/2009 "on conditions for access to the natural gas transmission networks" aims at setting non-discriminatory rules for access conditions to natural gas transmission systems and storage facilities. Harmonized principles for tariffs (or methodologies of their calculation) for grid access, as well as for capacity allocation, congestion management and balancing, are defined.

Network Codes on capacity allocation and congestion management, on balancing, on system operation, interoperability and data exchange rules, and on harmonized transmission tariff structures turn regulatory policies into operational rules.*

**currently still under development*

2.2 Mandatory regulatory requirements

With the implementation of the Third Energy Package, Member States have to adapt and to a certain degree also to harmonize their regulation of the natural gas sector. Some provisions allow for different implementation options (see Section 2.3), while the key elements below are mandatory.

2.2.1 Creation of a strong and independent national regulatory authority

The independence of energy regulators is strengthened. Each country shall designate a single national regulatory authority (NRA) and shall guarantee its *full independence*. This implies that the regulator is a legally distinct entity which can take autonomous decisions, which has authority over its own budget, and which has sufficient human and financial resources to carry out its duties. Regulators should be truly independent, not only from industry interests but, with respect to their day-to-day operational decisions also from governments. Thus, staff shall act independently from any market interests and shall not take direct instructions from any policy maker. The management of the NRA should be appointed for a five up to seven year term, with not more than one renewal.

In addition, also the *powers and duties* of NRAs are strengthened. Duties include fixing or approving transmission and distribution tariffs (or respectively the methodologies according to which these are calculated), avoiding any cross-subsidies between gas

transmission and supply activities, and monitoring transparency and wholesale/retail prices, market opening, competition, congestion management and system operators' investment plans. Regulators will be able to issue binding decisions on companies, to take appropriate measures in cases of insufficient market functioning and to impose penalties on companies that do not comply with their legal obligations or with decisions from the regulator, or that exhibit discriminatory behaviour in favour of vertically integrated undertakings.

2.2.2 System operation: Unbundling of transmission and production/supply activities

The European liberalization process, from its beginning, recognized the importance of unbundling (i.e. the separation of network activities from production and supply activities) as a major prerequisite to allow for non-discriminatory access to essential infrastructures, and thus also to markets. With the Third Energy Package, stricter rules on unbundling have been introduced in order to ensure an effective separation of system operation and competitive activities. Competition authorities had observed that solely legal and functional unbundling was not sufficient to ensure that a network operator was not influenced by the interests of the related supply subsidiary. European policy therefore follows the philosophy that any ownership link between network operator and supply companies needs to be cut.

Access to the transmission system needs to be granted based on published tariffs and in a non-discriminatory manner. Those tariffs, or the methodologies underlying their calculation, have to be approved prior to their entry into force by the respective national regulatory authority.

2.2.3 System operation: Unbundling of storage system operators

The Gas Directive also facilitates access to gas storage facilities through the introduction of legal and functional unbundling of storage system operators from any activities not related to transmission, distribution, and storage.[5]

Access to storage facilities and line-pack capacities[6] needs to be granted. Thereby, it is left to the Member States to determine whether a negotiated or regulated access regime is implemented. In any case, the system chosen has to be objective (criteria for access relate to the characteristics of the storage facilities), transparent (criteria for access are published ex-ante) and non-discriminatory (storage system operator provides the same objective service on equal terms to all customers, whether affiliated undertakings or third parties).

2.2.4 Transmission grid tariff design: Entry-exit model

With the Third Energy Package, an obligatory, EU-wide, decoupled entry-exit model for transmission grid access has been introduced in order to enhance efficient gas trade. The calculation of network charges on the basis of the contractual paths (so called "point-to-point model") won't be allowed anymore. Compared to the earlier distance and path-dependent regimes, today's entry-exit model was motivated by the objective to improve system transparency, trading flexibility for shippers, and cost-reflectiveness of grid tariffs.

The core of the entry-exit model is the definition of *market areas*, also called "entry-exit zones", which may correspond to a whole country or to smaller regions. Natural gas enters the grid at any *entry point* (e.g. interconnection points where gas arrives from

[5] Excluded from these provisions are storage facilities being exclusively reserved for transmission system operators in carrying out their functions, as well as those used for production operations.

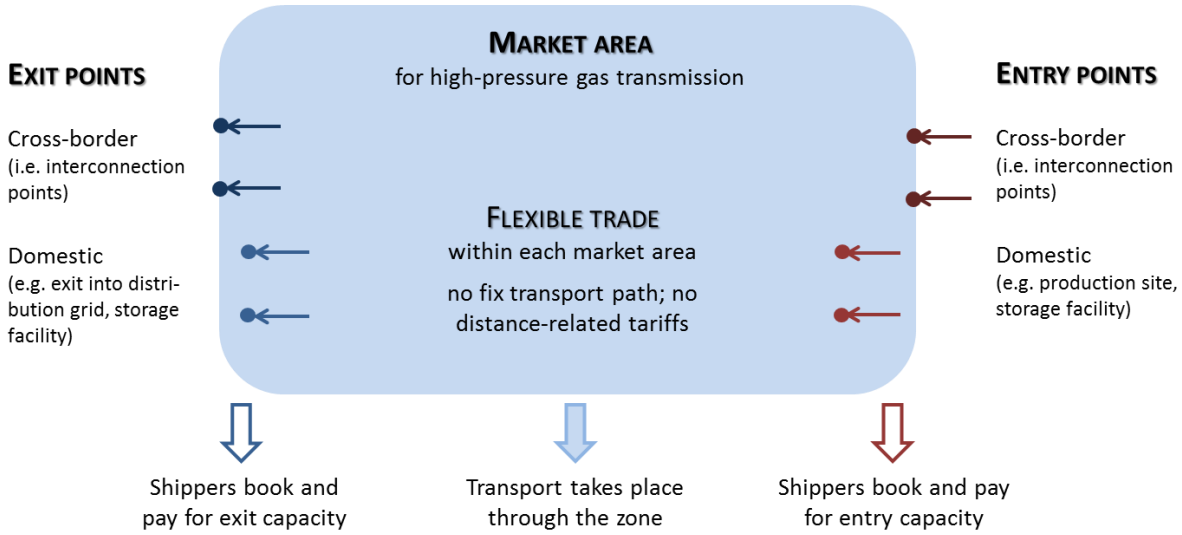
[6] Storing gas in pipelines by increasing the pressure.

another market area, a production site, or gas storage facilities) and leaves the grid at any *exit point* (e.g. interconnection points into another market area, a border point to the distribution grid, large customers, or gas storage facilities).

Shippers can book entry- and/or exit capacities independently and pay separate entry- and exit charges for grid usage ("*decoupled system*"). Tariffs at these points may differ and are independent of the distance of transportation. Thus, gas transport takes place through zones instead of along contractual paths. Trade within one entry-exit zone (i.e. a zone of a single price for the commodity) shall be completely flexible[7].

Figure 1

The entry-exit model



Source: Own depiction

[7] There is a lot of flexibility in the implementation of the entry exit model. In the EU every member state has essentially a different arrangement. For a detailed discussion see: Kema & Cowi (2013).

Box 3: Case Slovakia

Slovakia with the Eustream Pipeline serves as a transit country, receiving gas via Ukraine and delivering it to Central/Western European countries via the Czech Republic and Austria.

Capacity at the one entry as well as at the two exit points is allocated based on the first-come-first-serve principle. Tariffs are charged solely based on booked capacities, without any commodity-based component:

Entry/exit point *and 1 MWh = 93m³*	***Fee for firm capacity booking***	*If 1€ = 1.3 USD*
Exit to Austria (Baumgarten): USD/(m³/d)/a	140.38 €/(MWh/d)/a	1.96
Exit to CZ (Lanzhot): USD/(m³/d)/a	79.455 €/(MWh/d)/a	1.11
Entry from Ukraine (Velké Kapusany): USD/(m³/d)/a	124.12 €/(MWh/d)/a	1.74

So transiting 1 tcm from Ukraine to Austria in a stable baseload flow (1tcm/365=2.74 m³/d) costs:
[2.74 m³/d] x [1.96 USD/(m³/d)/a + 1.74 USD/(m³/d)/a] = 10.1 USD



Source map and data: http://www.gas-roads.eu

2.2.5 General principles for grid operation: Transparency, non-discrimination, competition

Regulation 715/2009 and related Network Codes[8] aim at setting non-discriminatory rules for access conditions to natural gas transmission systems.

[8] For details see:
http://www.acer.europa.eu/Gas/Framework%20guidelines_and_network%20codes/Pages/Legal-basis.aspx

First, there are harmonized *principles for transmission grid tariffs*. These have to be transparent, cost-reflective, and non-discriminative. They shall facilitate efficient gas trade and competition, while at the same time avoiding cross-subsidies between grid users. Moreover, transmission grid tariffs have to be set separately for entry and exit points (see above for more details regarding the "entry-exit system").

Second, there are harmonized *principles for capacity allocation and congestion management* at interconnection points. The maximum capacity, taking into account technical and security limitations, shall be made available.[9] Adjacent TSOs operating the grids of neighbouring market areas shall jointly offer bundled capacity products (i.e. exit plus respective entry capacity) at the interconnection points. For the event of contractual congestion, long-term and day-ahead use-it-or-lose-it mechanisms apply. The TSO shall offer unused capacity on the primary market at least on a day-ahead and interruptible basis; and secondary markets shall be available for those who wish to resell contracted capacity.

Third, there are harmonized *principles for balancing*. Market-based and daily balancing regimes have to be implemented, with the balancing zone corresponding to the respective entry-exit zone. TSO balancing actions thereby can include short-term standardized products traded within-day or day-ahead, and the use of balancing services (only if the former is either not possible or market liquidity is insufficient).

2.3 Available regulatory options

2.3.1 System operation: Three approaches to unbundling

In order to achieve an "effective unbundling" of transmission from production and supply activities, Member States can chose among three approaches to unbundling.[10] These imply different degrees of structural separation of network operation from competitive activities, but every model should remove any incentive to discriminate among grid users as regards network access and usage. Under any regime the transmission company may be a public or a private entity.

First, in the case of **Ownership Unbundling** a supplier can keep a direct or indirect shareholding in a network operator, if none of the following conditions is met: (i) shareholding does constitute a majority share, (ii) the supplier does directly or indirectly exercise any voting rights as regards his shareholding or has the power to appoint members of supervisory or administrative boards, and (iii) the supplier does have any control over the network operator. The same holds vice versa for the transmission network operator. In other words, under ownership unbundling it is not allowed to exercise control over and rights in a transmission system operator and at the same time exercise control over and rights in an undertaking performing any functions of production or supply. These rules apply equally to private and public entities, and also public bodies concerned must be truly separated.

Second, the **Independent System Operator (ISO)** model foresees to separate the ownership and the operation of the gas transmission grid. The ISO (being *not* the transmission system *owner*) is responsible for granting and managing third party access to the grid, and for operating, maintaining and developing the transmission system. In an ex-ante certification process, the ISO must demonstrate that it has at its disposal the required financial, technical, physical and human resources to carry out its tasks. The transmission system *owner* is responsible for financing investments, which have to be

[9] Based on standardized capacity allocation mechanisms (standardized auction design for different standardized capacity products). Moreover, daily products are to be offered for interruptible capacity if firm capacity is sold out day-ahead.

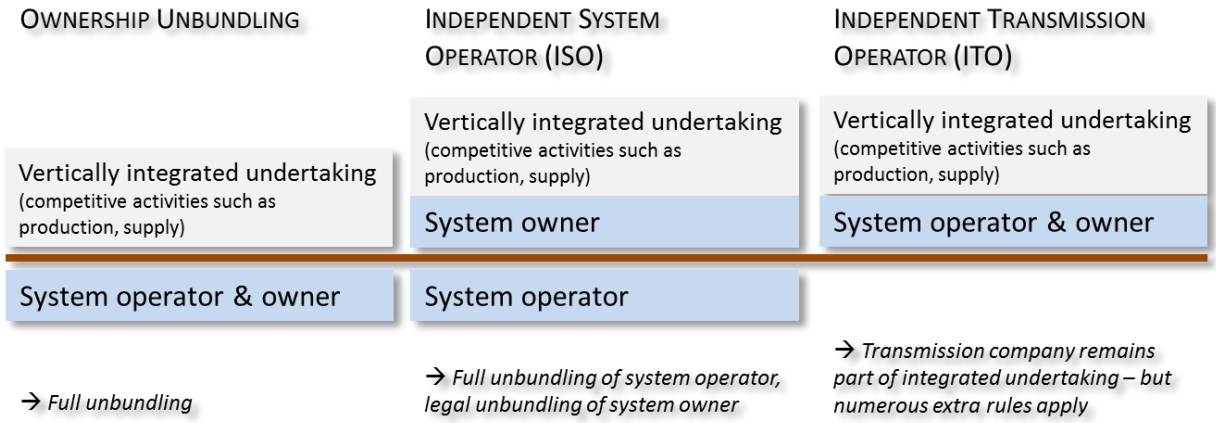
[10] For legal details see Directive 2009/73/EC, Art. 9 ff. as well as EC (2010).

approved by the national regulatory authority before. Even in the ISO model, the transmission system *owner* still needs to be legally and functionally unbundled from production and supply.

Third, in the case of an **Independent Transmission Operator (ITO)**, the transmission company may remain part of a vertically integrated undertaking; however, numerous detailed rules apply in order to ensure an effective unbundling. Amongst others, the ITO needs to be autonomous (i.e. equipped with all financial, technical, human resources to fulfil its obligations). All assets have to be owned and all staff to be employed by the ITO. The leasing of personal or contracting of services from other parts of the vertically integrated undertaking is categorically prohibited. Sharing IT systems or using the same consultants for IT systems is not allowed, too. Furthermore, ITO and supply subsidiary cannot be a direct or indirect subsidiary of each other. And the ITO must not, in its corporate identity, create any confusion with respect to its communication and branding.

Figure 2

Three approaches to unbundling



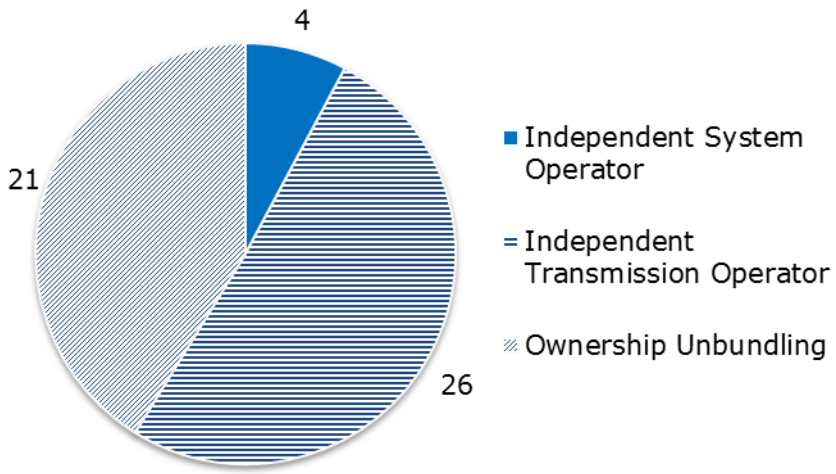
Source: Own depiction

Different EU Member States chose alternative models of unbundling (see Figure 3).[11] Full Ownership Unbundling and the ITO model thereby have been the most popular approaches for the gas sector. The ISO model does not play an important role. For a list of European gas TSOs and their model of unbundling see also Annex A-2. For an in-depth discussion of the implementation of different unbundling options in electricity and gas sectors of Central-Eastern European countries we refer to Jankauskas (2014).

[11] And in Member States with more than one gas transmission company even different TSO within single countries.

Figure 3

Implementation of different unbundling models in the EU



Source: Own depiction using data from the European Commission[12]

Trade-off:

Properly transposed all three models can ensure that the transmission system operator has no incentive to preferentially treat related companies. In reality, the **ITO model** risks to be bureaucratic, the complex rules hard to monitor and hence unbundling not fully effective. **Ownership unbundling** is an effective unbundling model, but with a strong intrusion into property rights. Fully unbundled TSOs have a strong information advantage over regulators that allows them to justify extra revenues, for example by claiming that a certain pipeline will need to be build. They also tend to shift as much cost as possible on all other market players, for example by obliging them to nominate flows much in advance.

On these issues the **ISO model** has some advantages as it reduces the information advantage of the TSO by making operation and investment decisions more transparent. The ISO model is also a very effective unbundling model. In addition, it allows optimal operation of networks owned by different system owners. But it also involves a strong intrusion into property rights. In addition, the lack of ownership over the transmission assets might involve 'split-incentives' requiring complex arrangements between owner(s) and operator to ensure they do not shift undue cost on each other.

2.3.2 Determination of a TSO's allowed revenue

Transmission grid tariff design involves two subsequent areas of regulatory intervention. First, it has to be determined how much a TSO/ISO is allowed to earn (this section). And second it has to be established how the respective sum is allocated to the different grid users (see Section 2.3.3).

The regulation of a TSO's allowed revenue in the EU is under national responsibility. The decentralized decision making and development of national regulatory regimes

12 http://ec.europa.eu/energy/gas_electricity/interpretative_notes/doc/certification/2013_received_notifications.xlsx

(dependent on individual sector characteristics, historical evolution of the regulatory design, national policy priorities, regulatory capabilities, etc.) have resulted in a wide heterogeneity in current regulatory practices (see Ruester et al., 2012).

a. Revenue control mechanism:

First, *various forms of general revenue control mechanisms co-exist*, including cost-plus (e.g. Denmark, Romania), rate-of-return (e.g. Austria), price-cap (e.g. Lithuania, Slovakia, Slovenia) and revenue-cap regulation (e.g. Germany, France, Estonia, Finland, Ireland, Luxemburg, Poland or Spain). Implemented approaches moreover typically deviate from the simple standard textbook cases. For example, Belgium or the Czech Republic implemented hybrid models including elements of price and revenue cap regulation. The UK "RIIO model" is based on an ex-ante price control combined with investment incentives, an innovation stimulus package, a strong output orientation and also a longer regulatory period. Italy uses a rate-of-return approach for the allowed return on assets, a price cap for operational cost and depreciation, and a separate price cap for the commodity charge.

Trade-off:

With a revenue cap, the users will bear the volume risk. If the network is strongly used the average price decreases as the TSO is not allowed to earn more than its cap. The big disadvantage of the revenue cap is that it reduces the incentives of the company to reduce cost, as any increase in revenue will be taken away. Similarly, a cost-plus approach does not incentivize cost reductions either. With a price cap, the TSO will bear the volume risk, as with lower usage its revenues will fall. It has, however, in all situations an incentive to improve its performance.

b. Cost accounting rules:

Gas transmission is very capital-intensive. Consequently, the major cost component is capital cost. Among EU Member States, there is wide heterogeneity regarding the calculation of these capital cost. The calculation of the regulated asset base differs in components included (e.g. fixed assets are always included whereas working capital might be included at varying levels; 'assets under construction' might be included or not) and in their evaluation (using historic costs, a replacement value, indexed historic costs or standard cost; treatment of fully amortized assets; treatment of assets partly financed by third parties or public subsidies; etc.). There is variation regarding the numerous parameters applied, such as risk-free interest rates, debt- and market premiums, the assumed capital gearing share, beta factors, etc. Taxes might be included or not; the calculation of the allowed rate-of-return might be based on nominal or real values.

Trade-off:

A generous interpretation of investment costs increases the investment incentives of companies (which at worst might lead to 'gold plating', i.e., unproductive overinvestment). A very narrow interpretation of costs in contrast can encourage an efficient use of capital, but risks to lead to underinvestment that is detrimental in the longer-term.

c. Regulatory period

Finally, also the *regulatory period*, one of the major factors signalling regulatory stability, varies considerably among Member States (e.g. one year in Slovenia in the past, four to five years in many Member States today (e.g. Belgium, Germany, Italy), eight years for the UK RIIO model). It should be noted that regulatory stability is crucial to incentivize capital-intensive long-term investments, typically undertaken by risk-averse market actors. "Investors want a durable pathway rather than a perfect or uniform one" (ECF, 2011, p. 18). Changes in regulation can have substantial effects on the profitability of a project; ex-ante uncertainty about possible future adaptations will be incorporated in private investors' decision making. Long-term commitments to future remuneration are

required to attract investors and allow them to secure the necessary financing; thus, extending regulatory periods above the currently common three to four years as has been proposed in the UK, can help to improve investors' expectance of reasonable remuneration.

Trade-off:

Long regulatory periods can help to provide investment certainty and hence incentivize investments, especially in assets with high upfront expenditures and longer lifetimes. Short regulatory periods in contrast allow to better adapt regulation to new circumstances.

2.3.3 Allocation of costs to grid users

The pricing of network services relates to the allocation of costs to grid users. The regulated transmission tariffs thereby should recover a TSO's regulated costs, and entry- and exit charges thus need to be designed such that the sum of charges collected approaches as much as possible the expected allowed revenue. To do this, the regulator approves fixed tariffs for domestic entry and exit points. Capacity at cross-border points is allocated via auctions[13]. To guarantee a certain revenue even if the cross-border points are not fully used (and hence an auction would lead to a price of zero), a reserve price is approved by the regulator. National regulators moreover approve mechanisms to deal with a potential over- or under-recovery of the allowed revenue.

Member States have developed different solutions while implementing the entry-exit model. Relevant design options for gas transmission pricing include (a) the entry-exit split, (b) the capacity-commodity split, as well as (c) the treatment of deliveries to domestic customers.

a. Entry-exit split and locational differentiation:

The *entry-exit split* determines the share of revenues collected from entry and exit points. This split may be based on more or less sophisticated calculation methods. A number of countries explicitly set the split to 50:50 (e.g. Denmark, Italy, Poland, or the UK). For Germany, the general target split used to be 50:50, too. However, with the integration of more than ten market areas into two large areas, many bookable entry and exit points have vanished. Hence, TSOs allocate a higher share of allowed revenues to remaining exit points.

For the Czech Republic 61.5% of the total allowed revenue is allocated to exit points. In Portugal, tariffs are calculated based on long-run average incremental costs using a simplified model of the transmission system with a resulting entry-exit split of 26:74. Austria applies a 20:80 split. Belgium allocates only fixed costs, equalling about 15% of the total allowed revenue, to entry points. Finland is in a special situation, as the gas transmission system has one single entry point and no cross-border exit point; a split of costs between entry and exit points is not of relevance. For the Swedish transmission system, 100% of the cost is allocated to exit points. Hungary and Luxembourg, in contrast, collect the majority of the revenues from entry charges.

For a detailed overview on tariff conditions in the EU gas transmission system see the ENTSO-G Transparency Platform.[14] For 897 entry and exit points, tariffs, available capacities, rules on balancing, past nominations, etc., are provided.

Trade-off:

[13] See Network Code on Capacity Allocation Mechanisms in Gas Transmission Systems. EU Regulation 984/2013.

[14] www.gas-roads.eu

With a differentiated, more complex allocation of the allowed revenue (i.e. the cost of gas transmission) to entry and exit points, TSOs are able to transfer locational signals to grid users, which can support efficient grid use and efficient investments, and thus help to minimize of overall system cost. The absence of locational signals, however, implies that transmission tariffs do not adequately reflect the costs caused by grid users and that instead costs are socialized. This will be less consequential for small price zones; however, a well-interconnected system with several alternative sources of supply and maybe even some flexibility in flow directions could clearly benefit from locational signals.

b. Capacity-commodity split:

Varying importance is also given to capacity-based (e.g. €/reserved capacity per day) and commodity-based (e.g. €/actually transported energy per day) tariff components. Charging purely on capacity-based tariffs, though, is becoming more and more common (e.g. Austria, Finland, Germany, France, Luxembourg, Netherlands, or Slovakia). The capacity-commodity split in other countries is 90:10 (e.g. Ireland, Romania), 80:20 (e.g. Greece, Poland) or 70:30 (e.g. Lithuania). In Denmark, the exact ratio depends on the ratio of capital and operating expenditures of the underlying cost base and may therefore change over time.

With the Third Energy Package, however, charges should preliminary be based on booked capacity, except for specific charges directly driven by the flowing volume of gas transported. This might also help to increase transparency, as in the past it was not always obvious which cost components were included in the commodity charge. In Italy, for example, the capacity charge covers capital costs while the commodity charge only operating costs; and fuel gas being provided by shippers. Some TSOs require the network users to compensate for the corresponding volumes of fuel gas and/or shrinkage (e.g. UK) whereas others apply separate charges (e.g. Ireland).

Trade-off:

Putting a higher weight on the commodity allows the TSO to benefit from the actual usage of the grid. But this gives incentives for underusing the capacity and too low incentives for the TSO to provide peak-capacity. Consequently, economists argue that most of the cost should be capacity-based, while only the cost that are actually due to the transported gas volume (e.g., fuel gas) should be charged commodity-based.

c. Reduction for short-distance domestic deliveries:

Entry-exit systems might suffer from a systematic bias in the form of a cross-subsidization between short-distance transmission and long-distance (cross-border) transportation (see also Kronfuss, 2009; CIEP, 2009). Tariffs at a specific entry point are equal for all grid users, independent on whether the gas is transported only a few km to the next local consumption centre or a few hundred km across the whole entry-exit zone. Thus, domestic consumers tend to cross-subsidize transit flows and transmission over some hundreds of km can even be cheaper than transmission over 50km depending on the pricing at individual exit points. This effect becomes more severe the bigger the price zone. Some countries (e.g. Italy, France, or the UK) have therefore introduced so called "short-haul tariffs" in order to adjust tariffs for short-distance transportation.

In Poland, there is no general distinction among domestic exit points on the one hand and exit points connecting a neighbouring market area on the other. However, transit flows are explicitly separated from transmission services as there is a clear separation between the transmission network and domestic gas system.

Trade-off:

Introducing exemptions to existing rules always adds complexity to the tariff system. However, in specific situations an adaption of exit charges will be needed to avoid cross-

subsidization of long-distance transit transportation by short-distance deliveries and to take heavy burden away from domestic consumers.

2.4 Discussion

The Third Energy Package was aimed at further opening up energy markets. The obligatory, EU-wide, decoupled entry-exit model for transmission grid access has been introduced in order to enhance efficient gas trade. Further major reforms include the strengthening of national regulators' powers and independence, the implementation of stricter unbundling rules, as well as the enhancement of market transparency. As discussed above, there are certain mandatory requirements to adapt national regulation, but for other issues (such as the model of unbundling, the determination of the allowed revenue, or the allocation of costs to grid users) a menu of regulatory options is available. Member States have developed very different solutions while implementing the entry-exit model.

Besides many improvements in developing functioning competition and integrating markets, a number of challenges are still discussed:

So called "*price pancaking*" resulting from the conclusion of successive contracts would be unproblematic from an economic perspective as long as charges are cost-reflective. In theory, the sum of all entry- and exit charges would equal the transmission charge that would have to be paid if there was one pan-European price zone. However, this is not fully given in reality since tariffs tend to slightly exceed the true cost in order to ensure cost recovery. In addition, tariffs might include socialized costs not reflecting the shipper's actual grid use (see e.g. LECG, 2011). So called "*contractual pancaking*" for long-distance transmission is a problematic that persists. Shippers are typically interested in booking capacity from a specific source to specific destination without being particularly interested in dealing with intermediate interconnections.[15]

Furthermore, there are various potential *obstacles to efficient competition.* As discussed e.g. in Petrov (2014), the lack of consistency and transparency in pricing regimes may lead to inefficiencies. The use of different cost allocation methodologies in different Member States, for instance, may distort long-distance cross-border flows, leading to sub-optimal outcomes, e.g. shippers might decide to take the route that minimizes their own cost but not necessarily the total system cost. Differences in pricing of short-term capacity (for natural gas this means a duration of less than one year) may lead to distortions in short-term trading patterns and hamper efficient trade, too.[16] And also the requirement for every grid user to have a strictly balanced nominations portfolio can be a potential undue barrier for short term trade (see Kema & Cowi, 2013).

[15] This issue is treated in-depth within the Gas Target Model discussions (see also Ascari, 2011; Glachant, 2011; LECG, 2011).

[16] Vital discussions about efficient pricing have been ongoing, also in response to the recent debates concerning adequate auction reserve prices for the different standard capacity products. If a resource is scarce, it is sufficient to define the bottom line price such that the market can be cleared (i.e. $p < MC$). The problem lies in off-peak periods. If the reserve price is too high, it would impede traders to participate in short-term trade, may hamper market entry and reinforce capacity hoarding and (contractual) congestion. If, in contrast, it is too low, cost recovery cannot be ensured and a potential under-recovery has to be corrected ex-post.

3. Implications of an implementation of the EU's Third Energy Package for Ukraine

Ukraine will have to implement the European gas market rules by January 2015[17]. This will not only serve to fulfil Ukraine's international obligations in the Energy Community and the Association Agreement. Most importantly, it is supposed to help Ukraine to establish a credible regulatory framework that incentivises private investments in its aging infrastructure. This will involve a major shift from the current organisation (laid out in the next section). In Section 3.2 we discuss an approach that allows to at the same time to (1) attract private (incl. foreign) investments, (2) benefit from gas transit, (3) mitigate the gas transmission cost of Ukrainian consumers and (4) grow Ukraine's gas industry.

3.1 Background: Status quo of the regulation of the gas transmission network

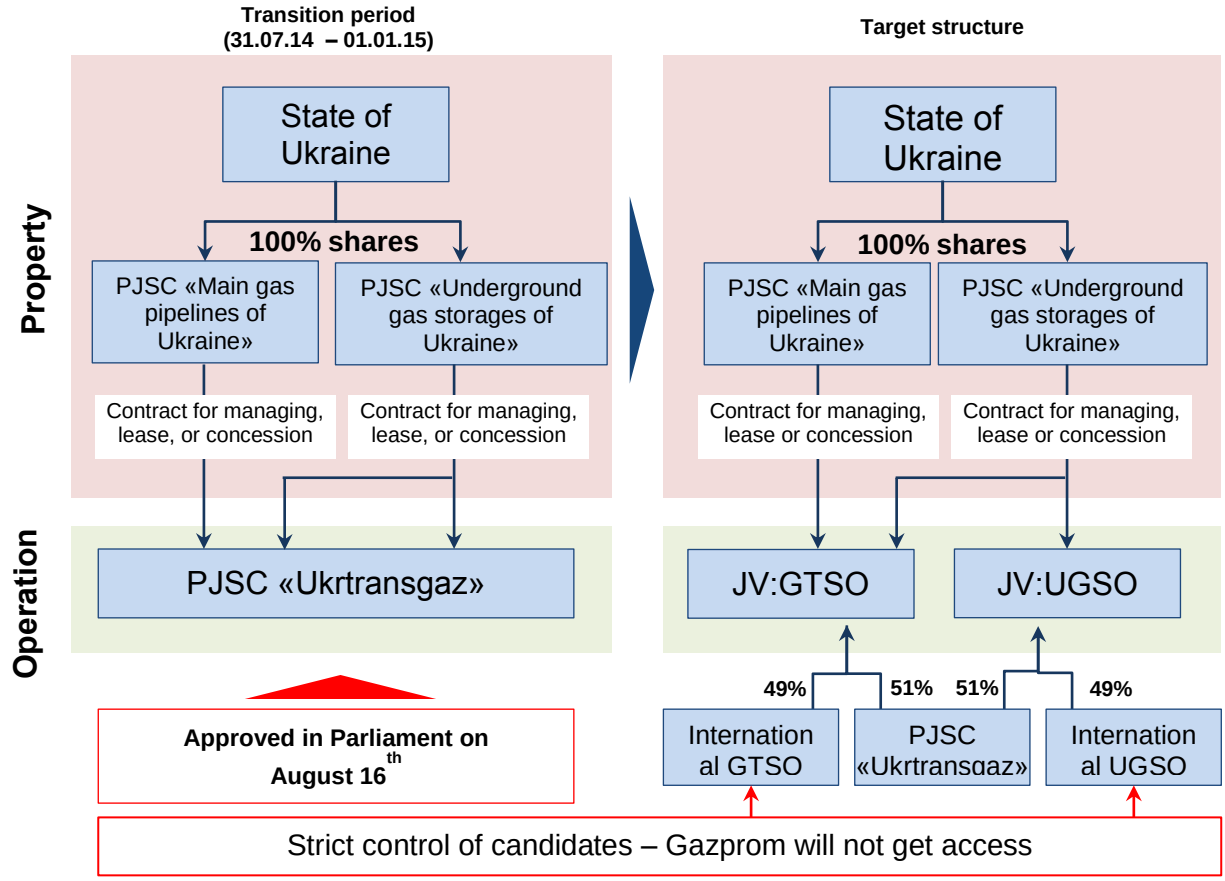
The physical assets of the gas transmission system of Ukraine - the pipelines and gas storage facilities – are owned by the Ukrainian state. They are operated by Ukrtransgaz – a subsidiary of the state-owned oil and gas company Naftogaz. The latter is also the biggest gas producer in Ukraine (89% of the 21 bcm produced in 2013) and also is the largest[18] gas importer to the country.

[17] For certain Articles of Directive 2009/73/EC there are longer deadlines: Article 9(1): 1 Jun 2016, Article 9(4): 1 June 2017 and Articles 11: 1 Jan 2017.

[18] It doesn't hold an exclusive right on gas import any more. After NERC issued an order (#305 as of 29.03.2012) about definition of gas suppliers large industrial consumers was allowed to choose a supplier freely.

Figure 4

New legal organisation of the gas infrastructure in Ukraine



Source: Presentation by Yuriy Vitrenko, Senior Adviser, Naftogaz of Ukraine

The reform bill passed on August 16th stipulates that Ukrtransgas is split up into a gas transmission system operator (GTSO) and an underground gas storage system operator (UGSO). A minority share in both companies is supposed to be privatised.

According to law #2467 as of July 8, 2010 "On principles of natural gas market functioning", access to the gas transmission network is granted according to Article 13 on a non-discriminatory basis. However, traders complained in the past that this was not fully implemented. For example, certain capacity reservations were not 'received' by Ukrtransgaz.

The tariffs are determined by the National Commission for Energy and Public Utilities Regulation (NCEPUR)[19]. In June 2014, they were increased from 93.90 UAH/tcm to 138.40 UAH/tcm[20]. That is, tariffs follow a postage stamp system independent of the gas transport distance.

In contrast to that, prices for gas transit are determined in negotiations between Naftogaz/Ukraine and Gazprom/Russia. According to the 2009 agreement on Russian gas transit, Ukraine received the transit fee at about 2 USD/tcm/100 km. In 2013 it was about 3.1 USD/tcm/100 km according to the contract formulae. Technical gas (about 4 bcm in 2013) needs to be provided by Ukrtransgaz. Gazprom/Russia is essentially free to

[19] The former regulator, the National Energy Regulatory Commission (NERC), has been disbanded by the Decree of the President of Ukraine of 27.08.2014 № 693/2014.

[20] www.nerc.gov.ua/?id=11069

determine the volume of gas to be transited and only has to pay for this volume (i.e., no ship-or-pay clause).

From 2015 on the tariffs for transit shall also be established in the framework of the entry-exit-system.[21] The distribution of the cost between different entry and exit points shall ensure that long-distance transit faces higher cost than domestic transport, although details are not yet published[22].

3.2 Discussion and recommendations

In this section we want to discuss an approach that allows at the same time to (1) attract private (incl. foreign) investments, (2) benefit from gas transit, (3) mitigate the gas transmission cost of Ukrainian consumers and (4) grow Ukraine's gas industry. To achieve these targets Ukraine first of all needs a credible and stable regulatory framework.

As the political system of Ukraine has not had time to develop enough credibility, it requires a credibility anchor[23]. The international commitments vis-à-vis the Energy Community and the EU (in the Association Agreement) can provide such an anchor. But the long-term credibility of the regulatory system also hinges on its economic and political sustainability. If investors today can already sense that too high prices will make the proposed regulation politically unsustainable in the medium-term, they will not invest whatever generous the proposed remunerations are. An important pillar for a credible regulatory framework is a truly independent regulator as this institution allows to, at the same time, have long-term investment incentives and the ability to adapt the system to changing circumstances. The same holds for gas transit. If Ukraine cannot commit to a 'fair' and stable treatment of gas transit, both, Russian exporters and European importers will be willing to invest economic and political capital in a somewhat redundant and expensive bypass pipeline (South Stream).

Accordingly, we suggest that Ukraine should transpose the 'entry-exit system':

(1) to provide an anchor of a credible regulatory framework that will help to encourage investments and continued usage of the transit system,

(2) to fulfil the commitments required by its membership in the Energy Community, and

(3) to become an integral part of the European energy market in the longer-term.

Furthermore, if properly implemented, the 'entry-exit system' represents a significant improvement over the current Ukraine situation in all aspects of gas transmission (third party access, transparency, investment incentives, …).

This will involve important legal aspects (e.g., how to deal with legacy contracts) we will not discuss here. But it also involves a number of questions on the economic implementation. We have seen that, within the general framework, there is ample flexibility in the design of transmission tariffs. Ukraine will want to make use of this flexibility because it features a very specific situation as a large transit country. In 2013,

[21] It is unclear to us, from which date on, this will affect legacy contracts between Naftogaz/Ukraine and Gazprom/Russia.

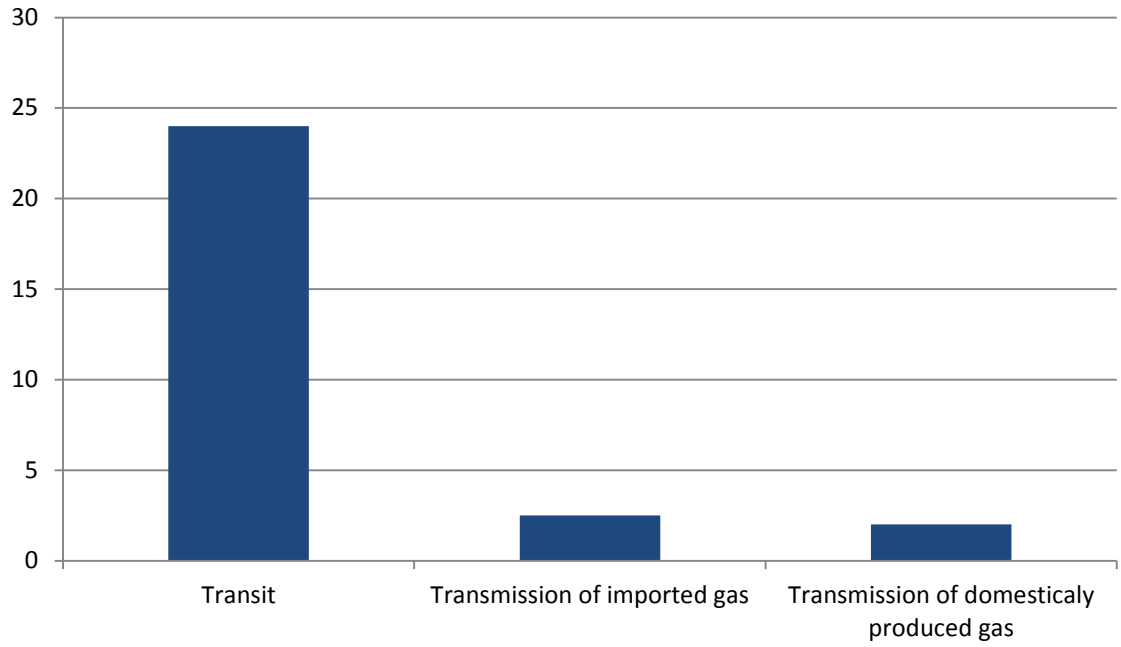
[22] We do not believe that the planned structure will receive sufficient interest by Western investors and that the current plans on structure and tariff-setting will create a stable regulatory environment. Our main reason for concern is the dominant role of the state that retains the instruments to unilaterally change the design of the system.

[23] The big issue problem when regulating infrastructure companies is 'time consistency'. Policy makers will always want low tariffs and high investments at the same time. So investors that were attracted by high tariffs of the first government can easily be expropriated by regulatory shifts by the next government.

the Ukraine GTS yielded about 24 bn UAH from gas transit[24], 2.5 bn UAH from transporting imported gas[25] and 2 bn UAH from transporting domestic gas[26].

Figure 5

Distribution of transmission revenues, UAH bn



Source: Own calculations based on Naftogaz data

Thereby, transit volumes cannot be controlled by Ukraine and are highly uncertain, while domestic consumption is very predictable. Thus, a general revenue cap on the GTS would in this context not be credible, as if transit volumes are reduced, a huge share of the revenue would have to be levied from the final customers[27].

Consequently we suggest a hybrid approach to gas transport tarification, that within the legal framework of the entry-exit system and given that the Ukrainian system has no separate transit and transmission infrastructure, allows differentiating tariffs between transit and domestic transmission.

1) Two market areas

Having multiple market areas is not uncommon in the EU. Germany is for example split in two market areas (see Annex A-3). Accordingly, we suggest to split Ukraine in two areas. One market area (MA1) should comprise all the entry points from Russia and Belarus up to the point where they first, branch out (exit point of MA1). The other market area (MA2) should comprise the rest of Ukraine[28]. This would allow to easily differentiate transit revenues from the first market area (MA1) from transmission revenues from the second market area (MA2).

[24] According to the consolidated financial statements of Naftogas (Ukrtransgas only reports 14.7 bn UAH).

[25] 94 UAH/tcm x 25 bcm

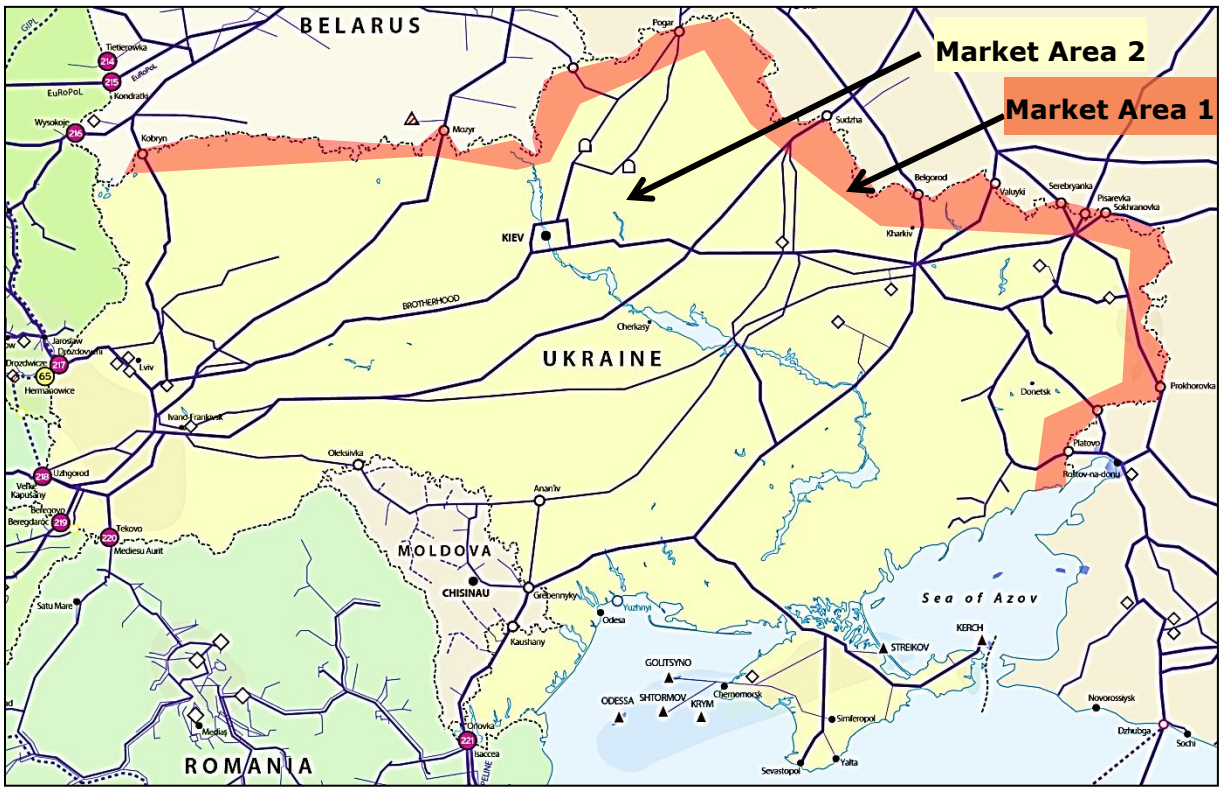
[26] 94 UAH/tcm x 20 bcm

[27] In our forthcoming Policy Briefing PB/12/2014 we explain in detail why we think that it is not possible to profile entry and exit cost in a single market area in such a way to generate predictable transit revenues.

[28] So the exit points of MA1 are entry points of MA2.

Figure 6

Illustrative map of the proposed market areas



Source: own depiction based on ENTSO-G map

From an economic point of view it would be best if the transmission infrastructure in both market areas is to be fully privatised. The privatisation revenue shall be accepted as capital cost in the 'regulated asset base'. In an open tender, investors should be willing to pay for the infrastructure in MA1, the value of the expected future transit revenues. At current transit revenues and an assumed interest rate of 10 percent, MA1 could sell at up to 240 bn UAH[29]. A cost-based regulation of MA1 would result in stable, non-discriminatory and transparent tariffs. In addition, one might oblige the investor in MA1 to install metering stations at the entry points[30].

As a full privatisation of pipelines is a very sensitive issue in Ukraine, it might not be politically feasible. In this case, a feasible alternative would be to tender long-term (>20 years) lease contracts for the infrastructure in the two market areas, that give the lessee full commercial control over the assets. In this case, it is essential to find proper incentives for the lessee to carry out maintenance and investments also during the last years of the contract.

2) <u>An independent system operator</u>

To manage a system with two market areas that are potentially under different control (MA1 might be sold to a financial investor, while MA2 is more likely to go to an infrastructure company) it would be suitable to introduce an independent system operator taking the responsibility for granting and managing third party access to the grid, and for operating and maintaining the transmission system. The revenues of the

[29] This would assume that the new owner has no operational cost of organising the flows (incl. no taxes).

[30] Such an obligation would obviously reduce the sell price of MA1.

ISO (typically minor compared to the cost of the actual infrastructure) are also regulated by the regulator. They are to be recovered from grid users.

3) Price Cap regulation

In each market area the regulator approves a separate tariff formula, applied for by the respective company. Tariffs shall be mainly based on booked capacity. Only the variable costs (e.g., fuel gas) are to be recovered via commodity-based tariff components. The price caps in both market areas are supposed to give incentives for productive investments and efficiency improvements. Thus, in addition to the inflation rate, the annual price cap revision shall imply that the companies reduce their cost by a certain fraction.

Obviously it will not be possible to implement such a thorough reform before the deadline set by the Energy Community: 1.1.2015. Consequently, we suggest that the new structure to comply with the unbundling rules (see Figure 4) is implemented as planned, while the new energy regulator NCEPUR prepares the implementation of the entry-exit model based on ambitious but realistic timeline that is to be monitored by the Energy Community secretariat.

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Annex

A-1: Size of market areas

The dimension of market areas (or "entry-exit zones") in the EU tends to be based on administrative borders rather than technical or economic considerations. Typically, a price zone coincides with an 'operating zone' managed by a certain TSO and reflecting the historically developed market structure with national (or even sub-national) grid operators. Thus, they are not all of an 'optimal size' and the process of merging market areas continues to be an issue. Given the policy goal of achieving a single European gas market, larger zones have some obvious advantages, such as an increase in market liquidity and possibilities to trade, or the reduction of price distortions due to contractual (and price) pancaking.

One single pan-European price zone in theory would be possible, though not necessarily desirable since an increase in the size of a market area entails various drawbacks, too. The creation of large price zones leads to economic inefficiencies: (i) *intra-zonal constraints are not subject to different prices anymore* and re-dispatching and/or countertrading managed by the TSO are required instead. Thus, prices become less cost-reflective; the costs of congestion are socialized among a larger number of grid users and cross-subsidies increase. See LECG (2011) for an in-depth discussion of this phenomenon as well as of further market distortions resulting from persistent intra-zonal constraints; (ii) within the new price zone, the *free allocation of capacities shall still be sustained* at the same time that supply security and system stability are maintained. There are technical constraints for offering decoupled entry- and exit capacities; an increase in the size of the market area means that further bottlenecks and possible flow scenarios will be included, which in turn reduces available firm transport capacities. Past mergers actually have led to a reduction of offered capacities at entry- or exit points or the transfer of former firm into interruptible capacities.

A-2: Implemented unbundling models in the EU31

Country	NRA	Transmission company	Model
AT	e-Control	Baumgarten-Oberkappel Gasleitungsgesellschaft	ITO
AT	e-Control	Gas Connect	ITO
AT	e-Control	Gas Connect Austria	ITO
AT	e-Control	NABUCCO	Other
AT	e-Control	TAG	ISO
AT	e-Control	TAG	ITO
BE	CREG	FLUXYS	OU
BE	CREG	I(UK)	OU
BG	DKER	Bulgartransgas	ITO
CZ	ERU	NET4GAS	ITO
DE	BNetzA	Bayernets	ITO
DE	BNetzA	Fluxys	OU
DE	BNetzA	Fluxys DE	OU
DE	BNetzA	GASCADE	ITO
DE	BNetzA	Gasunie Ostsee	OU
DE	BNetzA	Gasunie Transport	OU
DE	BNetzA	GRTGaz	ITO
DE	BNetzA	GTG Nord	ITO
DE	BNetzA	jordgas	ITO
DE	BNetzA	NEL	ITO
DE	BNetzA	Nowega	ITO
DE	BNetzA	OGE	ITO
DE	BNetzA	Ontras	ITO
DE	BNetzA	Terranets	ITO
DE	BNetzA	Thyssengas	ITO
DK	DERA	Energinet - gas	OU
ES	CNE	ENAGAS	ISO

Country	NRA	Transmission company	Model
ES	CNE	ENAGAS	OU
ES	CNE	Reganosa	OU
ES	CNE	Reganosa	OU
ES	CNE	SAGGAS	ISO
FR	CRE	GTRgaz	ITO
FR	CRE	TIGF	OU
FR	CRE	TIGF	ITO
GR	RAE	DESFA	ITO
HU	HEO	FGSZ	ITO
IE	CER	BGE	ITO
IT	AEEG	ITG	ITO
IT	AEEG	SGI	OU
IT	AEEG	SNAM RETE GAS	ITO
IT	AEEG	SNAM RETE GAS II	OU
NL	NMa	BBL	Other
NL	NMa	Gasunie Transport	OU
PL	URE	Gaz-System	OU
PT	ERSE	REN Gasodutos	OU
RO	ANRE	Transgaz	ISO
SE	EI	Swedegas	OU
SI	AGEN	Plinovodi	ITO
SK	URSO	Eustream	ITO
UK	Ofgem	BBL	Other
UK	NIAUR	BGTL	OU
UK	Ofgem	Interconnector	OU
UK	NIAUR	PTL	OU
UK	Ofgem	PTL	OU

[31] Data source: Website European Commission, DG ENERGY ec.europa.eu/energy/gas_electricity/interpretative_notes/doc/certification/2013_received_notifications.xlsx

A-3: Case study Germany[32]

The German natural gas transmission system has organically grown and is a well-meshed system with a total pipeline length of 112,000 km, owned and operated by 17 TSOs (as of 2012). Germany is a net importing country receiving about 85% of its total consumption (> 700 TWh) from foreign suppliers. It has a total import capacity of 200 GWh/h, and a total export capacity of 160 GWh/h at border points. The gas transmission system consists of pipelines for domestic supply as well as of large bulk transport pipelines (like MIDAL, MEGAL or OPAL) connecting important cross-border entry and exit points, storage sites and major load centres.

German TSOs operate under decoupled entry-exit models. The country thereby is divided into two market areas: "Gaspool" in North and Eastern Germany, and "NetConnect Germany" in South and Western Germany. All direct transports from one border to another (i.e. transit) were fully integrated into the entry-exit system. The national regulatory authority approves the tariff calculation methodologies ex-ante and has to be informed about resulting tariffs.

Common elements in the design of the entry-exit models:

- *Capacity products offered*: All TSOs offer annual, quarterly, monthly and daily products at entry/exit points. Thereby, 20% of the available capacity is not to be sold more than two years in advance, another 15% not more than 4 years in advance. Since October 2011, auctions are used for most of the capacities. The regulated tariffs serve as reserve prices, the auction result thus is only a premium which is payable above the reserve price.
- *Capacity-commodity split*: There is no commodity-based tariff component. Tariffs at all entry/exit points are to be paid in €/kWh/h.
- *Entry-exit split*: The target split used to be 50/50. However, with the integration of more than ten market areas into two, bookable entry and exit points have vanished for many TSOs. This lead to a higher share of allowed revenues allocated to exit points.

Certain differences in the implementation of entry-exit models of individual TSOs exist, too:

- *Locational differentiation of tariffs*: Some TSOs apply a locationally differentiated tariff system, whereas others use uniform tariffs at all points or with separate tariffs for entry and exit, respectively.
- *Capacity products offered*: Some TSOs offer interruptible capacity in any case, whereas others only once firm capacity is sold out. In addition, some TSOs offer products which include restrictions to free allocability (the virtual point or other physical points outside of a predefined point-specific link are not accessible or only accessible on interruptible basis or subject to certain (temperature) conditions).
- *Possible discounts*: Some TSOs offer explicit shorthaul tariffs at a discount varying around 50%.
- *Treatment of storage points*: Some TSOs offer capacities at lower prices in order to reflect the network supporting function of storage. Others have fully integrated storage points into their regular tariff system without any discounts. Whereas seasonally varied tariffs generally are not applied in the tariff system, this is used by some TSOs at storage points.

[32] Major source: DNV Kema & Cowi (2013)

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