EXPERT OPINION ON THE ECONOMIC SUITABILITY OF THE REGENT REGULATIONS AND THE POSSIBILITY OF COST-ORIENTATED REFERENCE PRICE METHODS

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1 Contents

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List of abbreviations

ACER	Agency for Cooperation of Energy Regulators
BEATE 2.0	Regulation regarding the details to convert annual service prices into service prices for capacity rights during the year, as well as details on the factual determination of network tariffs, in accordance with § 15 para. 2 to 7 GasNEV
BMWi	Bundesministerium für Wirtschaft und Energie (Federal Ministry for the Economy and Energy)
BNetzA	Bundesnetzagentur (Federal Grid Agency)
BZK	Capacities with limited allocability
DN	Diameter
DZK	Dynamically allocable capacities
EnWG	Energiewirtschaftsgesetz (Energy Industry Act)
EOG	Revenue cap
EU	European Union
FZK	Firm allocable capacities
GasNEV	Gas network tariff ordinance
GasHDrLtgV	High pressure gas pipeline ordinance
GDRM system	Gas pressure regulating and measurement system
GP	Gaspool
GÜP	Cross-border point / border transfer point
iB	Internal Order
LNG	Liquefied Natural Gas
Lv	End customer
MARGIT	Regulation regarding the size of the multipliers, discount at entry points from LNG systems and at entry/exit points from infrastructures set up to end the isolation of member states in respect of their gas pipeline networks, and regarding the level of discounts for interruptible standard capacity products at interconnection points
MÜP	Cross-market point / market transfer point

NAP	Network connection point
NCG	NetConnect Germany
NC TAR	Network Code on Transmission Tariff Structure
NEP	Network development plan
NKP	Network interconnection point
OLG	Higher district court
OPEX	Operational and maintenance costs
REGENT	Regulation on a reference price method, as well as other points mentioned in art. 26 para. 1 of regulation (EU) no. 2017/460 for all TSOs active in the NCG and GP entry and exit system
Sp	Storage
SQ	Status quo
TSO	Transmission system operator
uFZK	Interruptible transport capacity
VTP	Virtual trading point
VNB	Distribution network operator

EXECUTIVE SUMMARY

Reference price model

On 29th March 2019, the Federal Network Agency (hereafter the BNetzA) determined a reference price method for transmission system operators called REGENT-Regulation. The aims of the underlying EU regulation of the network code on harmonised pipeline tariff structures are, inter alia, to achieve harmonisation and transparency in the design of tariff structures for gas pipeline networks.

REGENT aims to set uniform network tariffs within one market area. The basis for calculating uniform tariffs is the forecast contracted capacity of the transmission system operators, as well as the revenue caps, aggregated for the respective market area. REGENT results in a postage stamp for the NetConnect Germany market area of 4.07 €/kWh/h/a and, for the GasPool market area, of 3.36 €/kWh/h/a in the year 2020.

The BNetzA justifies the uniform entry and exit tariff as a means of improving transparency and reducing the complexity of tariff calculations. Nevertheless, in specific cases an entry/exit tariff system with uniform tariffs does not sufficiently consider the principle of cost orientation. The main reason is that such a tariff system does not reflect the heterogeneity of the German gas transmission network and the differences in cost related to the various transmission activities.

The characteristics and tasks of the gas TSOs is shown using an assessment of the structural heterogeneity between the TSOs. As the TSO systems with a cross-system profile serve to transport large volumes of gas, the proportion of large gas pipelines is relatively high. Such TSOs have a high proportion of pipelines with a diameter > 700 mm. In addition, the exit density for these TSOs is low and the proportion of interconnector capacity to the exit capacity is high. They furthermore have considerably greater compressor capacity in their network. By contrast, the TSOs with mainly system-internal transport function have a high proportion of end consumers and relatively small pipeline diameters. The ratio between the number of exit points and the network length here is comparatively high. The total capacity of compressor units in these networks is by contrast comparatively low. The profile of an integral TSO that carries out both cross-system and system-internal transport activities can also be observed. Here, the underlying transport system therefore comprise of network components which carry out cross-system activities, and network components which primarily have system-internal functions.

The results of the assessment are also supported by an additional analysis of the network meshing. Analysis of the network maps show that network operators with largely cross-system transport functions are distinguished by a smaller number of meshes than the average of the network operators. This can be confirmed for Gascade Gastranport GmbH and GRTgaz Deutschland GmbH. This is based on the data sent by the network operators as part of the efficiency comparison of the TSOs for the third regulatory period, which was undertaken by the BNetzA. The TSOs characterised by system-internal functions are less strongly pronounced due to lower entry point density (as proxy for the degree of meshing). The comprehensive marketing of conditional products in the German gas network gives a further indication of the comparatively low level of meshing. This can be seen for the transmission networks with mainly cross-system transport function.

With respect to cost, the analysis clearly shows that within a network, the system functions, and therefore also the cost of the functions, can be differentiated. Above all, the dimensioning of the gas pipelines plays a significant role in the system operators' cost structure. Networks mainly used for cross-system transport tasks are characterised by gas pipelines with a larger diameter and the associated scale effects. The compressor capacity and the gas pressure regulating and metering system (GDRM systems) also contribute to the scale effects and the specific cost reduction with the increase of the volumes. This makes it clear that the specific costs for the cross-system transport function are lower in comparison with those of the system-internal function.

An appropriate design of network tariffs should consider the network functions for network usage and should therefore reflect the costs associated with these functions. For this specific case, the networks primarily serving a cross-system function have a dual role. On the one hand, these networks permit access to the market areas serving cross-border and cross-market transport. On the other hand, taking the technical connection of gas pipelines into account, the networks performing the cross-system function are also used to serve internal markets within the market area. The networks serving the system-internal function connect the cross-system levels with regional and/or local supply centres and transport gas to downstream distribution networks and end users.

The introduction of uniform postage stamps through the reference price methodology set out in the REGENT-Regulation leads to a significant difference between the network tariff for gas transport activities and the associated costs. Such a deviation from the principle of cost orientation would make future residual competition appear to be arbitrary - TSOs would no longer compete for network users based on their economic advantages but exclusively on other factors, such as product type and capacity constraints. The network tariff's steering function is weakened by this. Network users will be given incorrect signals regarding the costs associated with the potential transport alternatives in the gas transmission network. This will affect their decisions regarding the selection of transport routes over existing preferences, because of differences between network tariffs. Many European gas markets are affected by Germany's central location. Calculation of the transport costs of routes for Russian gas travelling through the German market area to France, Austria and the Czech Republic reinforce the expectation that there will be an increase in costs for cross-system transport.

Such rising transport costs may lead to quantity risks as a result of moving transport to other routes. The practical relevance of these quantity risks can be demonstrated against a background of increasing competition in transport capacity due to the additional capacity provided by Nord Stream 2 and Turkish Stream, as well as at LNG terminals.

In the event of a reduction in bookings in one market area caused by relocation of transport routes, the loss of revenue for the respective TSOs will be balanced out by the regulatory account. If other TSOs from the same market area do not earn the same degree of additional revenue, then the lack of revenue must be accounted for by an adjustment of the tariffs. The consequence will be that the uniform postage stamp will then increase in the following year. An increase in the postage stamp could result in additional network users leaving the customer base and the postage stamp would have to be increased once again. This may lead to spiral tariff effects.

Furthermore, it must also be noted that liquidity generally falls as network tariffs increase, because only greater differences in market prices would lead to trading between gas markets. Depending on the configuration of the market, a reduction in the possible margin from trading between gas markets due to higher transport costs implies that market participants without long-term contractual bookings and sunk costs have less incentives to remain in the market or to enter into the market. If these market participants leave the market, the number and diversity of market participants could fall. The market concentration and, consequently, market power of the remaining market participants would then increase, putting market efficiency at risk.

Based on the potential effects from the expected increase in cross-system tariffs, the uniform postage stamp determined by REGENT does not appear to be consistent with the objectives of European gas market integration.

A cost orientation for the network charges and simultaneous avoidance of cross-subsidies can be achieved through the explicit separation of transmission tasks and the function-specific costs. Similar approaches have already been implemented in France and Italy. The benefit of this model is that it follows a function-specific cost allocation approach. This enables the cost to be allocated to the respective transmission tasks, where possible. Pipe diameter, pressure levels in the network and a functional specification of the individual network points can be used as criteria for the separation of transport tasks. As a result, the function-specific tariffs in the respective market area would therefore reflect the cost of cross-system and internal system tasks of the transmission network.

Discounting

According to the BNetzA, an interruptible product is of lesser value than a conditional capacity product due to the higher risk of interruption. Following this argument, the discounting of conditional capacity products is limited through the interruptible transport capacity (uFZK) discount. The assumption of the BNetzA that conditional capacity products are in principle always more valuable than interruptible capacities is inaccurate from an economic perspective. Indeed, the discount for conditional capacity products must be based on the value for the network user and should therefore reflect this.

Conditional capacity products are in practice frequently booked by network users who want to transport gas along a certain trading route. In such cases, the interruptible access to the virtual trading point (VTP) is not relevant for the determination of the economic value since the specific network customer has no commercial interest in the VTP trade. In contrast, a network customer can book an uFZK (with the expectation of not being interrupted) and acknowledges the value of VTP access, because its business model is based on this access. Through this difference, the access to VTP has different roles and value, based on the intention and individual preferences of the users. Therefore, the restriction of the discount for conditional capacity products through the lowest discounted interruptible capacity product appears incomplete as the sole standard for pricing.

1 INTRODUCTION

In order to implement EU Regulation 2017/470 on establishing a network code for harmonised transmission tariff structures (NC TAR), the Federal Grid Agency (BNetzA) has set out the REGENT-Regulation for the market areas GasPool (GP) (file ref. BK9-18-611) and NetConnect Germany (NCG) (ref. BK9-18/610), AMELIE (ref. BK9-18/607), BEATE 2.0 (ref. BK-9-18/608), and MARGIT (ref. BK9-18/612) respectively. The aim of the NC TAR is to "introduce union-wide regulations, [...] which contribute to market integration, increase supply security and promote the interconnection of gas networks".[1] The decisions adopted by the BNetzA should meet the objectives of the EU regulation. The core decision of the BNetzA is the introduction of a market area-specific uniform postage stamp as a reference price method for tariff setting purposes (REGENT-GP/REGENT-NCG regulations) and a compensation mechanism (AMELIE) between transmission system operators in each market area to reflect the joint tariff establishment. The decisions are due to enter into force on 01.01.2020. The REGENT Regulations will have to be revised in the context of the planned market area merger between NCG and GP in 2021.

The transmission system operators GRTgaz Deutschland GmbH and Gascade Gastransport GmbH, as well as shipper Gazprom export LLC have commissioned DNV GL Energy Advisory GmbH to carry out a study on the economic appropriateness and reasonableness of the decisions adopted, in accordance with the requirements for implementation of the code as set out in NC TAR. The results of the study are presented in this report. Furthermore, the report includes an examination of alternative reference price methods, which represent an improved cost-orientation in the establishment of network tariffs in comparison with the reference price method set out in the REGENT-Regulation.

In compiling the report, unbundling conditions for the exchange of information were explicitly considered. In particular, the collection of the underlying data from the TSOs and Gazprom export LLC, compilation of the data and queries arising from this were worked through separately, with the respective other party excluded. Any transfer of data between the parties, in particular from GASCADE Gastransport GmbH to Gazprom export LLC, and vice versa, was excluded.

The starting point for the study is the analysis of BNetzA's REGENT-Regulation. REGENT aims to set uniform network tariffs within each market area. The basis for calculating the uniform tariffs is the forecast contracted capacity of the transmission system operators, as well as the revenue caps, aggregated for the market area. This results in a REGENT-based postage stamp for the NCG market area of 4.07 €/kWh/h/a and, for the GP market area, of 3.36 €/kWh/h/a in the year 2020. In addition to the arithmetic result of the reference price method, the underlying assumptions and reasons for implementing NC TAR are also significant and these therefore form the focus of the study.

In order to evaluate the appropriateness of the REGENT reference price method, the characteristics are compared with the requirements of the reference price methods in their respective areas of application. The reference price method set out in REGENT is presented in chapter 2. Chapter 3 presents the function and characteristics of network tariffs in entry/exit systems, in the present regulatory context, as well as the nature and characteristic of the German transmission system. This is of particular relevance for the application of the reference price method. In order to consider this, the study aims to assess the German transmission systems from a technical and functional perspective in chapter 4. This involves focusing on the individual cost structures of the transmission system set out in chapter 5. The latter allows to identify the theoretical and practical requirements for a correct and appropriate reference price method.

[1] NC TAR Reasons (1)

Based on the details of the characteristics of the gas transmission systems and the exit/entry regimes, as well as the REGENT reference price method, the potential economic effects of introducing REGENT have been assessed. The effects can be divided into two categories. The effects of market area-specific postage stamps on cost orientation and the network tariff signals have been analysed in chapter 6. In chapter 7, an economic assessment of the effects on both gas market and pipeline competition has been conducted. The analysis of the effects is supported quantitatively based on the data available.

Based on the analysis, it is shown that the reference price method using uniform postage stamps does not represent a correct implementation of NC TAR, as it does not fulfil the requirements of cost orientation and avoidance of cross-subsidies. Moreover, possible alternative reference price methods are outlined, which better correspond to the implementation of NC TAR and its cost-orientation objectives (chapter 8).

In addition to analysing the existing price reference method, the report studies whether and to what extent the restriction of the discount for conditional capacity products can be justified (chapter 9).

2 REFERENCE PRICE METHODOLOGY FOR BNETZA (REGENT)

The aims of the underlying NC TAR regulation are, inter alia, to achieve harmonisation and transparency in the design of tariff structures for gas transmission systems.[2] On 29 March 2019, BNetzA determined a reference price method for transmission system operators (TSOs) called REGENT-Regulation.

The new reference price method set out by the REGENT-Regulation shall apply for the determination of transmission system operator tariffs from 1 January 2020 in each of the two market areas, NCG and GP. According to the REGENT-Regulation, the calculation of tariffs follows the postage stamp method. The BNetzA prefers the postage stamp method over the capacity-weighted distance approach.[3] In contrast to the existing individual network operator tariffs, the approach required by the REGENT- Regulations results in a uniform capacity tariff (stamps) for each market area.

The BNetzA justifies this methodology on grounds of better transparency and clarity. According to the BNetzA, the overall costs for the gas transmission system are to be reflected in the tariff through cost drivers based on forecasted capacity bookings.

The postage stamp is determined using the forecasted capacity booking for each market area and the resulting revenue differences (deviations from the allowed revenue of each transmission system operator) are adjusted using a compensation mechanism amongst the TSOs (AMELIE Regulation).

To calculate the postage stamps, the cumulated revenue caps for all transmission system operators in each market area are divided by the forecasted capacity bookings. As such, the allowed revenue of each transmission system operator remains unchanged, but the total cumulated revenue is distributed differently as part of an integrated tariff system.

The entry-exit split is established indirectly by determining the capacity basis for calculating the postage stamps. It amounts to 31.94%/68.06% for the NCG market area and 37.63%/62.37% for the GP market area.

The REGENT-Regulation also contain specifications for the network tariffs for gas storage systems and tariffs for conditional capacity products. A discount of 75% is applied to tariffs for the entry and exit points on gas storage systems.

As set out in the REGENT-Regulation, the tariff for conditional capacity products may not be lower than the tariff for the interruptible standard capacity product at the respective point. The lower limit for the interruptible capacity product is because an interruptible product is an inferior product compared to the other capacity products. In contrast to the other capacity products, the possibility of interruption cannot be ruled out under any circumstances, which is why all other products are to be considered to have a higher value.

The postage stamps refer to the standard product for firm annual capacities. The shortfall and excess revenue resulting from the use of multipliers[4] and discounts are accounted for in a second step. Specifically, the tariffs are scaled using an adjustment factor.

The indicative tariffs from the REGENT Regulations and other indicative details and calculation components are shown in the following table.

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2 A detailed description of the objectives of NC TAR is contained in Appendix A: Roles and requirements of NC TAR.

3 BNetzA argues that the capacity-weighted distance method has a poorer forecasting quality and is not as resistant to errors. According to the BNetzA, the benefits of the postage stamp method lies in the cumulation of values for capacity forecasts and the related averages, which bring stability to the network tariffs (BK9-18/610-NCG, Rn. 215 f.).

4 The multipliers are used to calculate the tariffs from various non-yearly capacity products.

	NetConnect Germany	GASPOOL
Forecast contracted capacity	332,727,214 kWh/h	307,326,030 kWh/h
Revenue from transmission services	1,303,030,999 €	919,124,928 €
Indicative reference price before adjustment[5]	3.92 €	2.99 €
Adjustment factor	1.08	1.09
Indicative reference price after adjustment	4.21 €	3.27 €
Entry-Exit-Split	31.94 % / 68.06 %	37.63 % / 62.37 %

Table 1: Indicative details for 2020

Source: BNetzA[6]

The TSOs have published the postage stamp tariffs for the 2019 annual auction upon which capacity has already been based and auctioned. A postage stamp tariff is set for NCG at all entry and exit points in the sum of 4.07 € per kWh/h/a (after adjustment). For GP, the tariff is 3.36 € per kWh/h/a (after adjustment).[7]

The REGENT methodology must be repeated at least every 5 years. Due to the planned market area mergers on 01 October 2021, it is planned that REGENT 2.0 will be established prior to this.

5 According to BNetzA, the price before adjustment does not consider that based on the forecast capacities depending on the booking patterns of network users different revenues can be achieved.

6 https://www.bundesnetzagentur.de/DE/Service-Funktionen/Beschlusskammern/BK09/BK9_01_Aktuell/Veroeffentlichungen/Workshop_07112018/Folien_BK9.pdf?__blob=publicationFile&v=1 (accessed on 01.10.2019).

7 https://www.gwf-gas.de/aktuell/maerkte-und-unternehmen/24-05-2019-einheitliche-briefmarkenentgelte-2020-fuer-die-netzgebiete-netconnect-germany-ncg-und-gaspool-veroeffentlicht/ (accessed on 21.10.2019).

3 NETWORK TARIFFS FOR ENTRY/EXIT REGIMES

This chapter presents the features of an entry/exit regime and the role of network tariffs. It explains the significance of cost orientation for network tariffs and explores the network tariffs in the REGENT-Regulation in detail. It will serve as the basis for the following chapters in which the function-specific features and the cost structures for the transmission system will be analysed in the context of the entry-exit model.

3.1 Entry-Exit Regime

In accordance with the Directive 2009/73/EC, the EU Member States are obliged to implement the entry/exit model into their national law. Under EC regulation no. 715/2009, Member States were obliged to abolish the pricing of contract paths on 3rd September 2011. The objectives of introducing the entry/exit models are to promote competition in the wholesale market, encourage efficient network use and to support implementation of an EU internal market for natural gas.[8]

The entry/exit model is based on an abstraction of transport paths. Through this model, entry and exit capacities can be booked independently by transport customers. The capacities are offered based on various products. Firm capacities guarantee the provision of transport capacity by the network operator. Furthermore, interruptible transport capacities and conditional capacity products can be sold. The first group does not have a guaranteed transport right and the second group limits the free allocability of the booked capacity.

A virtual trading point (VTP) forms an integral component in the entry/exit models. The VTP is not bound to a physical location in the network and can basically be reached by every market participant. Besides the booked entry and exit capacities, no special entry or exit capacities are necessary for access to the VTP. Transmission users who have entry capacity in the market area can thereby trade gas on the VTP. The gas can be off-taken via exit capacity which is booked independently from the entry (and for instance be supplied to end customers or to adjacent market areas or the gas transmission systems of neighbouring countries). As such, the effective tariff for a specific gas flow depends on the selected entry and exit point.

3.2 Network tariffs in entry/exit regimes

The prices reflect the (long-term) marginal costs on the competitive markets. In this case, participants in the market would ultimately bear the costs caused by their purchase decisions. As the gas transmission networks are regulated and network usage tariffs are set, the tariff system should take into account the cost orientation and the potential effect on competition and trade in gas markets.

The principle of cost orientation means that entry and exit tariffs are determined so that they are as close as possible to the costs for providing the network service. The principle of cost orientation[9] combines two significant criteria: economic allocative efficiency (cost causation) and cost recovery (economic viability).[10]

In order to meet the criterion for cost recovery, the tariff system must allow the regulated network operator to recover its reasonable costs. This means, that the network tariffs are calculated so that they recover

8 The European regulation (EC) no. 715/2009 states: "To enhance competition through liquid wholesale markets for gas, it is vital that gas can be traded independently of its location in the system. The only way to do this is to give network users the freedom to book entry and exit capacity independently" (European Union, 2009, Regulation (EC) no. 715/2009).

9 E.g. Consentec / Fraunhofer, Optionen zur Weiterentwicklung der Netzentgeltsystematik für eine sichere, umweltgerechte und kosteneffiziente Energiewende, study commissioned by the German Federal Ministry for the Economy and Energy (BMWi), 11.06.2018.

10 See also chapter 3.3 in which the legal basis is set out, in particular art. 13 GasVO and art. 7 NC TAR.

the network operator's allowed revenue caps. These revenue caps comprise of the reasonable capital costs (depreciation and return on assets) and operating costs for the duration of the regulatory period.[11]

The criterion for allocative efficiency requires that the specified network tariffs generate reliable information for the transport customer with regards to the costs incurred by the network operator. The aim of allocative efficiency is to assign the costs to those causing them (network users). In this way network users are provided with adequate monetary incentives. They can opt to use transport services if the benefits of their decisions to use the services exceed the costs incurred. Therefore, network tariffs are causally fair if they are designed towards the cause-effect relationship between decisions on the user side and costs on the network side. If the tariffs are lower than the network costs caused by the user activity, the user will, from an economic point of view, be encouraged to inefficiently make high use of the network. On the other hand, if the tariffs are higher than the costs incurred by the network user, the network use will be inefficiently low.

Furthermore, network users are exposed to incentives to use the existing transport infrastructure economically. This applies both to daily business and in the long-term. In the short term, price signals are aimed towards achieving an efficient network operation and network use. In the long term, the signals ensure an efficient expansion of the network, which takes capacity needs into account. Tariffs that are causally fair should be orientated towards the network's (long-run) marginal costs[12] [13], which are caused by the respective network users' decisions. It is essential that the network user basically pays for the infrastructure used for the transport service.

In contrast to this, the revenue caps for network operators are based on historical costs. These costs are mostly no longer affected by the future decisions made of network users. They may differ from the network operators' marginal costs for several reasons, such as increasing returns to scale or changes in technology and factor prices. In order to meet the criterion for cost recovery, the tariff system must allow the regulated network operator to earn its reasonable costs. As such, average costs are often used in practice, as in the case for the tariff system in Germany. [14] Tariffs based on average costs are calculated by dividing the allowed revenue and a selected chargeable quantity, such as the forecast contracted capacity. The mechanisms used to allocate cost to network users play a central role in this context.

Fully fair cost causation cannot be achieved in practice because the network infrastructure is used jointly by many users and it is not possible to determine individual, exclusive user rights to parts of the network. Furthermore, the network is expanded by using asset components with a lumpy structure and not designed to meet the needs of individual users in precise stages. This does not, however, affect the primarily distributive question as to whether a justifiable allocation of existing costs can be made to network users based on their actual network usage. Even if complete cost causation in the allocation process cannot be achieved, the tariffs should reflect the form of use of the entry-exit system, such as internal system and cross-system use, so that network users of a particular infrastructure also bear this cost.

One of the key decisions in the design of an entry/exit tariff system is the extent to which the use of network tariffs should be differentiated or uniform. In the case of differentiation, the tariffs vary depending on the location of an entry or exit point in the network/market area or other criteria. It is possible to design different tariff structures between the two extremes, i.e. a system based on uniform tariffs and a system using highly differentiated point-specific tariffs. For instance, one can distinguish between different groups

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11 The deviation between the actual and allowed revenues is compensated by the regulatory account mechanism.

12 Long-run marginal costs are the additional costs including investments to provide additional transport capacity.

13 Entry-exit transmission pricing with notional hubs – can it deliver a pan-European wholesale market in gas? Oxford: Oxford Institute for Energy Studies. NG 23, Hunt, P. (2008).

14 Conditions for the transmission of gas and electricity, records of the Institute of Energy Economics vol. 51, Munich, Perner, Jens / Riechmann, Christoph / Schulz, Walter (1997).

of entry/exit points based on different aspects, in order to achieve a cost orientation for the network tariffs which would otherwise be missing. The decision as to the extent to which the network tariffs can be differentiated (and from an economic perspective should be differentiated), will depend on the specific network conditions.

3.3 Legal framework

The principle of cost orientation can be found in several European and national documents. The relevant aspects are addressed in the following section. In accordance with these regulations, the tariffs should be non-discriminatory and should not restrict market liquidity or trade.

EC regulation 715/2009 on conditions for access to natural gas transmission networks

According to EC regulation 715/2009[15], tariff models should ensure "*that they fully comply with the principle of non-discrimination and the needs of a well-functioning internal market and take fully into account the need for system integrity and reflect the actual costs incurred, insofar as such costs correspond to those of an efficient and structurally comparable network operator and are transparent, whilst including appropriate return on investments, and, where appropriate, taking account of the benchmarking of tariffs by the regulatory authorities."* (Recital 7). It further stresses the following: "*The tariffs or the methods for calculating them must make efficient gas trading and competition easier, whilst at the same time avoiding cross-subsidies between network users and offering incentives for investment and for maintaining or creating interoperability in the transmission systems.*" (Art. 13 (1)). Furthermore, art. 13 (2) states that: *"Tariffs for network access shall neither restrict market liquidity nor distort trade across borders of different transmission systems.*"

NC TAR

According to NC TAR, the reference price method should be aimed towards "*taking into account the actual costs incurred for the provision of transmission services considering the level of complexity of the transmission network*" (Art. 7(2)(b) and "*ensuring non-discrimination" (Art.* 7 (2)(c) and "*ensuring that the resulting reference prices do not distort cross-border trade.*" (Art. 7 (2)(e). The reference prices should also be designed to ensure "*a level of cost reflectivity*" (Recital 3 sentence 3).

EnWG (Energy Industry Act)

Even the EnWG[16] stipulates that the tariffs will be based on the costs of the respective network. Article 21 of the EnWG is the central national statutory basis for tariff regulation and makes provisions for the material basis of tariff formation. According to the EnWG, the tariffs for network access may not be less favourable "*than those applied by the network operators (...) and actually or mathematically billed*" (Art 21 (1)(1). In this regard, the EnWG requires that the tariffs are also based on "*the operational costs must correspond to those of an efficient and structurally comparable system operator, taking into account the incentives for an efficient provision of services and an appropriately competitive and risk-adjusted return on capital (...), in pursuant to a regulation , in accordance with Article 24, is not determined to be a deviation from cost-orientated tariff formation*" (Art. 21 (2)(1). Furthermore, the EnWG states that "*if the tariffs are formed using cost orientation, the costs and cost components that are to the extent not competitive may not be taken into account"* (Art. 21 (2)(2).

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15 Regulation (EC) no. 715/2009 of the European Parliament and the Council, dated 13 July 2009 regarding the conditions for access to the natural gas transmission networks and the repeal of regulation (EC) no. 1775/2005.

16 Electricity and gas supply act (Energiewirtschaftsgesetz - EnWG), dated 7 July 2005 (BGBI. in the sense of 1970, 3621), which was amended by article 1 of the law, dated 13 March 2019 (BGBI. in the sense of 706).

Gas Network Tariff Ordinance

The gas network tariff Ordinance[17] requires that network costs "*shall as far as possible according to cost causation principle, be recovered by entry tariffs on the one hand and exit tariffs on the other*" (Article 15 (1)(1). Amongst other things, "*an efficient use of the available capacities in the pipeline network*" and the *adherence to non-discrimination*" (Article 15 (2)(2) must be followed.

3.4 Network tariffs in the context of the REGENT regulations

The BNetzA justifies the uniform entry-exit tariff as a means of improving transparency and reducing the complexity of tariff calculations.[18] Nevertheless, in the case of an entry-exit tariff system with uniform tariffs, this does not sufficiently account for the principle of cost orientation. The main reason for this is that such a tariff system does not reflect the heterogeneity of the German gas transport network and the cost differences related to various transport activities.

As explained in chapter 4, the gas networks are used for cross-system and system-internal transport. The NC TAR also explicitly requires a differentiation between system-internal network use and cross-system network use. "System-internal network" use means transporting gas within an entry-exit system to customers connected to that entry-exit system (art. 3 (8) NC TAR). "Cross-system network use" means transporting gas within an entry-exit system to customers connected to another entry-exit system (art. 3 (9) NC TAR). An entry-exit system within this context is a market area[19].

The effects of market area-specific postage stamps on cost orientation and the network tariff signal effects are analysed in chapter 6. An economic assessment of the effects on gas markets and pipeline competition can be found in chapter 7.

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17 Regulation on the tariffs for access to the gas supply networks (gas network tariff ordinance- GasNEV), dated 25 July 2005 (BGBI. in the sense of 2197), which was amended by article 118 of the law, dated 29 March 2017 (BGBI. in the sense of 626).

18 BK9-18/610-NCG Rn. 213.

19 According to REGENT-GP, Rn. 176 *The term „entry-exit system" corresponds to the term "market area" in section 2 para 10 GasNZV.*

4 THE DEFINITION AND FUNCTION OF "TRANSMISSION" AND THE GERMAN TRANSMISSION NETWORK

4.1 Transmission network functions

According to EC 715/2009, transmission is defined as "*the transport of natural gas through a network, which mainly contains high-pressure pipelines, other than an upstream pipeline network and other than the part of high-pressure pipelines primarily used in the context of local distribution of natural gas, with a view to its delivery to customers, but not including supply*". (Art. 2 (1)(1) EC 715/2009)

"Transmission", according to its technical meaning and purpose, serves the transport of gas volumes. Transport is necessary to deliver imported or produced volumes of gas to distribution networks and final consumers ("system-internal network usage"). On the other hand, gas volumes are also delivered to other entry/exit systems and transported further ("cross-system network usage"). In particular for import-dependent systems (as most entry/exit systems) this is done mainly to off-take gas volumes from other entry/exit systems.

The German Energy Act emphasises this aspect by defining transmission networks as networks that "*have border or market area transfer points, which guarantee the connection of major European import pipelines to the German transmission network*" (Art 3 (5) EnWG[20]. Until the market area merger in 2021, transport between both German market areas therefore also counts as cross-system network usage.

These two functions of the transmission networks are accompanied by specific characteristics. Transmission networks are often called the "backbone" of a gas supply network[21] and are generally operated at high pressure levels. Compressor capacity is also a criterion which ensures that pressure is maintained in the transmission network. A further relevant criterion is the pipeline diameter. This is because the required transport volumes for the purpose of supplying gas to other entry/exit systems or procuring gas from other entry/exit systems can be increased by using a higher pipeline diameter. Networks with the system-internal function are connected to the networks with cross-system function.

The matter of whether and to what extent a cross-system network usage within the framework of a cost-orientated tariff can take place for the benefit of other entry/exit systems depends on the entry/exit system under consideration. For instance, the transmission system in Sweden cannot provide cross-system usage due to a lack of cross-border exit points.[22] By contrast, cross-system network usage is very pronounced in the German transmission network, as explained in the next section, due to substantial gas imports and exports.[23]

Transmission networks are typically connected to distribution networks. The task of a distribution network is "the distribution of gas" EnWG Art 3 (6), whereby distribution means the "*transport of gas via local or regional networks*" with the aim of "*making it possible to supply customers*" Art 3 (37) EnWG. It is precisely this purpose that frequently characterises distribution networks in terms of a high degree of meshing. They

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20 The full definition is as follows (own translation): "*Operators of networks that have border or market area transfer points which in particular guarantee the connection of major European import pipelines to the German transmission network, natural persons or legal entities, or legally non-independent organisational units of an energy supply company which are responsible for the task of transmission of natural gas and are responsible for the operation, maintenance and, if necessary, expansion of a network, a) which serves to connect domestic production or LNG installations to the German transmission network, provided this is not an upstream pipeline network as defined in number 39, or b) which has booking points or zones at border or market area transfer points, for which transport customers can book capacity*"

21 Competition on the transmission networks of the German gas industry - An economic network analysis, published by Prof. Günter Knieps 85, August 2002.

22 ACER Report on Sweden of 30.08.2018, Rn. 41, to download at https://acer.europa.eu/ro/Gas/Framework%20guidelines_and_network%20codes/Pagini/Harmonised-transmission-tariff-structures.aspx

23 See Diagram 5

are used technically for distribution over an area and typically have no relevance to the supply of other entry / exit systems.

A typical indicator to distinguish between the two types of networks, inter alia, is the difference in pressure levels. Normally a distinction is made between high-pressure, medium-pressure and low-pressure levels. In the publication requirements set out in Art. 27 of GasNEV, the high-pressure levels are defined as everything above 1 bar, medium pressure as between 0.1 bar and 1 bar and low-pressure as all pressure levels below that. These categories can, however, be further broken down. According to the industry association DVGW, the pressure levels between 16 bar and 100 bar are defined as high-pressure gas pipelines. This is also the case for the definition in the High-Pressure Gas Pipelines Regulation (GasHDrLtgV Art. 1). Gas supply networks with operating pressures of up to 16 bar comprise, according to DVGW statistics, 99% of gas distribution networks[24], whereby a technical distinction is made between gas pipelines with operating pressure between 4 and 16 bar and gas pipelines of up to 4 bar operating pressure.

It is possible to further differentiate the transmission pipelines. Depending on whether gas transmission pipelines are primarily used for system-internal or cross-system network use, the line diameters are usually different. This is because that gas transport to supply other countries usually requires larger volumes. Thus, with the number of directly or indirect connected "recipient countries", the transported volume inevitably increases beyond the imported volume for gas consumption in the internal market.

Transmission networks that typically fulfil mainly cross-system transport functions, high-pressure pipelines with larger diameters are typically used, i.e. diameter class A (>= 1000 mm DN) [25]. This can be seen, for instance, in the pipeline structure of the TSOs of NEL Gastransport GmbH, OPAL Gastransport GmbH and also GRTgaz Deutschland GmbH, which own only pipelines in diameter classes A and B in their transmission network. The pipelines in classes E (up to 350 mm DN) to G (below 110 mm DN) are, on the other hand, likely to be found at municipal companies or traditional distribution companies. [26]

When dividing the German high-pressure gas network according to pipeline diameter class, differences can also be found among transmission system operators, who conduct mainly system-internal activities. In this case, usually the majority of the pipelines are within class C (between 700 and 500 mm DN) and F (between 225 and 110 mm DN).

A technical review diameter class and transport activities is undertaken in section 4.3. Section 5.1 contains a further analysed from an economic point of view.

The following diagram presents the share of diameter class on the TSOs of the entire German gas network.

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24 This diagram is obtained from the data collected in the DVGW code of practice G 410 on the length of DSO pipelines (292,406 km) and the length of TSO pipelines (2,245 km) in the pressure range below 16 bar (see also DVGW publication "Energy | Water Practice Edition 6/7 2019").

25 E.g. Wettbewerb in Ferntransport von Erdgas? Technisch-ökonomische Grundlagen und Anwendung in Deutschland, Christian von Hirschhausen, Anne Neumann, Sophia Rüster, expert report commissioned by EFET Deutschland, p. 17.

26 In an analysis carried out by the experts and based on thirteen large distribution network operators (Avacon Netz GmbH, bnNETZE Gmbh, EnergieNetz Mitte GmbH, Energienetze Bayern GmbH & Co. KG, e-netz Südhessen AG, EWE Netz GmbH, GELSENWASSER Energienetze GmbH, inetz Gmbh, MDN Main-Donau Netzgesellschaft mbH, Mitteldeutsche Netzgesellschaf Gas mbH, Rheinische Netzgesellschaft mbH, Schleswig-Holstein Netz AG, TEN Thüringer Energienetze GmbH & Co. KG) with over 100,000 customers and approx. 116,000 km (according to the monitoring report 2018 of the BNetzA the total length of the German gas distribution network amounts approx. to 500,000 km), it was found that there are only around 15% of high-pressure pipelines, of which over 90% have a diameter in classes E to G.

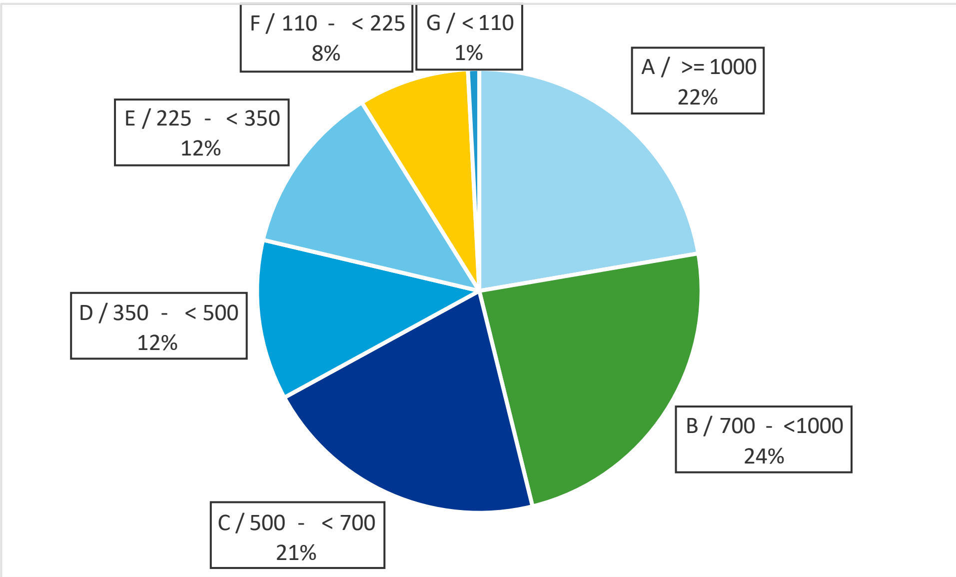

Diagram 1: Proportion of the respective diameter class on the entire network for all TSOs

Source: DNV GL, TSOs

Furthermore, when examining the various entry and exit points it becomes clear that they, by definition perform different tasks and have specific functional roles. On the exit side, bookings at border and market transfer points (GÜP and MÜP) serve cross-system tasks, whereas, for example, capacity bookings at exit points for end consumers and to downstream distribution networks (for internal orders) take on system-internal functions. Bookings on the entry-side are associated with both forms of network usage.

4.2 The German transmission network

The German transmission network consists of approximately 40,000 km of pipelines, which are connected to the gas distribution network through over 470,000 km of pipelines.[27] This transmission network is operated by 17[28] TSOs.

The high number of TSOs, which is unique in Europe, has historically grown due to regionally active private companies. There are large differences between the gas network operators, which is relevant for the tariff setting. Distinctions were made during the first regulatory period (2009-2012) between distribution network operators, trans-regional transmission network operators and regional transmission network operators. In the course of the new statutory regulations since the second and third regulatory periods, some formerly regional transmission network operators have been classified as distribution network operators. Distribution networks are downstream in the hierarchical network structures, and transport gas which has already been transported in a transmission network.

Following the objective of a European internal market, individual gas networks will be merged into market areas. The national market area merger will be completed with the merger of GP and NCG on 1 October 2021. In order to complete this merger reasonably in economic and technical terms, market mechanisms will mainly be applied. Independent of the market area merger, technical measures that support security

27 Source: https://www.fnb-gas.de/gasinfrastruktur/gassektor/

28 The capacity of jordgas GmbH is marketed by Open Grid Europe GmbH and Gasunie Deutschland GmbH (see: https://www.gasunie.de/news/reorganisation-von-jordgastransport-2). The procedure for certifying Ferngas Netzgesellschaft mbH has not yet been completed (file ref. BK7-18-051). Both companies are included in the 17 TSOs.

of supply and congestion management, such as the construction of new pipelines, will be incorporated in the network development plans and subsequently implemented.

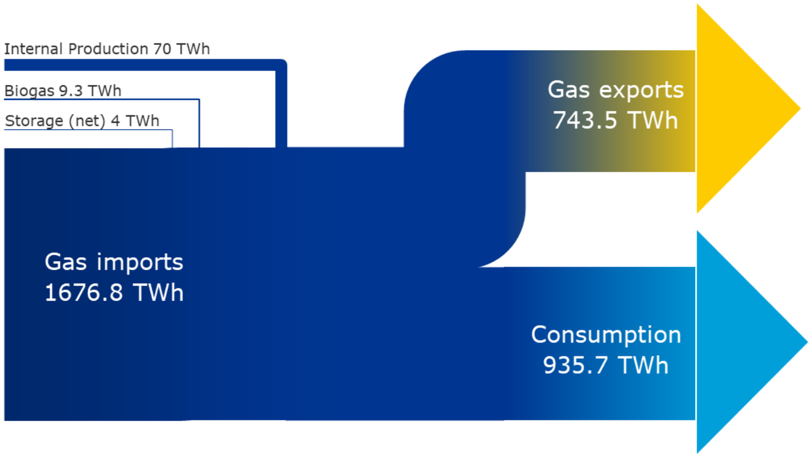

Diagram 2: Total gas balance 2017[29]

Source: DNV GL

Due to Germany's central location in Europe, parts of the German gas transmission network are used for cross-system transport. In 2017, export quantities (743.5 TWh) comprised of around 44% of imported gas (1,676.8 TWh).[30] The import countries were (in descending order of volumes received) the Czech Republic, the Netherlands, Switzerland, France, Austria and Germany's remaining neighbouring countries. Germany is therefore an important partner for these countries. In 2017, for example, 97% of all gas imports to the Czech Republic flowed through Germany. Even France, which has its own LNG terminals and gas, as well as routes from the north and south, obtained 17% of its gas imports through pipelines via Germany.[31] Some of the import countries also supply gas, so there are gas flows in both directions between Germany and certain neighbouring countries. The producer countries for the gas transported to Germany are Russia including the CIS states (approx. 65%) and Norway (approximately 17%).[32] Moreover, L-gas is primarily imported from the Netherlands. As a result of the planned closure of the gas field at Groningen, the Netherlands will, however, lose its importance as a gas producer. The rest of the supply comes from the United Kingdom and LNG from terminals in other EU states.

The following diagrams show a breakdown of the number of exit points and the cumulated technical exit capacity. Although the proportions of GÜPs and MÜPs are overall lower than those at network points iB (internal orders) and Lv (final consumers), the average technical capacity per point is higher for the first group (average in market area GP for GÜP and MÜP 3.9 GWh/h and for Lv and iB 0.5 GWh/h; average in market area NCG for GÜP and MÜP 2.0 GWh/h and for Lv and iB 0.2 GWh/h).[33]

On the entry side, the entire German gas import is spread across 46 cross-border points (including 19 in the GP market area and 27 in the NCG market area).[34] This implies, for example, that in 2017 there was an average import volume of 36.45 TWh per entry point. The average export volume per exit point (GÜPs) for 2017 was 17.7 TWh. In contrast to this, the consumption in the same year was spread across 512

29 Diagram inspired by the 2018 monitoring report by the BNetzA & Bundeskartellamt (2019), p. 339

30 Source: 2018 monitoring report by the BNetzA & Bundeskartellamt (2019), p. 339

31 Source: IEA GTF, https://www.iea.org/gtf/

32 Source: 2018 monitoring report by the Federal Grid Agency & Bundeskartellamt (2019), p. 350

33 REGENT Appendix 2 and 3, BNetzA (2019)

34 On the exit side, there are 16 GÜPs in the GP market area and 26 GÜPs in the NCG market area.

points for end consumers (114 in GP and 398 in NCG) and 609 points for internal orders (197 in GP and 412 in NCG), so that the average for these points was only 0.83 TWh.[35]

This highlights the significant role of cross-system gas transport in Germany. In the following section, the differences between cross-system and system-internal functions is discussed in detail, taking the different TSOs into account.

Diagram 3: The number of exit points (left) and technical exit point capacity (right) for the Gaspool market area

Source: REGENT-NCG Appendix 3 (left) and Appendix 2 (right), BNetzA (2019)

Diagram 4: The number of exit points (left) and technical exit point capacity (right) for the NetConnect Germany market area

Source: REGENT-NCG Appendix 3 (left) and Appendix 2 (right), BNetzA (2019)

Diagram 5: The number of exit points (left) and technical exit capacity (right) for both market areas

Source: REGENT-GP and REGENT-NCG Appendix 3 (left) and Appendix 2 (right), BNetzA (2019)

35 Own calculation - Source: 2018 monitoring report by the BNetzA & Bundeskartellamt, p. 339; REGENT Appendix 2 and 3, BNetzA (2019).

4.3 The heterogeneity of the transmission network

The different structures of the transmission system operators should be considered when determining a tariff methodology.

In contrast, the BNetzA does not attribute any significance to the heterogenous nature of the gas networks in the established tariff methodology, although this was already recognised in prior regulatory analyses. In the efficiency analysis of the distribution network operators, for example, heterogeneity was observed among these operators. Therefore, and due to the suspected distortion of results through the potential outliers, it was necessary to remove the former transmission system operators from the data sample of distribution network operators before a new efficiency analysis could be undertaken.[36]

Furthermore, when observing the network infrastructure data of transmission system operators, it shows that this too is a heterogenous group. This is attributable, among others, to the different transport activities in the German gas network. In our empirical analysis (using an evaluation matrix with several indicators), we demonstrate that various profiles characterise the transmission system operators with regards to the transport function.

4.3.1 Choice of indicators

The characterisation of network operators is based on the following five indicators:

1. The average diameter of the pipeline network (mm)[37]
2. The proportion of the pipelines (%) with diameter classes A and B (>700 mm)
3. The exit point density (exit point/kilometre)
4. The proportion of interconnector [38] capacity to the exit capacity (%)
5. The ratio of compressor capacity[39] to the length of pipelines with diameter classes A and B (MW/km)

The variation in the gas pipeline diameter size dependent on the transport tasks is taken into account in the evaluation matrix using two indicators: the average diameter in the gas pipeline network (mm) (Indicator 1) and the proportion of the gas network with a diameter of > 700 mm in the entire length of the network (%) (Indicator 2).

The average diameter is determined as a weighted average, whereby the weighting is derived by the length of the gas pipelines with various diameters. Both these indicators underline one of the key distinguishing features within the transmission network, in that a higher average diameter or a higher proportion of pipeline diameter classes A and B likely suggest a cross-system transport function.

Another important structural feature for transport activities is the number of exit points. The number of exit points is suitable for representing the granularity of transport activities. This corresponds to the

36 BGH dated. 12.06.2018 - EnVR 53/16 and VI-3 Map 121/14 [V] (OLG Düsseldorf)

37 The actual diameters are not known to us. According to §27 GasNEV the network operators are obliged to publish certain structural parameters. These parameters were used in the calculation. It is possible that the jointly operated pipelines are included with their full length in the data of the companies. Standard diameters according to the diameter classes were used in order to determine the average diameter for each system operator. Class A was set equal to 1200 mm, class B to 850 mm, class C to 600 mm, class D to 425 mm, class E to 287.5 mm, class F to 167.5 mm and class G to 80 mm.

38 Information for these indicators is based on data in the NEP database 2018. Interconnector capacity refers to the exit capacity of the GÜP and MÜP in the respective market area.

39 The information on the compressor capacity is based largely on the publications in NEP 2018 from March and April 2019.

system-internal function described, which is generally related to many exit points. Accordingly, we use the exit point density, which is determined by dividing the network length by the number of exit points, and therefore also represents a characteristic indicator of the transport function (Indicator 3). A higher number of exit points per kilometre in the respective network indicates the greater importance of the system-internal function. In addition, we calculate the proportion of interconnector capacity in exit capacity (in %), which is a further important indicator for the distinction in transport functions (Indicator 4), where a higher ratio of exit capacity at border and cross-market points relative to overall capacity is indicative of a mainly cross-system function.

Because cross-border transport involves the transmission of large volumes of gas, larger compressor capacity is regularly required to ensure that the pressure remains stable across these long distances. On the contrary, gas networks with system-internal functions exhibit typically lower compressor capacity because they take gas from high-pressure networks and transport gas to networks and final users connected to the low-pressure level. The ratio of compressor capacity to network kilometres therefore represents another suitable indicator for characterising the transport task (Indicator 5).

For international or cross-market area transport, the operating pressure is generally higher because larger volumes of gas need to be transported over longer distances.[40] This also becomes clear in an example from the Spanish gas transmission network, where international gas transport is carried out only via pipelines with pressure over 60 bar (see chapter 8.2.2). Also, in the Dutch HTL system (see chapter 8.2.2), the pressure levels are significantly higher than in the downstream RTL.[41] In order to account for this, the role of the compression is reflected by using another indicator set as the ratio of the compressor capacity to the length of the pipeline with a diameter of > 700 mm (MW/km).

4.3.2 Analysing transmission system operators

When evaluating network operators, each of these can obtain a maximum of 20 points per indicator and therefore achieve a maximum score across all indicators of 100. A low score characterises a network with mostly system-internal functions, whilst a high score characterises a network with mostly cross-system functions. The sum of the five individual scores therefore provides an aggregated score that describes the functional characteristics of the network.

The establishment of the indicators was conducted using samples from 15[42] German TSOs. For each indicator, a score was calculated using the respective inputs for TSOs in the sample. Therefore, the respective maximum and minimum scores in the sample for each indicator represent the limits between zero and 20 points. Scores located in this bandwidth are calculated in proportion to the limits (linear interpolation). For example, a network operator with an indicator scoring at 80% of the sample maximum would therefore obtain 16 points.

Outliers were scored with the highest or lowest scores in the evaluation, in order to avoid distortion within the samples.[43] The following overview shows a boxplot diagram of the respective indicators. The diagram is to be understood as follows: the outer limits of the box represent the quartile limits, whilst the

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40 In networks with lower pressure levels, there are no or only a comparatively low number of compressor stations.

41 According to chapter 5.2.1. (p.18) of Gasunie Transport Services B.V. document "Ontwerp uitgangspunten transportsysteem" (https://www.gasunietransportservices.nl/uploads/download/6f579049-e1b8-42af-9935-64d707742d63), the pressure is typically equal to 67.2 bar, 71.6 bar or 80.9 bar, depending on the line. The maximum pressure for the RTL system is stated as 41 bar, and the minimum network pressure as 16 bar (chapter 6.1.4, p. 25).

42 Due to the circumstances described in the footnote 28, jordgas Gastransport GmbH und Ferngas Netzgesellschaft have not been included in the samples.

43 This was only necessary for the third indicator. Outliers were identified using the definition set out by John W. Tukey. This states that scores outside one and a half times the interquartile difference can be regarded as outliers (John W. Tukey (1977). Exploratory Data Analysis)

“antennae” above or below the box show either one and a half times the distance between the quartile limits (interquartile distance) or the maximum or minimum within the bandwidth of the sample. The limits inside the box represent the median, whilst the cross symbolises the mean. In this way, it becomes possible to visibly recognise the differences between the network operators and the dispersion within the indicator categories.

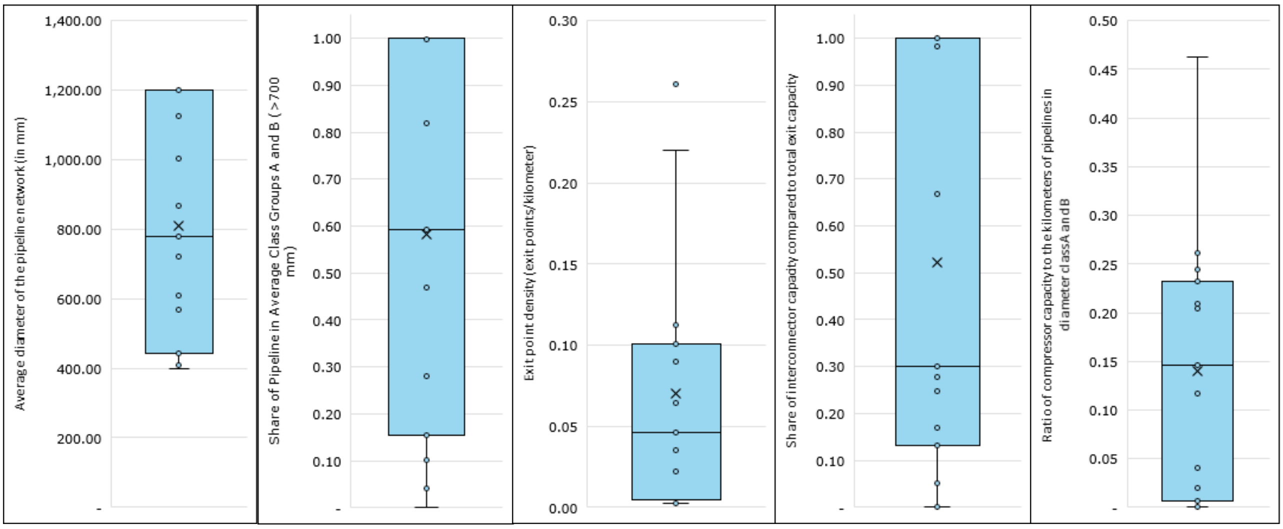
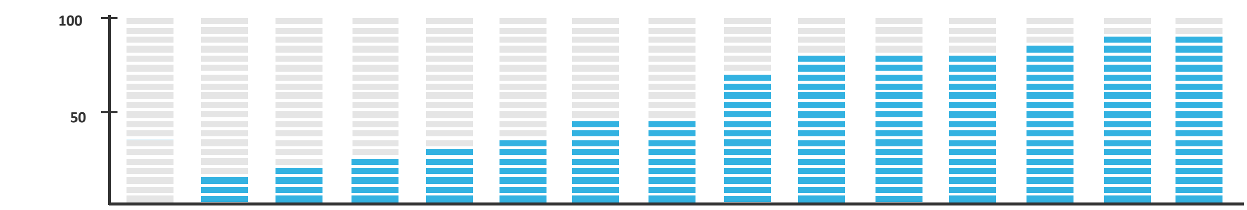


Diagram 6: **Boxplot diagram per indicator in the network operator sample**

Source: DNV GL

The scores aggregated for each category and applied for the German TSOs are shown in the following diagram.



TSO	GTG Nord	Thyssengas	Nowega	Bayernets	Ontras	Terranets bw	GUD	OGE	GASCADE	Fluxys TENP	NEL	Fluxys NEL	GRTgaz D	Lubmin-Brandov GT	OPAL GT
Sum	0	13	19	27	29	34	44	45	69	80	80	80	87	89	89
Indicator 1	0.00	0.33	0.25	4.29	5.25	1.16	8.10	9.51	11.73	15.12	20.00	20.00	18.16	20.00	20.00
Indicator 2	0.00	3.09	2.02	5.58	5.61	0.82	9.38	11.87	16.37	19.94	20.00	20.00	20.00	20.00	20.00
Indicator 3	0.00	0.00	14.14	9.86	14.31	10.94	15.96	11.96	16.98	18.20	19.78	19.99	17.98	20.00	20.00
Indicator 4	0.00	0.00	2.63	6.00	3.38	1.03	5.54	4.96	13.33	20.00	20.00	20.00	19.65	20.00	20.00
Indicator 5	0.00	10.03	0.28	1.75	0.84	20.00	5.05	6.33	10.56	6.44	0.00	0.00	11.28	8.83	9.04

Diagram 7: **Sum of indicator scores for all TSOs**

Source: DNV GL

4.3.3 Results of the structural analysis

The results presented in section 4.3.2 allow to identify various profiles. These profiles can be characterised as transmission system operators with largely system-internal transport function, “integral” transmission system operators with a combination of both transport functions, and transmission system operators with largely cross-system transport function.

The transport systems of TSOs with a cross-system profile serve to supply large volumes of gas with a high capacity utilisation. They often consist of individual pipelines with large diameters. Other than the pipelines with large diameters, there are often few or no pipelines with a smaller diameter in the network. As such, the proportion of large pipelines is relatively high. This becomes clear in the evaluation matrix, whereby the TSOs with largely cross-system transport functions display a high proportion of pipeline length with a diameter of > 700 mm (more than 60%). The TSOs in this profile usually have a large connecting capacity and relatively low number of exit points. Therefore, the exit point density for these TSOs is low and the proportion of interconnector capacity to the exit capacity is high. Finally, the TSOs with mainly cross-system transport functions have a significantly higher total compressor capacity in their network.

Transmission system operators with lower indicator score have typically mainly system-internal transport functions. For networks with a high proportion of end consumers and relatively small pipeline diameters, in some network sections the features of a regional distribution network can also be found. For example, these networks have a comparatively large number of exit points. Despite the relatively long pipelines, the ratio between the number of exit points and the length of the network is comparatively high. The total capacity of compressor units in the networks of TSOs with predominantly system-internal transport functions is by contrast comparatively low.

Ultimately the profile of an integral TSO (which conducts both cross-system and system-internal transport tasks) can be seen. In such cases the underlying transport system contains network components that fulfil cross-system tasks and network components that fulfil system-internal tasks. Due to the integration of function-specific network components in the individual operator’s network and the balanced function-specific characteristics, the scores for each indicator are mostly within the bandwidths of the sample and rarely show one extreme or the other.

The heterogenous nature of the transmission system operators indicates that overlaps between the system-internal transport function and the distribution function can exist. Examples include distribution networks, which solely serve industry customers (e.g. EWE RVN GmbH), as well as some of the former TSOs. The latter have to some extent merged with other TSOs or DSOs. A sample analysis reveals that, for instance, the networks operated by Avacon Hochdrucknetz GmbH (formerly E.ON Avacon) or Creos Deutschland GmbH are somewhat similar in their structure to the group of TSOs with a mainly system-internal function. These network operators also only have pipelines and exit points in the high- pressure network and few to no pipelines of the high diameter classes, A and B. This is also reflected in the comparable average diameter[44] of the pipelines. Further, the not-yet-completed procedure for Ferngas Netzgesellschaft GmbH with respect to the future system operation as a combined system operator indicates similarities between existing DSOs and TSOs.[45]

On the other hand, there is a relationship that can be identified based on an analysis between the indicator scores of the TSOs and the dominance of a cross-system role. The cross-system task is measured by the proportion of cross-border[46] exit capacities. The following diagram clearly shows that the gas transport functions are reflected correctly (the higher the score of the indicators, the more cross-system function per network operator).

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44 If the same assumptions are made as in footnote 37 the average diameter for Creos Deutschland is 258 mm (see https://www.creos-net.de/netzzugang-gas/netzinformationen/strukturmerkmale-27-gasnev.html), whereas for Avacon Hochdrucknetz GmbH (seehttps://www.avacon-hochdrucknetz.de/de/veroeffentlichungspflichten/strukturmerkmale.html) it is 246 mm.

45 Case no. BK7-18-051 (Initiation of certification proceedings, in accordance with § 4a EnWG)

46 This refers to the sum of GÜP and - MÜP capacities.

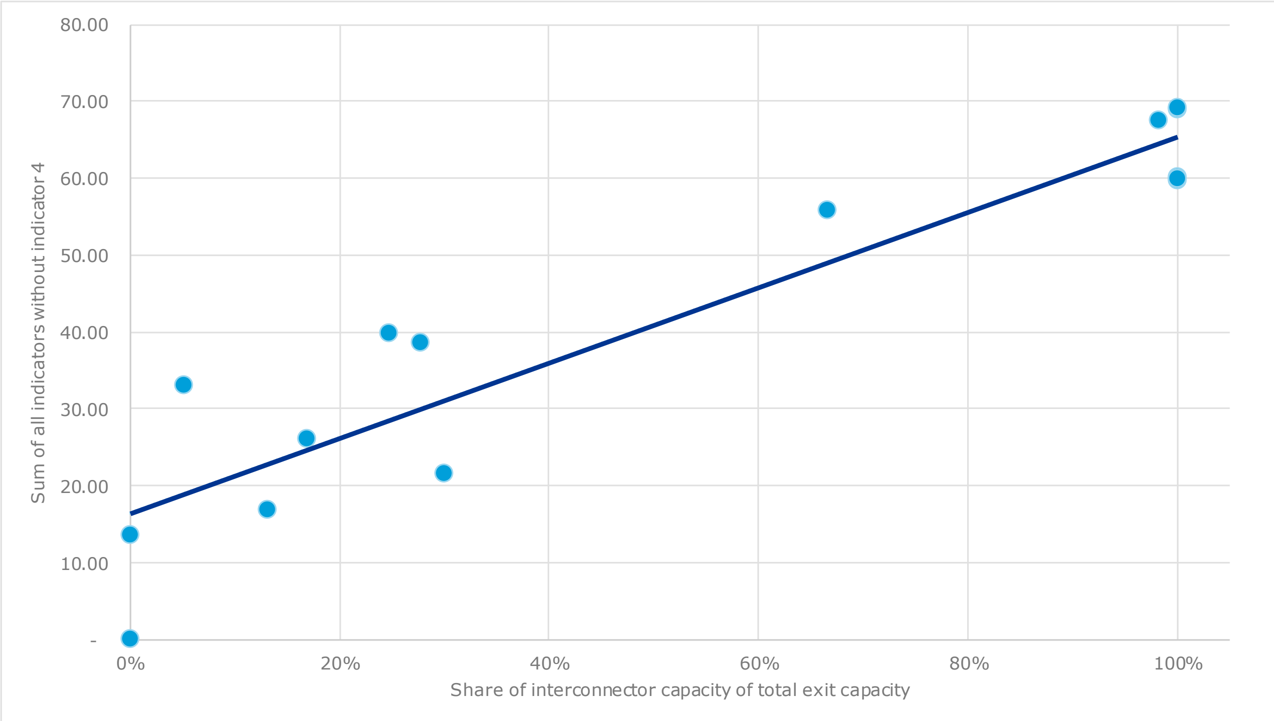

Diagram 8: Total indicator scores (Indicators 1-3 and 5) v. share the exit capacity of GÜP and MÜP (Indicator 4)

Source: DNV GL

4.4 The role of meshing

An important issue when evaluating the network features is the degree of meshing or the number of meshes in the total network.

Gas network systems can be classified according to various basic structures. As such, it is possible to distinguish between singular or branched pipelines (unilaterally or bilaterally fed), distribution networks with a main pipeline on which several nodes further develop the network peripherally, as well a ring networks, in which the pipelines are arranged in a ring, and meshed networks, in which there are a multiple connections between network points (Diagram 9).

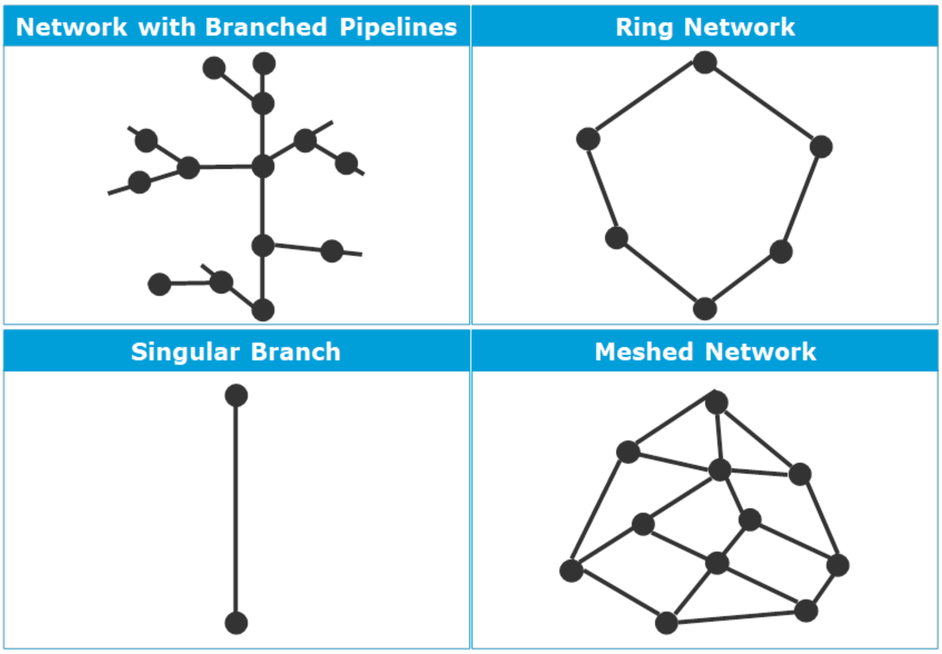

Diagram 9: The basic structures of pipelines

Source: DNV GL[47]

The representation of meshed networks set out in Diagram 10 is also used in the cost driver analysis and the subsequent efficiency analysis of gas transmission system operators based thereupon in the third regulatory period[48]. The network points connected to the meshed network are differentiated according to nodes with and without branch points. A maximum of two strands go from nodes without branches, whilst from nodes with branches, it is theoretically possible to have an unlimited number of strands connecting to them.

A mesh is therefore the connection between node points in a way that creates a virtual surface between points. To determine the degree of meshing, it is standard to count "the number of independent meshes, i.e. only those meshes that cannot be formed from other meshes"[49].

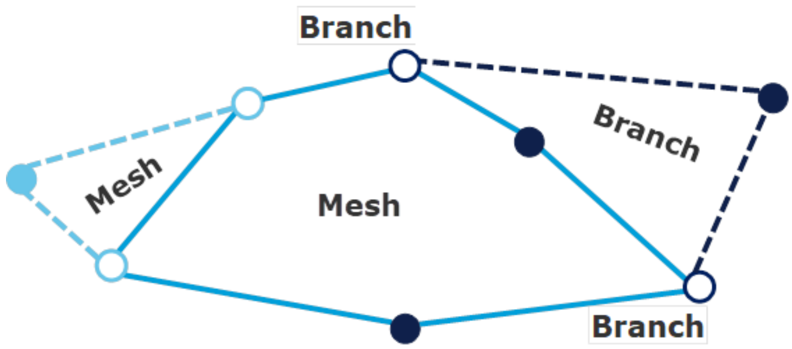

Diagram 10: Definition of branches and meshes

Source: DNV GL[50]

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47 Inspired by Lipphardt (2006)

48 BNetzA (2018c)

49 BNetzA (2018c)

50 Inspired by BNetzA 2018c

The degree of meshing in the German gas network is to be seen on a differentiated basis. On the one hand, the Federal Ministry for Economy and Energy (BMWi) describes a “closely meshed gas distribution network to the point of the end consumer”[51]. This observation is supported by the exemplary examination of a gas distribution network (Diagram 11). The gas network map clearly shows that many branches and thus many independent meshes are located in one such network.

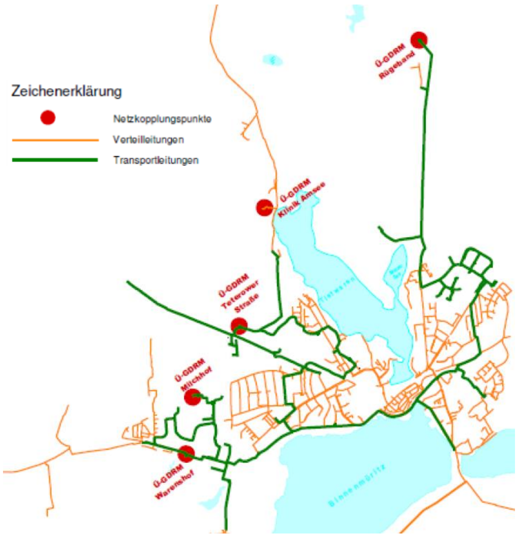

Diagram 11: Example of a DSO gas network in the excerpt from the gas network map for Stadtwerke Waren GmbH

Source: Stadtwerke Waren GmbH

Bearing the categorisation from Diagram 9 in mind and the structure of the gas transmission networks in Germany, the degree of meshing of the transmission network appears to be high. In general, clear regional differences can be detected here (e.g. in the northwest or east of Germany), so only with reservation it is possible to speak of a meshed transmission network at national level.

When limiting the examination to gas pipelines with largely cross-system transport functions (i.e. pipeline diameter classes A and B, see section 4.3), the network structure more closely resembles a ring only with scattered larger meshes (Diagram 12).

51 https://www.bmwi.de/Redaktion/DE/Artikel/Energie/gas-erdgasversorgung-in-deutschland.html (accessed 02.10.2019)

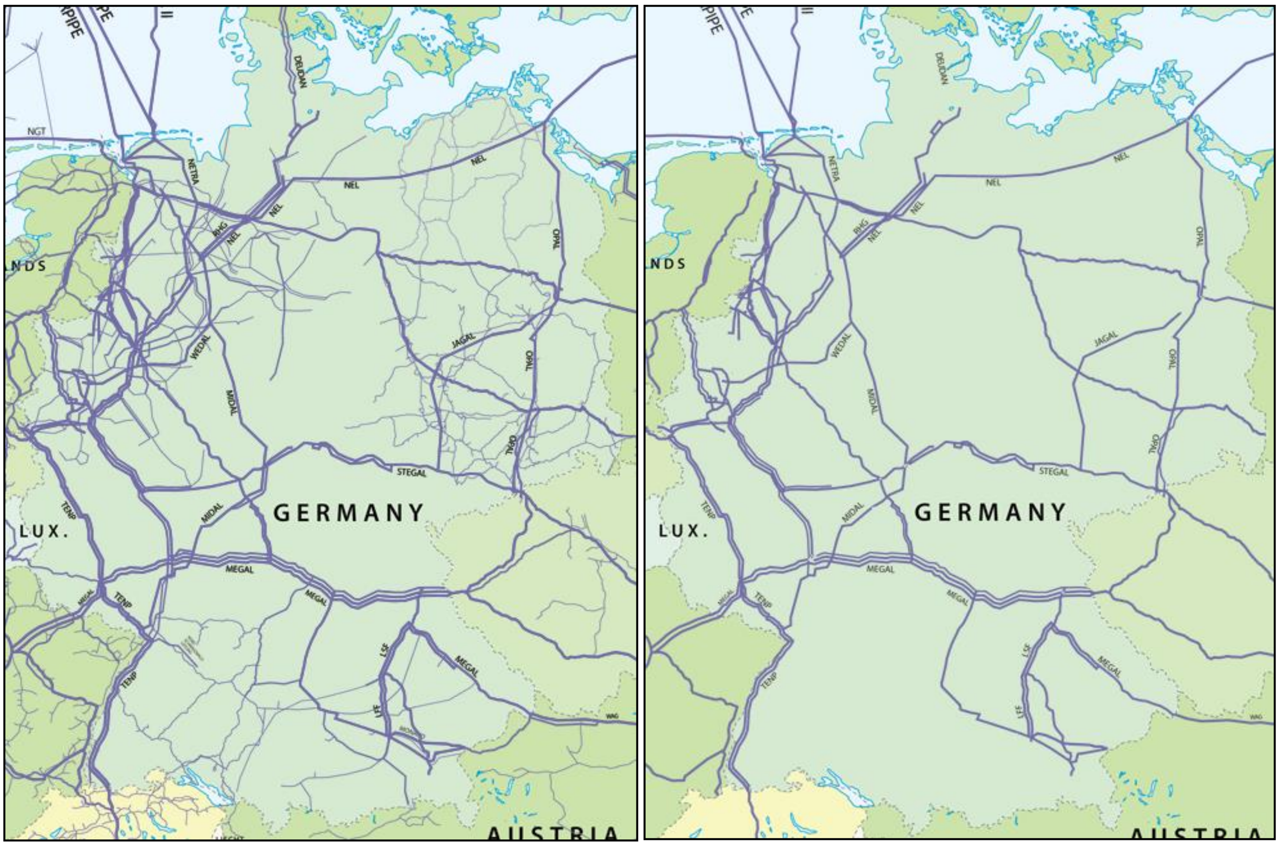

Diagram 12: Overall transmission network in Germany (left), transmission network with pipeline diameters above 900 mm DIN[52] (right)

Source: ENTSOG Transparency Map

It is possible for (only) the BNetzA to evaluate the degree of meshing of individual networks and undertake further analysis by using the data gathered in the efficiency comparison of the individual network operators. There are nevertheless other major indications to support a differentiated view of meshing. An assessment[53] conducted by Swiss Economics on behalf of the BNetzA calculates an average number of meshes per system operator of 81.1. The standard deviation of 196.2 stated in this assessment suggests a wide spread of results, so it can be assumed that the respective operator networks do not in fact have an uniform degree of meshing.[54]

A view of the network maps shows that network operators with largely cross-system transport functions are distinguished by a lower number of meshes than the average profile of the network operators. This corresponds to the above indicators. The transmission operators GASCADE Gastransport GmbH, GRTgaz Deutschland GmbH and NEL Gastransport GmbH[55] have provided data in respect of their networks as part of the efficiency comparison of TSOs in the third regulatory period undertaken by the BNetzA. By analysing this data, the relationship set out above was unequivocally confirmed for these TSOs[56]. According to the analysis in section 4.3 these furthermore also display a profile pertaining largely to cross-system transport functions.

52 The transparency map by ENTSOG only shows the following distinctions in the European transmission network: all pipelines, all pipelines with a diameter of >600 mm and all pipelines with a diameter of >900 mm

53 Kostentreiberanalyse und Effizienzvergleich der Gasfernleitungsnetzbetreiber, commissioned by BNetzA (2018)

54 A similar picture emerges for the stated mean value of branches or branches without NKP, which also suggests a broad spread due to a comparatively high standard deviation.

55 NEL Gastransport GmbH has provided their data after request by GASCADE Gastransport GmbH.

56 Also the number of branches, both with and without NKP, for both system operators lie below the section for all system operators.

A further possibility for approximating the degree of meshing is based on the parameters network connection points or network coupling points per kilometre of pipeline. This option was already highlighted by transmission system operators during the consultation process with the BNetzA.[57]

The analysis of the function-specific transport network characteristics in section 4.3 uses the exit point density (number of network exit points per kilometre of pipeline). The use of this indicator shows a relationship between the dominance of a network operator's cross-system transport function and the degree of meshing (page Diagram 13). A higher exit point density can therefore be found in particular in networks with more prominent system-internal functions.

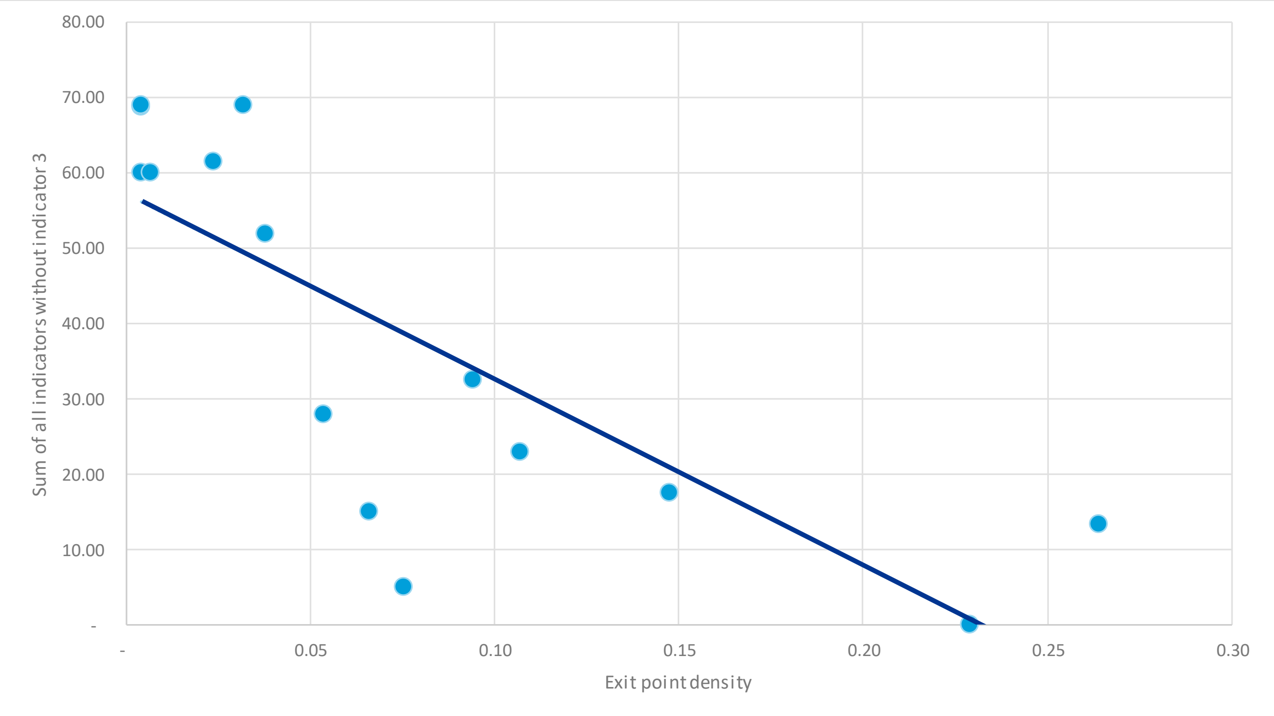

Diagram 13: Total indicator score (Indicators 1-2 and 4-5) vs. network exit points per kilometre of pipeline (Indicator 3)

Source: DNV GL

A further note on the various degrees of meshing among network operators can be found in the ACER consultation documents. Under point number 67 [58], ACER write that the comprehensive trade of conditional products in the German gas network reflects the network bottlenecks present and therefore may indicate a low degree of meshing in the transmission system. A comparison between the analysis in section 4.3 and the proportion of bookings for conditional capacity products in 2019 makes it possible to conclude that these products are generally sold by network operators with a predominant cross-system function and less meshed network structures (see Diagram 14). The comparison of the function profiles of the network operators characterised by the sum of indicator scores suggests the contrary to the statement made by BNetzA in Rn. 262 (REGENT NCG) of the REGENT determinations. The BNetzA stated that the proportion of conditional capacity is not a factor which would argue against the complexity of the transmission networks.

57 Yearly determination of the revenue caps for the second regulatory period for gas.

58 This is part of ACER's recommendations to BNetzA: "An assessment on the extent to which the network can be considered as meshed, in view of its internal physical constraints reflected in the extensive use of conditional products"

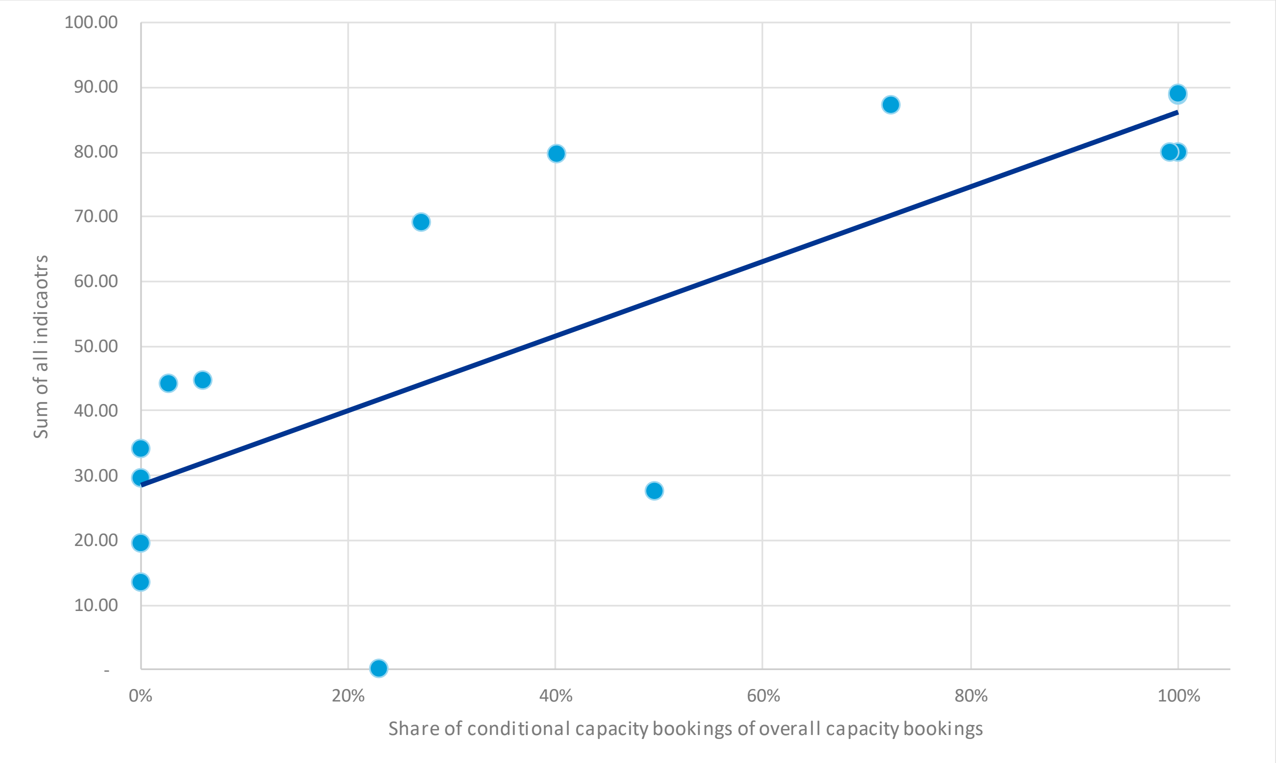

Diagram 14: Indicator value in comparison with proportion of bookings using conditional capacity products by network operators in 2019[59]

Source: DNV GL, NEP 2018 database

4.5 Examples of functional separation from elsewhere in Europe

Two European examples in respect of the separation of functions of the transmission network are described below.

4.5.1 France

In France, there are two transmission system operators, GRTgaz and Teréga. GRTgaz transports nearly 84% of gas in France and its network covers much of France's territory, with the exception of the southwest. Gas transmission in southwest France is operated by Teréga.

The transmission system is divided into main transmission and regional transmission networks (réseau principal and réseau régional). The main difference between the two networks lies in the different functions and structures of the networks. Whilst the main transmission network links the network points with neighbouring networks, underground storage, LNG terminals, the regional transmission network and large industrial consumers. The core function of the regional transmission network is to transport natural gas from the main transmission network to the local distribution networks and to the directly connected consumers.

Establishing the tariff for the main transmission network involves the application of the capacity-weighted distance method. The allocation of costs for entry and exit points is based on a 35%-65% split. There is a

59 The estimation of the proportion of bookings via conditional capacity products relative to all capacity bookings excluding interruptible capacity is based on the methodology for establishing values in Appendix 5 to the decisions described by BNetzA in the REGENT determinations. On the basis of the representation set out in Appendix 5 which is not separated by network operator, a comparative appraisal was undertaken by using the database published in NEP 2018. While BNetzA in its calculations arrives at a proportion of conditional capacity of around 22%, the representation based on NEP data results in a share of around 26% and shows a high degree of coincidence.

compensation mechanism between the two transmission system operators because the transmission tariffs are determined for the entire main transmission network. The tariff setting in the regional transmission network is independent of the tariff setting in the main transmission network. The tariffs in the regional transmission network are also determined according to a distance-based approach and added to the costs from the main transmission network.

A detailed description of the French system can be found in Appendix B: International experiences - implementing the NC TAR in France.

4.5.2 Italy

SNAM is the transmission system operator for Italy. The Italian gas transmission system is divided into:

- the national transmission network, Rete Nazionale dei Gasdotti (import/export pipelines, pipelines connected to storage and LNG systems, national main pipelines and compression stations) and
- the regional transmission network Rete Regionale di Trasporto (all other pipelines for transporting gas in contrast to the local network delivery point).

The transmission tariff in Italy uses the capacity-weighted distance approach. The procedure applies to the entire network, including the national and regional networks. The allocation of costs for entry and exit points in the national transmission network is based on a 40%-60% split. In contrast to this, the costs of the regional network are completely allocated to the exit points, which means that 72% of the entire transmission costs are charged at the transmission exit points.

A detailed description of the Italian system can be found in Appendix C: International experiences - implementing the NC TAR in Italy.

5 COST STRUCTURES AND CROSS-SUBSIDISATION

5.1 Cost structures for the transmission system

The transmission system consists of, inter alia, pipelines, compressor stations and the relevant measurement technology (gas pressure regulation/control and measurement systems, GDRM).

Natural gas is transported in pipelines over long distances from the production areas to the areas of consumption.[60] Gas quantities are transported at high pressure and the pressure drops during the transport process due to friction losses.[61] To enable the transport process over long-distances, this means that the falling pressure needs to be constantly increased. Compression stations are used to compensate for the pressure loss throughout the pipelines, and they have to be constructed at intervals of a few hundred kilometres. Gas pressure regulating stations are used to reduce the pressure of the gas transported to a pressure level required for particular technical applications.

Similarly, to other capital-intense network industries, the gas network infrastructure is also characterised by a high proportion of fixed costs. The reason for this is the high capital costs (depreciation and capital return), which reflect the capital-intense investments in systems with long technical asset life. The fixed costs are incurred for the provision of a specific transport capacity and are not dependent on the volumes of gas transported. The operating costs are partly variable (e.g. the costs for the energy used by compressor stations) and partly fixed (e.g. maintenance costs). There are differences between the operating costs of gas pipelines and compressor stations. The operating costs of gas pipelines play a minor role, whereas, the operating costs incurred by compression stations are more important.[62] The cost of gas consumption in the compressor stations is the key component in the variable costs of the natural gas transmission network.

The transport capacity for a gas pipeline between two points generally depends on the pipeline diameter, transport distance and inlet and outlet pressure as well. The pressure difference between two points is the result of pressure loss throughout the pipeline. The pressure should not fall below or exceed the permitted lower or upper limits at both points. At a given transport distance, the increase of the transport volume is associated with a higher pressure drop and will require a higher compression capacity. Furthermore, at a given transport volume the increase of the transport distance leads to a higher pressure drop due to friction losses. Consequently, a higher compression capacity is also required in this case. The larger the diameter of the gas pipeline, the more positive the effect on transport capacity (scale effects). At a given distance and pressure difference, the increase of the pipeline diameter leads to an over-proportional increase of the transport capacity.

The scale effects can be seen in the following example using empirical figures. Based on data of the transmission system operators from the network development plan (NAP) for 2018[63], an increase of the pipeline diameter leads to higher costs per pipeline kilometre but the specific costs per m^3 pipeline volume decrease exponentially (see Diagram 15). The specific costs per m^3 of a pipeline with a diameter of 400 mm compared with the costs of a pipeline with a diameter of 1400 mm are roughly four times higher. The reason for this is that the transport capacity of the gas pipeline increases exponentially with the circular area and accordingly with the diameter of the pipeline.

60 Alternatively, natural gas can also be transported by ship as LNG.

61 This is the resistance of the gas molecules to the flow and friction experienced by the gas on the pipe wall.

62 This can be seen in the higher Opex allowance for the investment measures according to §23 ARegV which is set equal to 5.2% for compressor stations and 0.8% for pipelines.

63 Chapter 9.1 (NEP 2018)

According to the study by-Swiss Economics for the BNetzA, there is “an almost linear relationship between pipeline diameter and construction costs, as well as an almost quadratic relationship between the diameter of the pipeline and the transport capacity”[64]. They drew to this conclusion from data compiled from previous studies and the TSOs.

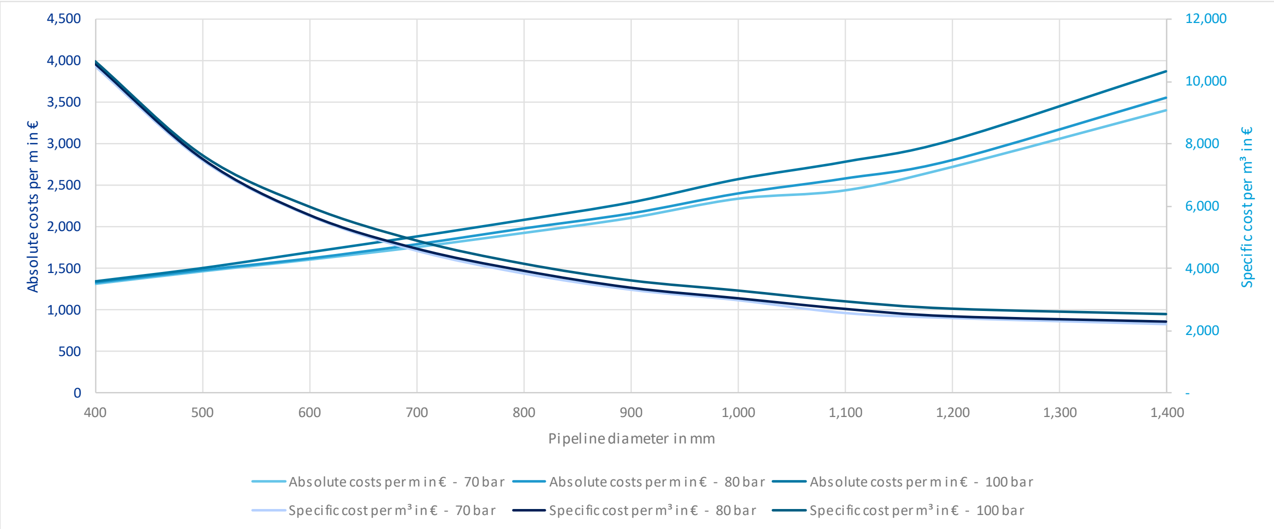

Diagram 15: Absolute and specific costs depending on the pipeline diameter and pressure range [65]

Source: DNV GL, NEP 2018 (2019)

For networks with a higher cross-system function, one can assume that the network function is characterised through gas pipelines with a larger diameter and the associated scale effects. The larger the pipeline dimensions, the lower the transport cost per capacity unit.

The pressure level of the natural gas transmission pipelines has also an influence on their cost structure. It can be stated, that the costs per km will increase with the rising pressure level of the pipelines, this cost increase however is lower in comparison to the one driven by a larger pipeline diameter (see Diagram 15).

Furthermore, the number and the installed capacity of compressor stations has an influence on the cost structure of the network operators. Here, there are different cost data from network operators, depending on the complexity[66], installation type and size of the compressor station, as well as the transport volumes. These differences range from approximately 2.5 million Euros per MW for a simple compressor station with an installed capacity of over 20 MW per machine unit to approximately 5.5 million Euros per MW for a comparatively small compressor station with high complexity with an installed capacity of below 10 MW (see Diagram 16).

64 Kostentreiberanalyse und Effizienzvergleich der Gasfernleitungsnetzbetreiber, commissioned by BNetzA (2018)

65 The cost estimates have been made on assumptions for construction of low complexity. As such, the cost estimates assume, for example, a flat topography, simple soil conditions or the construction of pipelines in the months of May to September.

66 According to the network operators, the complexity of a compressor station is differentiated between "simple", "medium" and "high", whereby a "simple complexity" is, for example, characterised by a unidirectional connection or a flat topography, while a "high complexity", for example, can be characterised by a new location and/or a crossing point with several pipelines.

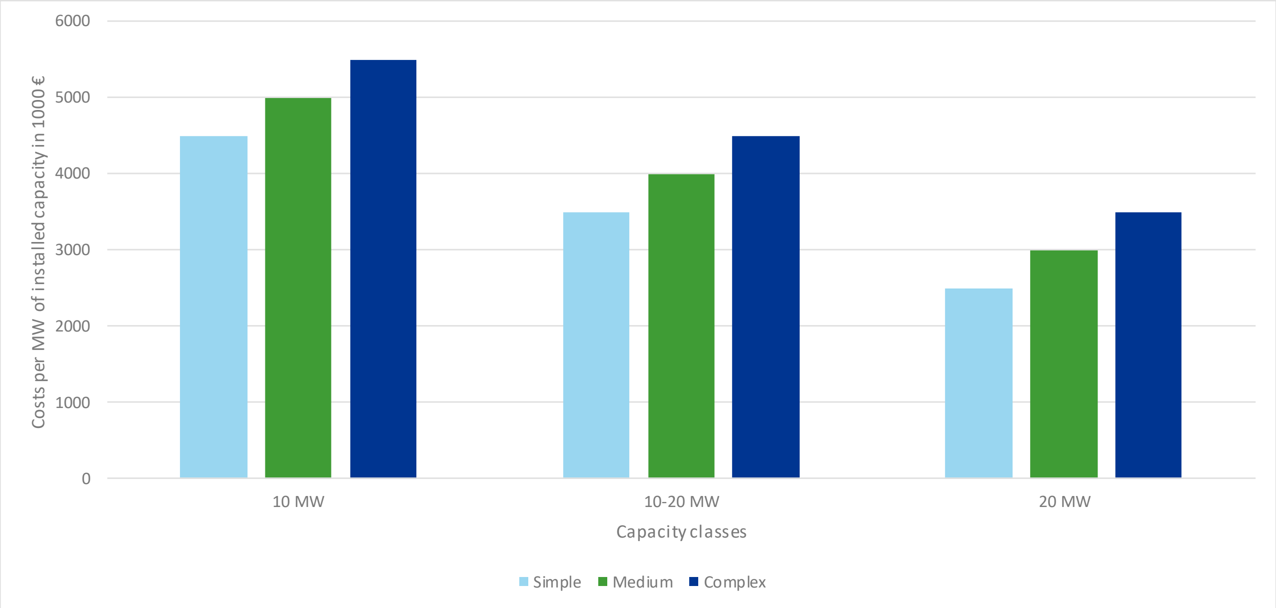

Diagram 16: The costs per MW of installed capacity according to compressor station complexity

Source: DNV GL, NEP 2018 (2019)

It can therefore be assumed that networks with a higher number of compressor stations/higher compressor capacity incur higher costs in absolute terms than networks with fewer compressor stations. However, for networks with a more dominant cross-system function, it can be assumed that on average, compressor stations are characterised by a higher installed capacity and therefore lower specific costs per MW for these network operators. A comparison of the sum of indicators determined in chapter 4.3 and the average compressor capacity per compressor station and network operator shows this relationship (see Diagram 17).

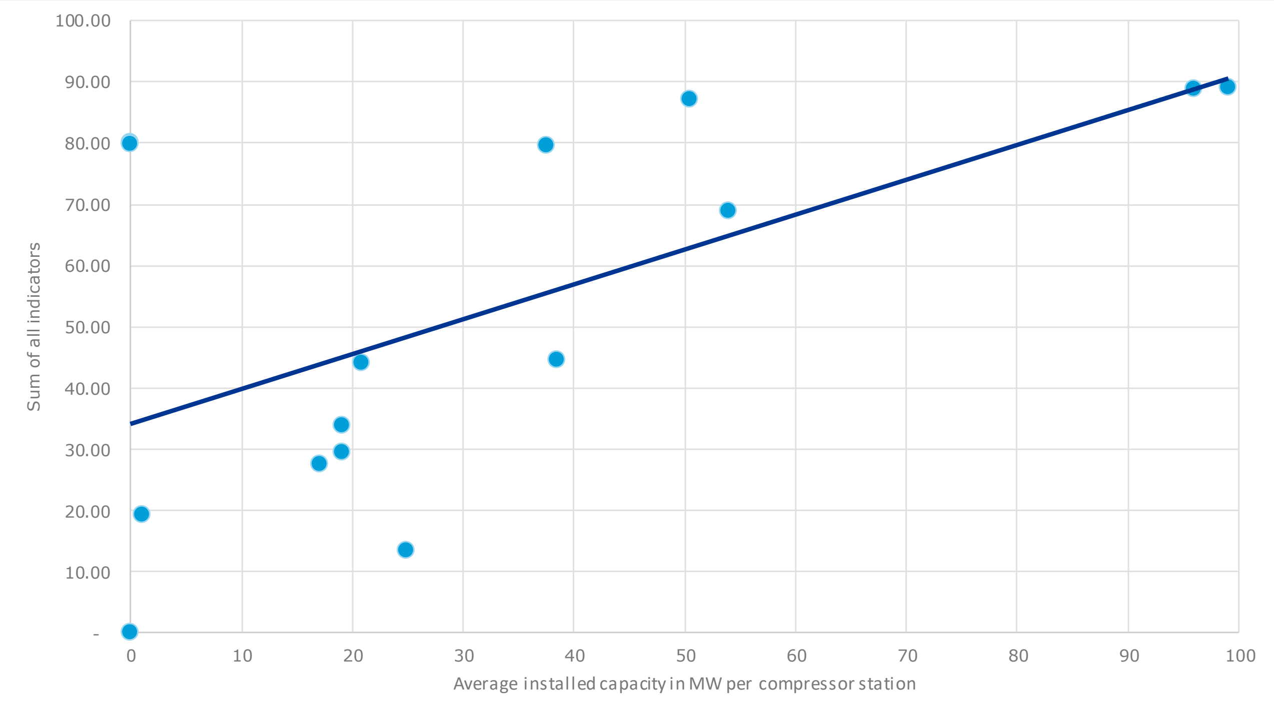

Diagram 17: Average installed capacity in MW per compressor station[67] in comparison to the sum of all indicators

Source: DNV GL

The cost data for gas pressure regulation/control and measurement systems (GDRM) required on high pressure levels, also varies and is dependent on the installed capacity. Here too, the overall costs increase in conjunction with the installed capacity, whereas the specific costs per m³/h fall (see Diagram 18).

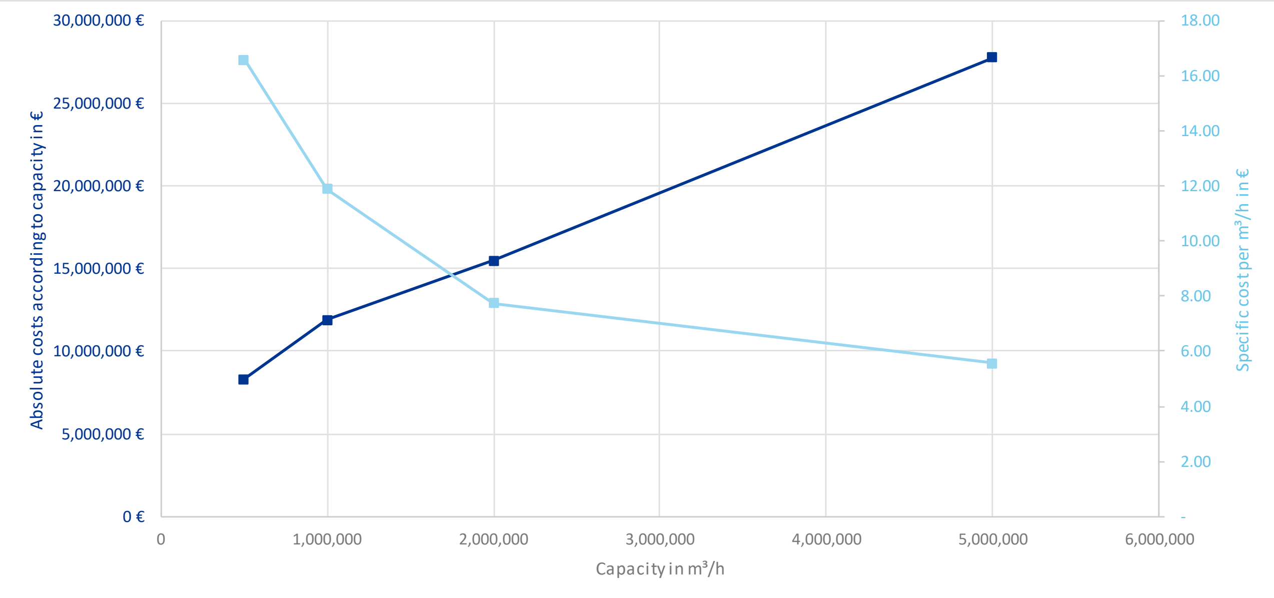

Diagram 18: Cost estimates and specific costs for GDRM systems

Source: DNV GL, NEP 2018 (2019)

67 According to NEP 2018 (2019)

When taking the fixed operating costs of network operators into account, it can be assumed that they change similarly to the investment costs. Considering the pipelines and compressor capacity, cross-system functions have in absolute terms, higher operating costs than system-internal functions, however in specific terms, a decreasing pattern with increasing transport capacity appears realistic. The variable operating costs depend on the required compressor capacity and the use of compressors, at stable pressure levels the variable costs change largely proportional to the transported volume.[68]

This analysis clearly demonstrates that within a network, the system functions and therefore also the cost of the functions can be differentiated. The dimensioning of the gas pipelines plays a significant role in the cost structure of the network operators. Networks mainly used for cross-system transport tasks are characterised by gas pipelines with a larger diameter and the associated scaling effects. The compressor capacity and the gas pressure regulation/control and measurement systems (GDRM) also participate in the scale effects and therefore the specific cost decrease with the increase of the volumes. Overall, it can be concluded that specific costs for cross-system transport tasks are lower in comparison with the costs of the system-internal tasks.

In the context of network access, transmission capacity plays an important role as a cost-driver for gas transmission. The unit costs decrease with the increase of the transport capacity. As the analyses above demonstrate, this still applies when the cost of compressor capacity is also taken into account.

5.2 Cross-subsidisation

Cross-subsidisation takes place when the costs incurred in a geographically and relevant product market are fully or partially shifted to products in other markets. In case of cross-subsidisation between two customer groups, the under-recovery of cost within one customer group due to lower revenues is subsidized from the other customer group.

With regards to gas transport tariffs, cross-subsidization can occur when the tariffs for capacity booked at points with cross-system function exceed the function-specific costs associated with the network usage. Thus, an inappropriately high proportion of the revenue cap share is accounted to these transport capacities and the tariffs for transport capacities with system-internal functions are undervalued compared to their function-specific costs.

In economic literature, prices free from cross-subsidies are often described as prices which at least meet the marginal costs and are not above the stand-alone costs for providing the service.[69] [70] In the field of network infrastructure, this can lead to a broad price corridor of cross-subsidy-free prices, depending on the definition of costs[71]. If, for example, the short-term marginal costs are used as the lower limit for the provision of gas network services, these gas network costs are typically relatively low and it is very likely that they will not exceed the allocated tariff.[72] Although there is no exact estimation of the stand-alone costs for gas transport networks with cross-system functions in the market areas, it is not unrealistic to

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68 Hirschhausen, C., Neumann, Rüster, 2007. Wettbewerb in Ferntransport von Erdgas? Technisch-ökonomische Grundlagen und Anwendung in Deutschland, Report on behalf of EFET Germany.

69 The significance of lower and upper limits from an economic standpoint is explained using the analogy of competitive markets. In competitive markets, prices above the stand-alone costs can only be maintained in the long-term through the presence of entry barriers or other restrictions. In markets with free entry, prices above the stand-alone costs will lead to other companies entering into the market and the service offered will be provided at a lower price. Conversely, the marginal costs represent a minimum, as a company cannot provide services to a customer who does not pay at least the marginal costs for the service. The company would improve its profitability by not supplying this customer.

70 The works by Faulhaber (1975) and Heald (1996) are widely recognised in this field and are frequently cited in cases studies and literature. Faulhaber (1995), Cross-Subsidization: Pricing in Public Enterprises, The American Economic Review; Heald (1996), Contrasting approaches to the 'problem' of cross-subsidy.

71 Regulatory Approaches to Cost Allocation, a Report for ORR prepared by NERA, April 2001, London.

72 Depending on whether the capital stock is regarded as a constant in the provision of additional transport capacity or whether additional investments are considered, a difference is made between short and long-term marginal costs.

expect, that these costs will not lie above the average tariffs for network operators with predominantly cross-system functions.

As described in detail in chapter 6.1, the REGENT postage stamp for each market area is significantly above the status quo tariffs for TSOs with predominantly cross-system functions. Therefore, it can be assumed that the tariffs derived from the REGENT determinations will very likely be above the stand-alone costs for networks with cross-system functions and therefore are not free from cross-subsidisation.

From a practical point of view, when establishing network tariffs, the question is how to minimise the discriminatory potential when allocating network costs and calculating network tariffs. The tariffs in the entry-exit model are point-specific tariffs, which enable access to a market area via entry and exit points and are not bound to the individual transactions in the commodity trade.[73] However, by allowing access to the market areas and to the VTP[74] does not imply that the required services of the network operator are equivalent and the network charges set by the reference price method cannot be differentiated, as assumed by the BNetzA.[75]

The attempt by the BNetzA to justify this assumption based on the free assignability of capacity is unsuitable, as this argument presumes free assignability for all network points. According to the definition, "free assignability" in cross-system network usage, only refers in any case to assignability to points which can be used across systems, so cross-border point (GÜP) and cross-market point (MÜP). The assignability to system-internal points has no relevance when looking at the cost of free assignability within the context of cross-system network usage. The costs caused as a result are only to be assigned to system-internal network usage. This again confirms that the system-internal network usage is more expensive than the cross-system network usage.

Appropriate tariff setting should reflect the network functions and the associated costs. In the specific case, the networks predominantly serving a cross-system function perform a dual role. On the one hand, these networks permit access to the market areas which enables cross-border and cross-market transport. On the other hand, taking the technical connection of gas pipelines into account, the networks with cross-system function also serve the internal markets in their respective market area. The networks performing system-internal function connect the cross-system levels with regional and/or local supply centres and transport gas to downstream distribution networks and end users.

A cost allocation using an additive approach is appropriate for such type of network usage, and not a tariff method which charges the network cost to network users without differentiating between the type of usage.

Therefore, in this specific context, the uniform network tariffs set by BNetzA in the reference price method are not reasonable from an economic perspective. A causally fair participation of network users in the transport network costs should be ensured by the correct allocation of the costs of system-internal function and cross-system function.

In many cases, it is possible to draw conclusions on network usage and the network function based on the bookings of transport capacities at the individual points. As the system-internal function performs a system-internal task, the services are predominately remunerated through tariffs of capacity bookings for

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73 Recital no. 19 REG (EC) no. 715/2009: "Tariffs should not be dependent on the transport route. The tariff set for one or more entry points should therefore not be related to the tariff set for one or more exit points, and vice versa".

74 The VTP is not bound to a physical location in the network and can be reached by every market participant. No special entry or exit capacities are necessary in addition to the entry and exit capacities for access to the VTP. Transport customers accessing the market area through an entry capacity can thereby bring gas to the VTP and transport customers accessing the market through an exit capacity can transport the gas from the VTP.

75 E.g. Decision regarding the regular decision on reference price methods, as well as other points made in article 26 para. 1 of the regulation (EU) no. 2017/460 for all transmission system operators active in the NCG entry and exit system (REGENT-NCG), 29.03.2019. Page 79, P. 305.

internal orders and end-users. The reason for this is that such capacity bookings certainly fall to system-internal network tasks.[76] In contrast to this, the costs for cross-system functions must be covered by capacity bookings at all entry and exit points. This is based on the role of this function described above and the fact that it is required by all network customers, if gas for the domestic market is being imported via the network. If, however, the network is used exclusively for cross-system purposes, i.e. exit points used exclusively for cross-system purposes (GÜP and MÜP exit points), allocating a share of the cost of the networks with system-internal function is not justified as they are not used for this transmission task.

The REGENT determinations fail to reflect the network functions and the costs associated with the form of usage of the network, although this would be practically possible. Consequently, the REGENT determinations set tariffs for system-internal network usage below their cost-orientated level and charge customers who use the network for cross-system purposes. Accordingly, the tariffs for capacity bookings at cross-system exit points includes costs of the system-internal function.

This does not correspond with the provisions of NC TAR for designing a reference price method (art. 7 sentence 2 letter c). The Network Code states that the reference price method must ensure non-discrimination and prevent cross-subsidization. The model of the BNetzA however, treats equally substantially dissimilar circumstances and therefore is not free of discriminatory effects.[77] In this context, the dissimilar circumstances manifest in the co-existence of various transport network tasks, which must be taken into account when setting tariffs. However, this is not possible with a method using uniform postage stamp.

ACER has also pointed out that the BNetzA does not differentiate between the network cost structures related to the TSO tasks (system-internal and cross-system network use).[78]

As described in more detail in chapter 7, the uniform postage stamp resulting from the REGENT determinations lead to various negative effects on the network use and competition in gas markets. In order to avoid cross-subsidisation between network tasks/network users, the function-specific cost differences must be reflected in the network tariff design.

5.3 Cost allocation test for NC TAR

The NC TAR provides for an assessment of the cost allocation to examine the scope of cross-subsidisation between system-internal and cross-system network use.[79] To do this, a capacity cost allocation comparison is carried out between the capacity ratios of the system-internal and cross-system network usage. This means testing the extent to which the revenues from the specific network use differ for each capacity cost driver. The capacity cost drivers can be selected differently depending on the reference price method. A possible cost driver is for instance "*the sum of the average daily forecasted flows at each intra-system entry and exit point, or cluster of points* [...]”.[80] The goal of the test is to identify whether the revenues can be appropriately allocated to their corresponding cost drivers. It is not a part of the assessment method to determine whether the choice of the cost driver is appropriate for the actual cost structure of the respective network usage.

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76 The use of the tariffs for capacity bookings at entry points is similarly feasible.

77 In the consultation draft for the REGENT determinations, this was noted in point 99, which states that there would be no discrimination in the BNetzA model because all network customers are treated equally and all services are priced identically. It is, however, important to note that discrimination is not only present when equal circumstances are treated dissimilarly but also when dissimilar circumstances are treated equally.

78 The consultation document for the entry/exit tariff system (REGENT) was presented to ACER by BNetzA for assessment. Under EU regulation 2017/460, ACER is tasked with evaluating the consultation document for the entry/exit tariff system in EU countries. On 15 February 2019, ACER published its evaluation of the REGENT draft, cf. Agency Report - Analysis of the Consultation Document for Germany P.11

79 Regulation (EU) 2017/460 of the Commission, dated 16 March 2017 to determine a network code for harmonised transmission tariff structures, art. 5.

80 ibid.

The BNetzA has carried out the NC TAR cost allocation test and has concluded that the conditions of cost allocation test have been met. We were able to reproduce the calculation of the BNetzA. However, we consider that such an assessment of the cost allocation has no validity for the assessment of cross-subsidisation between internal system and cross-system network usage. The assessment by the BNetzA merely confirms the mathematical accuracy of the derivation of network charges.

The assessment is inherently circular, and the result of the evaluation is predetermined by the assumptions of the reference price method since the division of revenues into the respective network usage represents the same division of the respective cost drivers. The uniform postage stamp is calculated by dividing the revenue cap by the entire forecast contracted capacity. The revenues from specific network usage are determined by the postage stamp and the capacity of the specific network usage.

At the same time, the capacity cost driver is the capacity of the specific network usage. The average revenues, i.e. the capacity ratios, for specific network usage are established by dividing the costs allocated to specific network usage and the corresponding capacity of the specific network usage. Thus, they correspond automatically to the uniform postage stamp. The calculation of the comparison is meaningless since the capacity ratios are already the same in the design. This is also evident from the fact that the capacity is determined by the same specification when determining the revenues from the specific network usage, on the one hand, and the cost driver on the other. It is therefore inherent in the design of the allocation of revenue and capacity that the NC TAR cost allocation test cannot show a distortion. The application of the test in the specific case by using unadjusted average contracted capacities leads to a comparison index of 0%.[81] Deviations may occur due to multipliers and discounts as well as the allocation of storage to the possible network usage.

Overall, the assessment of the cost allocation disregards the function-specific differences in the cost structures of system-internal and cross-system network usage and does not provide a reliable result for cross-subsidisation between the network user groups.

81 This was also confirmed by BNetzA, see REGENT page 51, para. 158.

6 EFFECTS OF THE REGENT DETERMINATIONS ON COST ORIENTATION AND THE SIGNALLING FUNCTION OF THE TARIFFS

Against the background of the reference price methodology defined in the REGENT determinations, and the specific structure of the German transmission networks, the effects of standardised postage stamps are analysed below.

The following were examined in particular:

- The effect on network tariff cost orientation
- The signal effect of the impacted cost orientation
- The effect on investment incentives for TSOs
- The effect on trade incentives on the gas markets

Each of these effects are analysed and evaluated with respect to the transmission tasks of the German TSOs.

6.1 Function-specific consideration of the effect of REGENT on the cost orientation

As discussed in chapter 4, network tariffs should correspond as closely as possible to the underlying cost for gas transport. By designing network tariffs cost-reflectively, there will be adequate incentives to use the network efficiently. Accordingly, network users will only opt for a transport service in a particular network if the benefit exceeds the costs to be covered. Furthermore, there will be an incentive for network operators to operate and expand their networks economically.[82]

The introduction of a uniform postage stamp through the reference price methodology set out in the REGENT determinations leads to a significant difference between the network tariff for gas transport activities and the associated costs. This weakens significantly the steering (allocative) function of the network tariffs.[83] Network users receive incorrect signals regarding the costs of the potential transport alternatives in the gas transmission network. This then affects their decisions regarding the selection of transport routes over existing preferences, based on the differences between network tariffs.

The expected changes to tariffs due to the introduction of market area-specific uniform postage stamps under the status quo and under the hypothetical TSO-individual stamps in 2020 are presented in Table 2 and Table 3. For that purpose, the unweighted average tariffs of TSOs under the status quo (SQ) and after introduction of REGENT, as well as the hypothetical TSO-individual stamps for 2020 indicated by the BNetzA are shown. Based on this, the percentage changes in the tariffs due to the introduction of the uniform postage stamp are calculated and are also presented in the table. In addition to the annual adjustments to the forecast contracted capacity and the allowed revenues, the change is mainly attributable to the application of the uniform, market area-wide postage stamp and the TSO's membership in its respective market area. [84] The tables further include the total indicator scores determined in chapter 4.3,

82 Alongside the network tariff, further criteria for deciding to use a network include the available product types and the utilization of network capacity.

83 The steering (allocative) function of network tariffs is related to the provision of reliable information on the costs of network usage. (Hewicker 2009, p. 484).

84 Any variations between the actual individual postage stamp tariff of individual TSOs relative to the hypothetical individual postage stamps for 2020 set out in the REGENT determinations are confidential and not the subject of this analysis. In that regard, variations could exist due to internal calculations, assumptions and special effects.

which approximate the transmission tasks and cost structures. The higher the total indicator score, the more predominant the cross-system task in the network of the respective TSO.

TSO - Gaspool	Total indicator score	Status quo* (SQ)	Individual postage stamps 2020	REGENT	Change to status quo	Change to individual postage stamps 2020
Gastransport Nord GmbH[85]	0	1,16	1,37	3,36	190%	145%
Nowega GmbH	19.32	4.00	3.80	3.36	-16%	-12%
ONTRAS Gastransport GmbH	29.40	4.06	3.93	3.36	-17%	-15%
Gasunie Deutschland Transport Services GmbH	44.03	4.45	4.46	3.36	-25%	-25%
GASCADE Gastransport GmbH	68.98	2.64	2.64	3.36	27%	27%
NEL Gastransport GmbH	79.78	2.02	2.15	3.36	66%	56%
Fluxys Deutschland GmbH[86]	79.99	2.79	3.78	3.36	20%	-11%
Lubmin-Brandov Gastransport GmbH	88.82	1.87	1.87	3.36	80%	80%
OPAL Gastransport GmbH & Co. KG[87]	89.04	0.61	0.62	3.36	451%	442%
Average - Score*		**3.71**		**3.36**	**-10%**	
Average - TSO**		**2.62**	**2.74**	**3.36**	**28%**	**23%**

NB:
****Weighting: every network point counts as 1,***
***** Weighting: every TSO counts as 1***
Values for status quo, individual postage stamps 2020, and REGENT in €/kWh/h/y

Table 2: Overview TSO-Gaspool

Source: BNetzA REGENT Appendix 3 and 6; Press releases from TSOs and Energate.[88]

85 Gastransport Nord constitutes an exception. The relevance of the reference price to Gastransport Nord is only partially comparable to the other TSOs because Gastransport Nord mostly has entry and exit capacities to discounted underground storage. Source: Transparency platform Gastransport Nord https://b2b-prod.gtg-nord.de/publication/

86 The difference between the calculated tariff in the status quo and with separate application in the hypothetical case for 2020 is due to the different basis of the data. Whereas the calculated status quo is the mean value of the tariffs listed in Appendix 3 for the network points Achim II and Greifswald, the hypothetical value can be attributed to the indicative reference price for the year 2020. It should be noted that the tariffs listed in REGENT Appendix 3 refer to DZK products. This deviates from the basic approach to capacity products in Appendix 3. Furthermore, the hypothetical reference value of 3.78 €/kWh/h/y for 2020 is described as synonymous with a reference value of 4.40 €/kWh/h/y for the year 2019, which can be exclusively attributed to the network point at Greifswald but not to the network tariffs at Achim II (REGENT GP, Rn. 284).

87 Equivalently to the REGENT data source Appendix 3 and 6, the provided figures refer to the regulated component of OPAL and include special effects.

88 Uniform transmission tariffs for 2020 published Energate (2019) https://www.energate-messenger.de/news/191983/einheitliche-fernleitungsnetzentgelte-fuer-2020-veroeffentlicht, Press release Gasunie (2019) https://www.gasunie.de/news/2, Price list Gascade https://www.gascade.de/fileadmin/downloads/netzzugang/preise/GASCADE_Preisblatt_Januar_2020_190708.pdf.

TSO - NetConnect Germany	Total indicator score	Status quo*	Individual postage stamps 2020	REGENT	Change to status quo	Change to individual postage stamps 2020
Thyssengas GmbH	13.44	5.25	5.2	4.07	-23%	-22%
bayernets GmbH	27.50	3.03	2.94	4.07	34%	38%
terranets bw GmbH	33.95	4.43	3.43	4.07	-8%	19%
Open Grid Europe GmbH	44.62	4.09	4.5	4.07	-1%	-10%
Fluxys TENP GmbH[89]	79.69	3.30	1.68	4.07	23%	142%
GRTgaz Deutschland GmbH	87.075	2.23	3.16	4.07	82%	29%
Average - Score*		**4.38**		**4.07**	**-7%**	
Average - TSO**		**3.72**	3.49	**4.07**	**9%**	**17%**

NB:
****Weighting: every network score counts as 1,***
***** Weighting: every TSO counts as 1***
Values for status quo, individual postage stamps 2020, and REGENT in €/kWh/h/a

Table 3: Overview TSO-NetConnect Germany

Source: BNetzA REGENT Appendix 3 and 6; Press releases from TSOs and energate.[90]

The different impact on system-internal and cross-system transport becomes clear when we consider the calculations of the average changes to the current network tariffs.[91] The average network tariffs compared with the SQ decline in both market areas (7% for NCG, 10% for GP) if we only take the number of points into account.[92] In this case, the attribution of network points to a TSO is not considered. Network points from TSOs with a higher number of network points receive a stronger weighting.

If, however, each TSO is individually considered, i.e. the calculation is based on the average of the average tariffs per TSO, then the network charge in each market area will increase by 9% (NCG) and 28% (GP). The difference between the results of the calculations follows from the fact that the number and type of network points are unequally distributed across the TSOs.

Taking the differences in the size and number of network point types into account, as listed in chapter 4.2, the weighting skews the result of the first calculation of the average in favour of system-internal points. The second calculation partially corrects the distortion by giving a stronger weight to network points from TSOs with fewer network points.[93] This allows TSOs to be mutually compared and allows for interpretation regarding network functions. Since a comparatively large number of system-internal points exists, the observed difference to the average figures implies a tariff increase for network points with a pre-dominantly cross-system function.

89 The comparatively low tariff for the hypothetical individual-operator postage stamps in 2020 is apparently attributable to the fact that the BNetzA assumes a full usage of the TENP pipeline, although this pipeline will only be fully available from October 2019, according to details provide by the operator. If one calculates the separate hypothetical postage stamps in 2020 on the basis of approx. 55% of forecast contracted capacity, the tariff, and hence the change, would not represent an outlier in the quantitative analysis. The BNetzA took this anomaly into account in its REGENT determination (GP, Rn. 285f.).

90 Uniform transmission tariffs for 2020 published by Energate (2019) https://www.energate-messenger.de/news/191983/einheitliche-fernleitungsnetzentgelte-fuer-2020-veroeffentlicht, Press release GRTgaz Deutschland (2019) https://www.grtgaz-deutschland.de/en/node/1252 accessed 20.11.2019.

91 The average changes are calculated as a simple arithmetic mean, without taking capacity weights into account.

92 ACER also comes to the conclusion that the network tariff within Germany will decrease comparatively. (ACER Market Monitoring Report 2018 – Gas Wholesale Markets Volume (2019) P.57).

93 This calculation also does not consider capacity differences and therefore differs from the results in the Market Monitoring Report 2018, ACER (2019).

This tendency becomes clear in Diagram 19, where the tariff changes are presented in relation to the total indicator scores. The network tariffs tend to increase for TSOs with higher predominance of cross-system tasks, both compared to the status quo and to the hypothetical TSO-individual stamps in 2020. Overall, these tariff analyses reflect the results already obtained as described in the above assessment. The relationships[94] displayed in the diagram below shows that the area-specific REGENT postage stamp would not lead to an improvement in the cost orientation of the network tariffs.[95] [96]

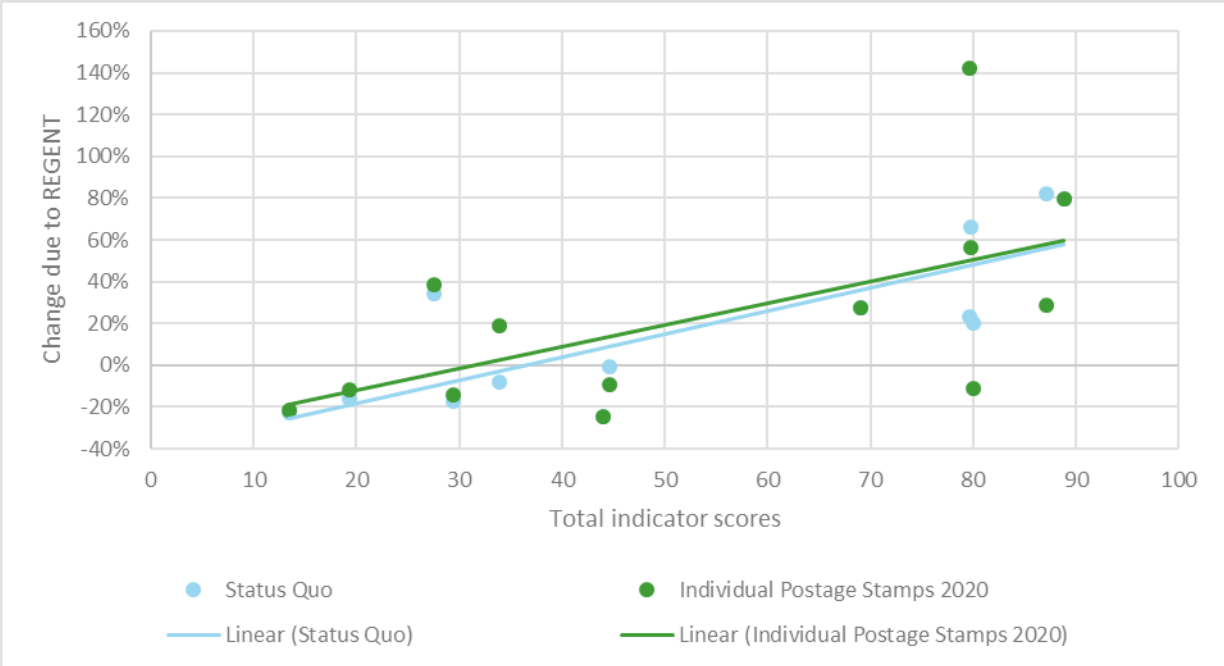

Diagram 19: Relationship between the tariff change and the total indicator score[97]

Source: DNV GL

6.2 Signal effects of the impact on the cost orientation

The possible signal effects of this distortion can be recognised in a comparison between two similar transport routes. For example, a network user under the status quo will pay almost identical tariffs for the entry capacity reserved for their entry in Emden and exit capacity in Eynatten, Belgium, to Thyssengas GmbH and Fluxys TENP GmbH or Gasunie Deutschland Services GmbH and Gascade Gastransport GmbH. When postage stamps are introduced in the respective market areas, however, the comparative cost advantage of the network charges for the transport route via NCG is reversed only because the respective TSOs belong to different market areas and therefore apply different tariffs.[98] Although capacity bookings take place at border points (GÜP), the shipper will be confronted with equal postage stamps, which reflect the overall network costs. As a result, incorrect signals occur which imply different charges for the same

94 See explanations on the analysis initially carried out independently of tariffs in chapter 5.

95 The use of function-specific reference price methods illustrated in chapter 8 results in a tariff change relative to the status quo. At the same time, it signals that the changes to be expected from the REGENT postage stamps will result in inappropriately high tariffs for TSOs with a dominating role of the cross-system tasks.

96 The network tariffs under the status quo can function with a compensation mechanism linked to the provided transmission services.

97 This diagram depicts all TSOs with the exception of the two extremes OPAL and Gastransport Nord, and the trend lines.

98 The costs for the route in the GP market area under the SQ amount to 7.09 €/kWh/h/y and in NCG 6.50 €/kWh/h/y. After introducing the REGENT postage stamp, they change to 6.72 €/kWh/h/y or 8.14 €/kWh/h/y respectively.

endeavours. The steering (allocative) function of the tariffs does not correspond to the principle of cost orientation. Also, within one market area, such a tariff distortion assumes equal transport costs despite different network tasks and cost structures, as already discussed in chapter 4.2.

The tendency to reduce the charges at network exit points to customers within Germany on average and to increase the charges at points at German borders, is contrary to the principle of cost orientation. It constitutes a discouraging signal for the cross-system use of German networks and routes through German market areas. This is because alternative routes become comparatively more attractive as the price of German cross-system transports increases.

Particular reference is drawn here to the downstream end markets in France and Italy. France procures pipeline gas from Great Britain, Norway, and via Germany and LNG over LNG terminals.[99] Accordingly, network users using cross-border transport can easily adjust their import routes depending on the network tariffs. The attractiveness of the existing alternative import routes will then clearly correspond to the associated transport costs. Italy does not currently have a comparable option to diversify gas sources. Nonetheless, for those shipping gas to Italy, it is partially possible to substitute the route of gas from Russia through Germany by the route through Ukraine (Route P). Norwegian gas can be substituted by the route through France (Route N). The options for France and Italy are set out in Diagram 20. The routes A, B and C via Germany can e.g. be substituted by N or P.

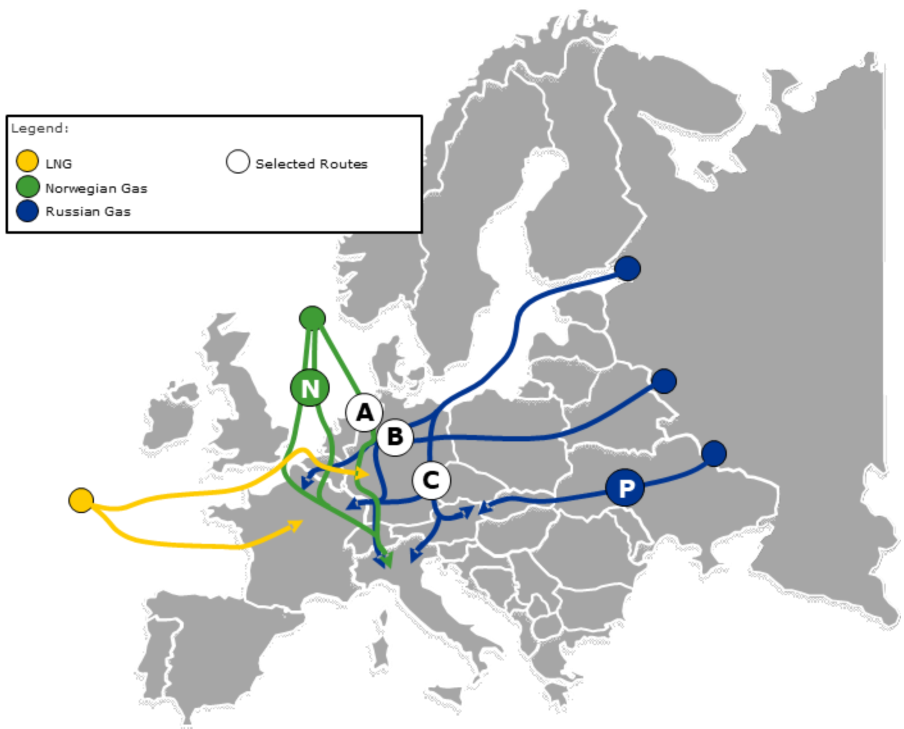

Diagram 20: Selected transport routes in Europe

Source: DNV GL

The economic viability of these substitutions depends on several factors. By modelling the routes based on the changing network tariffs, the immediate effect on the economic viability of these routes can be calculated. For this, the alternative routes are selected so that they represent realistic options. The results of modelling the routes for Russian gas travelling through the German market areas to France, Austria and

99 Market Observatory for Energy – DG Energy, Quarterly Report on European Gas Markets (2019) https://ec.europa.eu/energy/sites/ener/files/quarterly_report_on_european_gas_markets_q1_2019_final.pdf

the Czech Republic confirm that there will be an increase in transport costs for cross-system transport, also taking into consideration of the changes in network tariffs in the other relevant countries. It is worth noting that the least expensive route to France using the NEL Gastransport GmbH network will increase by approximately 17% (Route B). The modelling of the routes from Norwegian gas to Switzerland, which then leads via FluxSwiss to Italy, shows a similar picture (Route A). In this case, a price increase of 10% was identified for the most favourable route. The resulting signals encourage clearly substitution. In chapter 7.2, we discuss the effect on the network user groups.

6.3 The effect of REGENT on investment incentives

As already set out above, the introduction of the uniform postage stamp distorts the tariff allocative function. Network users can opt for other entry and exit points or circumvent the German market areas due to the increase in cross-border transport costs.

The incentive to enhance the attractiveness of the network to network users via lower tariffs decreases, because the tariffs are uniform within a market area. At the same time, other, comparatively favourable, existing networks lose their advantage due to the suggested equivalence of the transport costs. As a result, numerous unexpected changes in capacity bookings can take place.

For example, an exit point with a relatively high tariff may experience additional use following the introduction of the uniform postage stamp, while an exit point with a favourable tariff may be used less. These changes can result in incorrect investment incentives because well-established routes that were used previously will have fewer or no network users. This can lead to stranding of gas networks in certain geographic regions.

In addition, the changes in capacity bookings may cause new bottlenecks. This may also lead to new investment needs which may not be reasonable in the context of the existing networks. Such incentives result from the distortion in the demand for transport capacity and can lead to a sub-optimal network expansion.

6.4 The effect of REGENT on trade incentives on the gas market

The transmission costs incurred by network tariffs represent an integral factor in the price differences between gas markets.[100]

The REGENT determinations lead to an increase in transmission costs for trade between the gas markets connected via Germany. Depending on the market conditions, such an increase can have various effects.

If there is intense competition on the gas markets, the increase in costs implies a reduction of the margins from trade between various markets because the increased transport costs cannot be transferred in the sales price. If it is not possible in the short term to shift the transport of gas to a more favourable route, a higher portion of the difference between the purchase price and sale price will be needed to cover the transportation cost from one market to another.[101] This thereby lowers the incentive and the willingness to transport gas from one VTP in a German market area to another VTP or several VTPs via a route through Germany.[102]

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100 Effects of transmission tariffs to wholesale market development in the EU ACER (2018) https://www.energy-community.org/dam/jcr:ce1cb4d7-f572-4801-b008-29a90edff26f/REGSCHOOL102018_ACER_WMD_EU.pdf

101 Possible effects of shifts are further discussed in chapter 7.

102 This is based on the assumption of "rational arbitrage behaviors", so that market participants trade under the assumption that the margin between the supply and demand price exceeds i. a. the transport costs. See also Growitsch et al. (2015)

This effect is largely independent of the fact that gas is also currently traded when there are price differences below the transmission costs. [103] Even in these cases, the price difference between purchase and sale price as well as the effect of the tariffs for the traders are relevant in the medium term. Furthermore, alternatives to a loss-making export can be considered, such as a pay decision in "take or pay" contracts. Such alternatives will become more attractive when export costs increase, so that by the use of these options, the trade between gas markets will be reduced.

In close relation to the increase in prices for cross-border transport, it is also important to consider potential changes in liquidity. Liquidity generally falls as network tariffs increase because greater differences in the market prices between gas markets are needed to encourage trade.[104] As already explained in chapter 4, parts of the German gas transmission network are used for cross-system transport to other European countries, due to Germany's central location in Europe. Therefore, a reduction of liquidity on the European markets with increasing network charges for cross-system gas transport through Germany, as would be the case with the REGENT postage stamps, appears realistic.

In the case of less intense competition on the gas markets, a rise in prices for cross-border transport could have a negative effect on the convergence of gas prices on the European markets. Ultimately, in different markets market prices of identical products converge due to existing arbitrage possibilities until the price difference corresponds to the transport/transaction costs.[105] In the case of less intense competition, shippers can add part or all of the increased transport costs to the gas market prices, the market prices will be then further segmented according to the added costs. Moreover, the increasing price difference does not necessarily imply additional incentives to trade or enter the market, as it simply reflects the higher transport costs.[106] An empirical modelling study shows that in the absence of liquidity, a convergence of gas market prices fails to materialise.[107]

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103 ACER Market Monitoring Report 2018 – Gas Wholesale Markets Volume, ACER (2019) P.8

104 Doane and Spulber (1994) https://www.journals.uchicago.edu/doi/10.1086/467321

105 Neumann & Siliverstovs (2006), P 5. See also Growitsch et al. (2015) P. 91

106 For the sake of completeness, it should be noted that the margin rises for non-marginal suppliers using alternative transport routes which have not become more expensive. If this increase is sufficient for market entry on these alternative transport routes, the marginal supplier will be less in demand.

107 Neumann & Siliverstovs (2006), P 10.

7 THE EFFECTS ON COMPETITION AND TRADE

In addition to the signal effects on network users, traders and TSOs, the introduced market area-specific postage stamps affect competition in wholesale markets and between pipelines. The effect on efficiency of the wholesale markets as well as on pipeline competition is analysed in this chapter, based on the model applied in chapter 6.2.

7.1 The effects on gas market efficiency

As explained in the previous chapter, it is expected that the incentives to trade between wholesale markets and the liquidity at the German VTPs will decrease. These are effects caused by the implementation of the REGENT postage stamps and therefore represent an obstacle to competition from an economic point of view.[108] Many European gas markets are affected by Germany's central location. Liquidity plays an important role in an efficient market. Only when there is high liquidity, it is possible to exchange information about supply and demand without delay and to evaluate the traded good accordingly. As a result, liquidity contributes to reduce the spread between purchase and sales prices.[109] This applies both within a market and between connected markets. A lower spread reduces the potential for market manipulation and improves the functioning of the market.[110] High liquidity is therefore desirable; it will however decrease across market areas when transport costs for gas increase.

The number and diversity of the market participants are, inter alia, relevant for high liquidity and market efficiency.[111] The reduction in potential margins for trade between gas markets caused by higher transport costs implies that i.e. market participants without long-term contractual obligations and sunk costs have less incentives to remain in the market or to enter into the market.[112] If these participants leave the market, the number and diversity of market participants may fall. The market concentration and, consequently, market power of the remaining market participants would then increase.[113] In addition to a further reduction in liquidity, a potential for market manipulation could then arise. Also, in regard to security of supply, a critical assessment of a potential increase in market power should be considered. For example, LNG tankers usually operate with shorter time horizons than shippers transporting via pipelines.[114] The diminishing margins could further reduce the incentives to transport LNG which is re-gasified in the Netherlands and transported to Germany. This would result in a decline of a diversity of supply sources.

7.2 Volume risk and tariff spirals

In the event of a reduction in bookings (volume risk) in one market area, the loss of revenue for the respective TSOs will be compensated. According to AMELIE, this is done by crediting the revenue losses in the regulatory account.[115] If other TSOs from the same market area do not earn higher revenues in the equivalent extent, then the revenue shortfall must be covered by an adjustment of the tariffs. The

108 Gas Transport Tariffs and the Dutch Gas Market: The Role of Gas Tariff Structures in Maintaining Desirable Features of the Dutch Gas Market. Brattle (2017) P.13

109 Heather (2019), P.3

110 ibid.

111 ibid. see also P. 7

112 For example, Chyong (2019) argues that surcharges on cross-system transport costs could lead to the dismantling of trade between the Baltic markets and Bulgaria and the rest of Europe.
ACER also argues that tariffs influence market entry and exit and can significantly affect the margin between supply and demand prices. https://www.energy-community.org/dam/jcr:ce1cb4d7-f572-4801-b008-29a90edff26f/REGSCHOOL102018_ACER_WMD_EU.pdf

113 Equivalent to this, Chyong (2019) argues that market entry of LNG suppliers has implied a decrease in the market power of existing pipeline transport market players.

114 Chyong (2019) P. 94

115 BNetzA BK9-18-607

consequence will be that the uniform postage stamp will then increase in the following year. An increase in the postage stamp could result in further network users leaving the customer base and the postage stamp would then have to be increased once again.[116] [117] This can lead to an escalating tariff spiral, which constitutes a fundamental problem of uniform postage stamps in networks with structurally heterogeneous transport activities. It is worth noting that an escalating tariff spiral cannot be resolved through market mechanisms.

The loss of revenue described above may, under certain circumstances, be lower if the increased cross-system transport costs can, to some extent, be transferred to the gas prices and/or the network customer margins and counteract the escalating tariff spiral.

The practical relevance of this volume risk can be demonstrated against the background of increasing competition in transport capacity due to additional capacity provided by Nord Stream 2 and Turkish Stream, as well as LNG terminals. Thereby, surplus capacity will occur on transport pipelines to the European market areas over long periods of time within the year. While the currently available capacities transporting Russian gas are almost constantly highly utilised,[118] the construction of additional capacities by Nord Stream 2 and Turkish Stream also aims to diversify the transport routes.[119] Possible gas flow shifts of Russian gas upon completion of the additional pipelines are thus part of the prospective use of the transport network. The transport charges such as the REGENT postage stamps constitute a decision criterion that can represent a comparative advantage for the competing pipelines in their efforts to sell capacity.

For example, considering the outstanding trilateral negotiations between Russia, Ukraine and the EU to set future network tariffs for Ukrtransgaz, the price increase for cross-system transport in Germany seems to support the competitive policy ideas to improve transmission capacity utilisation in Ukraine. It is already possible to find such regulatory developments in the current version of the decision on the "Method of Determining and Calculating Tariffs for Natural Gas Transmission Services for Entry and Exit Points on the basis of incentive regulation mechanisms".[120] The document states that discounting of capacities is permitted maximally to the transmission costs of competing routes. As a result, the northern route could become the incremental route for supplying Austria and the downstream markets which is only used when the eastern route through Ukraine is fully utilised. This scenario is further strengthened to the extent that storage capacity within Ukraine could be used when shifting the gas flows.[121] The example shows that volume risks from gas flow shifts triggered by unilateral increase of transmission tariff do not appear unrealistic.

7.3 Pipeline competition

In addition to economic implications on competitive wholesale trading, the uniform postage stamp also has an effect on pipeline competition. Internal (residual) tariff-based competition in Germany will be eliminated by the uniform postage stamp.

116 Through the compensation mechanism the loss of revenue is aggregated for the entire market area. Ultimately, the compensation mechanism will function if the required tariff increase within the market area can fully compensate the lost revenue from cross-border transport.

117 Chyong (2019) refers to a 'spiral of death'. In a study on the tariff structure in the Netherlands, this possibility is confirmed in a similar way (Brattle (2017), P. 40f.).

118 Sharples (2018) P. 8

119 Pirani (2018)

120 Методики визначення та розрахунку тарифів на послуги транспортування природного газу для точок входу і точок виходу на основі багаторічного стимулюючого регулювання, Національної комісії, що здійснює державне регулювання у сферах енергетики та комунальних послуг, edition of 11.10.2019

121 Market Monitoring Report 2018, ACER (2019), P. 56

7.3.1 Restrictions on residual competition

The residual competition between TSOs with shared or geographically adjacent network points within one of the German market areas is influenced by the uniform tariffs mainly in two ways.

On the one hand, the network tariffs lose their allocative function based on price differences and can trigger gas flow shifts and adverse investment incentives. The utilisation of network points, changes from the balance between supply and demand for transport capacity established by residual competition. This results in reconsidering the use of transmission capacity with potentially far-reaching consequences for capacity extension measures, which are primarily driven by distorted signals of network tariffs. Such a deviation from the principle of cost orientation would make future residual competition arbitrary because TSOs would no longer compete for network users based on their economic advantages but exclusively on remaining factors, such as product type and capacity bottlenecks.

For example, network users of Fluxys TENP benefit from lower tariffs at the entry point Eynatten in comparison to the tariffs of OGE at the same network entry point. After introducing the uniform postage stamp, these advantages will be removed. Ceteris paribus, the network users may then start using other TSO networks more, although this would not have been the case with a cost-orientated tariff system.[122] In the GP market area, for example, a similar case can be identified at the entry point Oude Statenzijl between the TSOs Gasunie Deutschland (GUD) and Gastransport Nord (GTG).[123]

The equalisation of the network tariffs due to the reference price method results in a price level set for all TSOs, which systematically differs from the price levels balanced out through the residual competition. In addition to the discriminatory potential and the deviation from the principle of cost orientation, this distorts the balanced market configuration, thereby decreasing the effectiveness of the capacity market.

This distortion becomes evident when considering competing TSOs at the same points for internal orders within a market area. For example, Rheinische Netzgesellschaft has, until now, been able to choose between gas from Thyssengas pipelines or OGE pipelines on the basis of different network tariffs at the network point Belkaw 1. In the GP market area, a comparable case can be seen for Stadtwerke Uelzen, which can choose between the Nowega and GUD tariffs. Price differences then represent decision-making factors to the benefit of network customers.[124] Through the undifferentiated postage stamps, competition *ex ante* becomes impossible.

Comparable situations may also exist in cases with joint ownership and geographically adjacent entry points. The ratio of entry points with the option of choosing one TSO over another based on price differences relative to entry points without this option is one to four in the NCG market area, or one to three, if only entry points at the national border and market area border are considered.[125] In the GP market area, the ratio is one to eight or one to seven respectively. At these points, where there are several active TSOs, the potential residual competition provides incentives for the TSOs to set their network charges adequately in the context of the specific circumstances.

122 In the SQ the reference prices for Eynatten are 3.30 €/kwh/h/y (Fluxys TENP) and 4.09 €/kwh/h/y (OGE). After the introduction of the uniform postage stamp both will be 4.07 €/kwh/h/y.

123 In the SQ the entry tariff is 1.16€/kWh/h/y for Gastransport Nord and 4.45 €/kWh/h/y for GUD.

124 It should be noted that due to a lack of data, a detailed analysis of the conditions for competition is not possible.

125 The ratios are calculated based on BNetzA REGENT (NCG) Appendix 3. For this purpose, the number of entry points and geographically adjacent points where more than one TSO is active are compared with the number of entry points used by only one TSO.

7.3.2 Destabilising the international balance of competition

Other consequences are to be expected for international pipeline competition among pipelines with cross-system functions. A comparison of tariffs will remain a key decision factor for choosing an entry and exit point.

Network users can choose whether to use a route in the market area with the uniform postage stamp or to use an alternative route via another market area. In this case, a TSO applying a uniform network tariff will compete with a TSO operating in another market area in Germany and abroad, which apply other network tariffs. Depending on how much the uniform network tariffs deviate from the cost-reflective tariffs the extent of the distortion and its impact on competition may vary.

Furthermore, TSOs with mainly pipelines with a cross-system function will be disadvantaged towards international competition. This is because they will also have to bear some of the costs for system-internal networks. If international TSOs with cross-system activities do not have to bear these costs in their markets, this disadvantage would result in efficiency loss of international pipeline competition. Even if the same prerequisites are present, i.e. if international competitors also cross-subsidise their national system-internal networks, international pipeline competition would remain inefficient. The tariffs for cross-system transport would then not reflect the costs associated with the transport activities for any of the competitors.

Apart from that, incentives would arise to avoid the German market area. Gas transport over existing pipelines could be replaced, so that existing pipelines might not be utilised (stranding). Whilst the basis for shifting of gas flows could, inter alia, be the high transmission charges of the German cross-system transports, it similarly implies that the system-internal network users in Germany will also bear the risk of cross-system pipeline competition. In the event of a replacement of German cross-system transport pipelines and stranding of gas pipelines, both system-internal and cross-system network users will bear the resulting burden due to the socialisation of network costs.

7.4 The effects of gas market integration

The central objective of the European Gas Target Model is to establish a liquid, transparent and well-functioning gas market in Europe. The Gas Target Model is based on cross-border connections between markets and removal of cross-border trade barriers to achieve maximally convergent prices. Cross-border access to the transmission networks is a prerequisite to developing functioning and integrated wholesale markets. It therefore constitutes the prerequisites for market entries, which increases liquidity and reduces price differences between the various gas markets. Access can be hindered by distorting the transmission tariffs. Furthermore, capacity bottlenecks and lack of economic incentives to trade represent potential barriers for growing market integration.

Based on the potential effects from the expected increase in cross-system tariffs, the uniform postage stamp established by REGENT does not appear to be compatible with the objectives for European gas market integration. Due to Germany's central location, the increasing price of cross-system gas transport constitutes a trade barrier for neighbouring gas markets and transit routes. In the event that marginal gas supplies are drawn through Germany, an increased price segmentation can be expected.[126] If, for example, the costs of the network tariff change can be transferred to the gas price on the Czech market, this would mean additional annual costs of around € 8.7 million for Czech final consumers.[127] Moreover, the

[126] ACER refers to a „price segmentation" effect due to the network charges. (ACER Market Monitoring Report 2018 – Gas Wholesale Markets Volume (2019) p.8, see also p. 57)

[127] The calculation here is based on the assumption that the transported gas flows via Nord Stream through Germany to the Czech Republic. Furthermore, it is abstracted from secondary effects and assumed that the changes in network charges would be fully added to the gas price. Possible surcharges and price discounts by multipliers, rebates and the effects from the international implementation of NC TAR are

downstream markets could be negatively affected by additional costs. For Italy, the corresponding modelling shows additional costs of € 242 million for the year 2020.[128] It is worrisome, if gas prices in markets outside Germany increase, and the consumers there would have to pay for the high network charges for cross-system gas transport in Germany.

Even if the increase in transport costs cannot be added to the gas market prices, and the price difference between the gas markets remains largely unchanged for the time being, the margin may narrow such that market participants would be forced out of the market. In both cases, the potential effects do not conform to the objectives for European market integration. Whilst a transfer of the increasing transport costs in gas market prices is hampering price convergence, potential market exits, compromise the liquidity and functionality of the existing markets.

not taken into consideration on the transport cost side. The calculation on which it is based is from the ERU Gas System Report 2018 data and the ACER (2019) Market Monitoring Report 2018.

128 This calculation is based on the TENP Route from Belgium over Switzerland to Italy. The approach and assumptions are equivalent to those explained in the previous footnote. The data for the calculation is from ACER (2019) Market Monitoring Report 2018 and Snam Rete Gas (2017) Ten-year development plan of the natural gas transmission network 2017 – 2026. http://pianodecennale.snamretegas.it/static/upload/201/2017-2026-decennale-web_eng.pdf.
The Italian regulation authority also reckons with extra charges of € 300 million for Italian consumers. https://www.euractiv.com/section/energy/news/italy-squeals-on-german-gas-tariff-reform-eu-ready-to-step-in/

8 ALTERNATIVE TO CHANGING THE REFERENCE PRICING METHOD

As presented in previous chapters, the transmission networks in Germany are not homogeneous. The extent of heterogeneity is demonstrated by investigating different structural parameters. It is shown that networks with cross-system transmission tasks are generally characterised by a higher average pipeline diameter and large transmission capacity. Accordingly, the average costs of gas transmission in such networks are lower compared to networks with mostly system-internal transmission tasks.

The standardisation of postage stamps set by the BNetzA does not account for the different transmission tasks and their cost differences. Consequently, the signals generated from the tariffs are distorted. A cost-orientated tariff model should consider the cost differences in the transmission functions of the transmission networks. This can take place either with or without an explicit allocation of function-specific transmission costs. The models are explained below.

8.1 Application of point-differentiated postage stamps without explicit cost allocation according to transmission tasks

The first approach divides the allowed revenues of the TSOs based on exogenous parameters. The individual revenue caps of the TSOs are assigned to entry and exit points using the weighted (forecast) capacity. The shares of revenue are then aggregated for each TSO in the respective market area and the overall revenues spread over the capacities of the network points. By distinguishing between exit points for domestic end consumers (downstream networks) and exit points at border and cross-market points, postage stamps differentiated by points are derived. Such an approach was proposed by Frontier Economics and already discussed in the consultation process[129].

8.2 Use of function-specific postage stamps with explicit cost allocation by transmission tasks

A cost orientation for the network charges and simultaneous avoidance of cross-subsidies can be achieved particularly by the explicit separation of the transport tasks and the function-specific costs. Similar approaches have already been implemented in France and Italy. The advantage of this model is in the function-specific cost allocation. Where possible, the costs are allocated to the respective transmission tasks. The calculated function-specific tariffs in the respective market area reflect the cost of cross-system and system-internal network tasks.

First the costs included in the revenue cap for every network operator in the respective market area are allocated to the two transmission tasks. This allocation constitutes the function-specific separation of the revenue cap and can be based on different assumptions. Suitable assumptions can be made, based on the analysis in this report using the parameters pipeline diameter, various pressure levels in the network and the function-specific attribution of individual network points.

[129] The proposed model can be put into effect with 4 groups of score-specific postage stamps: Entry points; storage; exit points (domestic end consumers/downstream networks); exit points (MÜP, GÜP). It is possible to add a further fifth group (internal market region exchange points). Gas network tariffs according to REGENT determination, Frontier Economics, page 24.

8.2.1 Pipeline Diameter

As already demonstrated in chapter 4, the diameter of gas pipes in the German gas transmission network varies in accordance with the specific transmission tasks. The gas networks with mainly cross-system functions are dimensioned for large transmission quantities and typically contain a higher proportion of large-diameter gas pipes.

Due to the existing classification of pipe diameter classes, making a distinction of these classes seem appropriate. The range of the classes goes from diameter class A (>= 1000 mm DN) to G (less than 110 mm DN). It is also useful to separate these assets into two different functions: diameter classes A and B, and diameter classes C to G. This is also supported by the results obtained in the evaluation matrix, whereby the network group of TSOs with largely cross-system transport functions have a high proportion of pipes with a diameter > 700 mm (classes A and B). Nevertheless, further considerations may be necessary in determining the function of individual pipelines. Cross-system functions of pipelines which in fact fall within other pipe diameter classes can also be considered. The practical implementation of functional separation can take place using a classification for the individual pipelines. It is associated with administrative efforts and can be undertaken by cooperation between the network operators and the BNetzA. We have already provided examples from other European regulatory authorities in Italy and France in their respective statements on the changes contained in the NC TAR. France, for instance, treats major pipelines greater than 600 mm as pipelines with a cross-system function.

The following diagram presents the different transport functions.

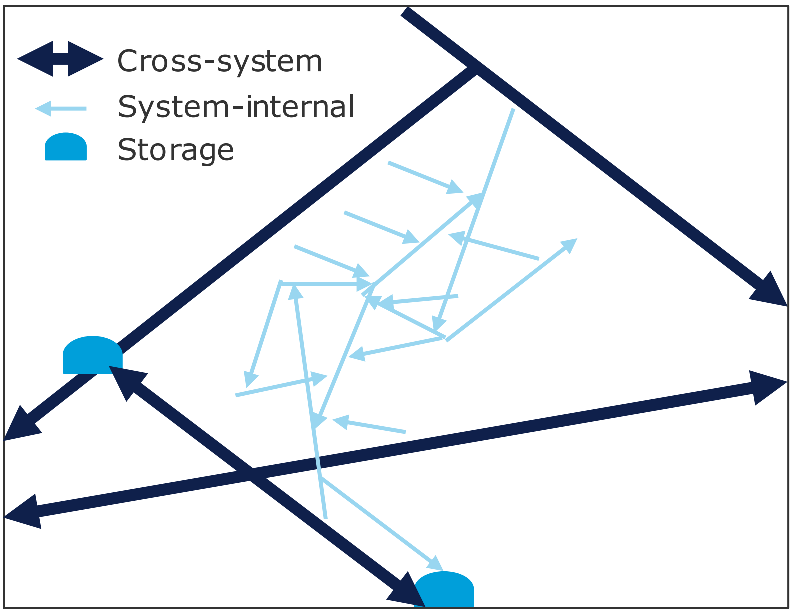

Diagram 21: Stylised representation of the coexistence of different transport roles

Source: DNV GL

8.2.2 Cost allocation according to pressure stages in the gas pipeline network

Looking at the example of France, it is evident that making a distinction between functions which also take pipeline pressure into account, has already been done. Network components with cross-system functions are basically assumed when the pressure is between 40 and 60 bar, whereas pressure levels below this are assigned to system-internal functions. The new Spanish reference price method, currently in a consultation process, for the regulatory period 2021-2026 also proposes the cost separation of the transmission network between the primary network (>60 bar pressure) and the network for national supply (secondary network and distribution network <=60 bar pressure).[130] An approach based on a similar classification/distinction between pressure levels also appears appropriate for Germany.

As shown in the data submission for the 3rd efficiency analysis of the gas TSOs, in the German gas network, a distinction can be made between the following nominal pressure ranges:

- HD 4 (> 70 bar)
- HD 3 (> 16 bar and ≤ 70 bar)
- HD 2 (> 5 bar and ≤ 16 bar)
- HD 1 (> 1 bar and ≤ 5 bar)
- MD (> 0.1 bar and ≤ 1 bar)
- ND (≤ 0.1 bar)

For cross-system use, the pressure class HD 4 is relevant in all cases, and parts of the pressure class HD 3 perform cross-system functions in the network. The BNetzA can undertake a further analysis with existing data from the network operators to differentiate within the pressure class HD 3. Such a classification of the gas network can support the separation of both functions, whereas it can also consider individual cases where there is a predominant cross-system or system-internal function, regardless of the pressure class of the pipeline. An example from the Netherlands shows that such an approach has been considered in Europe. The TSO "Gasunie Transport Services B.V." describes its network as being divided into a high pressure network (HPN, with cross-system functions) and a medium pressure network (MPN, with system-internal functions), whereas the latter takes gas from the HPN network via measurement and pressure regulating devices.[131] For some periods of time, both networks were also operated by formally separated network operators. In its announcement of May 2015[132], Gasunie stated, inter alia, that the role and duty of the networks increasingly differ, and through the separation of the networks, costs and tariffs for users of the respective networks can be designed more transparently and objectively.[133]

130 In the current Spanish system, gas traders pay the TSOs a capacity tariff when the gas is supplied to the Spanish network. The tariff covers the cost of gas transmission from the entry point to the VTP and is uniform across all points. At the exit points, a differentiated network tariff is charged by pressure level and annual consumption. For the differentiation, the network costs are divided into three groups according to the pressure level of the pipelines, the first group with the highest pressure level (>60 bar) including the primary network. Customer groups are further differentiated according to annual consumption. By estimating demand at the respective pressure levels, the network costs are divided and from these the tariffs for the exit points are established. Tariffs for each group consist of a fixed tariff (€/customer or €/kWh/day depending on consumer group) and a variable tariff based on transmission volume (€/kWh).

131 https://www.gasunietransportservices.nl/en/network-operations/the-transmission-network

132 https://www.gasunietransportservices.nl/en/news/gasunie-announces-the-creation-of-gasunie-grid-services-ggs

133 This separation was cancelled after pressure from the Dutch Regulatory Authority, ACM, and participants in the market at the start of 2018, as all parties were unable to reach a more closely specified agreement (see annual report "Gasunie Grid Services B.V." 2017).

8.2.3 Cost allocation according to network-point specific functions

A further possibility of cost allocation exists in differentiating between network points. A separation is possible here, for instance between the cross-border points and other network node points. The parameter "horizontal transmission" has been used as synonymous for the cross-system transmission function in the expert report on cost driver analysis for the efficiency analysis of the gas TSOs in the third regulatory period. In this case "horizontal transmission" can also include network node points which cannot be booked or ordered. They also perform a cross-system function as no internal orders for downstream networks or offtakes to end consumers can be placed here. Internal orders and offtakes are described in the report as "vertical transmission" which represents the system-internal transmission function.

To determine the actual share of the horizontal transmission or the cross-system function, the forecast contracted capacity of the individual network points can be used for the calculations, as this is already the case in the REGENT determinations. The share of the cross-system function can be established for the individual network operators as well as for the market area. It is worth noting that unlike the two methods explained above, this approach does not consider specific allocation of network components to functions but seeks a generic separation of the functions in a network or market area. The individual cost structures of the network systems are not explicitly reflected.

8.2.4 Function-specific revenue caps

Regardless of the chosen methodology for the differentiation of the network functions (differentiation according to pipeline diameter, pressure ranges or network points)[134] the shares of the allowed revenue caps for the cross-system and system-internal function need to be established. In the first two methods, this is achieved by allocating the directly attributable capital and operating costs of the network elements and the relevant portion of the cost of each TSO. When using differentiation according to network points, the allowed revenue caps are directly divided into the two functions based on the calculated indicator.

For each market area, the allowed revenue caps are separated for cross-system and system-internal functions. The two revenue cap shares in each market area are then divided by the forecast contracted capacities. Thereby, market area-specific postage stamps for the use of the cross-system and system-internal gas transport network functions are established[135]. The application of such postage stamps requires a compensation mechanism between the TSOs in the respective market area.

134 It is also possible to combine the methods by individual parameter weighting.

135 The model proposed can also be expanded with varying degrees of complexity with regard to a consideration of entry capacities, bookings at storage points and the specific configuration of the network or network points.

9 DISCOUNTING CONDITIONAL CAPACITIES

9.1 The role of capacity products

Entry and exit capacities are generally offered by various capacity products, which reflect the objective of capacity maximisation for the TSOs. As already described in chapter 3, network users with firm allocable capacities (FZK) obtain a guaranteed provision (except in the case of "force majeure"). The offered FZKs therefore correspond to the technically feasible transport capacity of the pipeline network and represent the standard product in primary capacity sales. In the event, that technical constraints/bottlenecks within the transmission network do not allow free gas flow at entry and exit points, additional capacity products may be used. Capacity products are then differentiated on the basis of the conditions under which the gas network may be utilised or gas injected/extracted.

The interruptible transport capacity (uFZK) is sold in addition to the FZK. Interruptible capacities do not have a guaranteed transport right. If network bottlenecks do not permit the use of the booked capacities on an uninterruptible basis, the network operator has the right to reduce or decline the corresponding nominations. uFZKs are therefore exposed to a real risk of interruption.

The interruptible capacity is based on capacities that cannot be provided with a guarantee, as availability is dependent on the actual and prioritised load flows. Therefore, interruptible capacities are generally offered at a reduced price in comparison to firm capacities. The discounted price granted should appropriately reflect the probability of interruption (in accordance with GasNEV Art. 13 (3). The probability of interruption should ideally be calculated using historical load data and the inclusion of assumptions regarding future load flows.[136] In MARGIT, the BNetzA defines a timespan of three complete financial years (where data is available), in order to realistically represent the probability of interruption. Notwithstanding this, for the tariff year 2020, as per art. 28 of EU regulation No. 2017/640, the data of the last complete financial year was used. Due to the new version of the network code and the changes made to the capacity allocation in EU regulation No. 2017/459, no comparable values were available for a longer period of time. Calculating the probability of interruption corresponds to the sum of the actual interrupted uFZK in relation to the sum of the uFZK sold. In section 5 of MARGIT, the procedure is provided for determining the level of discount for standard capacity products for interruptible capacities at interconnection points. This procedure is orientated towards the provisions of the NC TAR (NC TAR, art. 16) and sets a minimum discount for interruptible capacities of 10% or 11% and a maximum discount of 90% compared to the price of FZK.

In addition to FZK and uFZK, TSOs sell conditional capacity products that represent various conditions for usage, such as restrictions to free allocability and special local particularities.[137] According to NC TAR, the use of conditional capacity products is permitted when setting tariffs and they are widely used in both German market areas.

Conditional capacity products differ from FZKs based on the risk of interruption, the network use of fixed entry and exit points and access to the VTP. In this respect, differences are drawn between "capacities with limited allocability" (BZK) and "dynamically allocable capacities" (DZK), whereby BZKs do not have access to the VTP and DZKs have access on an interruptible basis.[138]

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136 If there is sufficient technical capacity to cover the transport demands, this will result in a very low probability of interruption.

137 For example, short-distance transport capacities.

138 On 28.06.2018, ruling chamber 7 initiated the determination proceedings (BK7-18-042) on standardising capacity products (KASPAR) and completed these proceedings on 30.10.2019. Amongst other things, it was determined that BZK products are to be converted into DZK

When using DZK products, allocation requirements are determined ex-ante in the marketing process. The limit on free allocability usually takes place using a point-based allocation of capacities. The product guarantees network use in connection with specific entry and exit points and includes a risk of interruption when other entry and exit points are used. The characteristics of DZKs are suited for cross-border flows and are also largely contracted by network users. [139]

9.2 Discounting

Similar to uFZK, tariffs for conditional capacity products are normally offered at a reduced price via a discount on firm capacity products. According to REGENT[140], the value of conditional capacity products lies between firm, freely allocable capacities and interruptible capacities. Therefore, the discounted tariff for conditional capacity products is restricted by the tariff for the lowest discounted interruptible capacity product. The discount for interruptible capacities, based on the historic probability of interruption, is topped up with a security margin of 10%. The security margin guarantees a minimum discount of 10% or 11% for uFZKs.

Conditional capacity products have been developed in order to reflect the needs of TSOs and transport customers and the physical conditions of the gas network. The advantage of conditional capacity products for network operators thus lies in the improvement in load flow security and the reduction of network expansion costs.[141] For transport customers, conditional capacity products allow improved network use in the context of their specific supply portfolio. The clear increase in significance and market relevance in the form of increasing shares of conditional capacity booking in Germany over recent years can be explained based on this.[142]

ACER suggests that national regulatory authorities carry out a cost-benefit analysis, in order to investigate the impacts of the change in discount conditions for conditional capacity products before a decision is taken on the level of discounts. The BNetzA has not published a cost-benefit analysis and has strictly restricted the discounting of conditional capacity products through the REGENT determinations. TSOs with mainly cross-system functions have previously sold conditional capacity products with a discount significantly above the limit determined by BNetzA.[143] By limiting the discount, it is realistic to expect that the contracted volumes of conditional capacity products will fall. In addition, setting such limits provide incentives to cross-system users of conditional capacities to switch to FZKs[144] due to the low tariff differences or choose alternative routes, which could result in a distortion of international competition. ACER has also identified these risks and therefore recommends that the cross-border impacts of newly applied discounts should be analysed in the framework of a cost-benefit analysis.[145] The BNetzA has also recognised the relevance of conditional capacities for national and international supply security.[146] Additionally, it should

products and the DZK regulation is to be harmonised for the whole of Germany. The provisions of the determination are to be implemented by 01.10.2021.

139 REGENT-GP, Recital no. 33

140 REGENT-GP, Recital no. 403

141 According to ACER, the comprehensive marketing of conditional capacity products in both German markets reflects the topological network conditions. ACER 2019. Agency report – analysis of the consultation document on the Gas Transmission Tariff Structure for Germany, Recital no. 67

142 The dependence of demand for capacity products on the transport purpose and the relevant cost-benefit ratio was pointed out in the Study on Capacity Products in the German Gas Market published by Wagner, Elbling & Company, on behalf of BNetzA, 20.08.2014.

143 NEP Gas database and Wagner, Elbling & Company, on behalf of BNetzA, 2014

144 An example can be found in the „Report on determination of requirements for the in 2019 starting process for new capacity between Poland TGPS und the Trading Hub Europe". In the specific case at the interconnection point Mallnow the demand from 2022 has been focused on FZK irrespective that DZK is available. (GASCADE Gastransport GmbH, GAZ-SYSTEM S.A., 21.10.2019).

145 ACER 2019. Report on the conditionalities stipulated in contracts for standard capacity products for firm capacity. Recital no. 33

146 Wagner, Elbling & Company, on behalf of BNetzA, 2014, P.10: "DZK and BZK make an important contribution to the security of the international supply because of their usual application on transit routes. In addition, these capacity products at exit points enable the reduction

be noted that BZK and DZK products could especially contribute in avoiding inefficient capacity reductions after the market area merge.

According to BNetzA, an interruptible product is of lesser value than a conditional capacity product due to the higher risk of interruption. [147] Based on this argument, the discounting of conditional capacity products is limited by the discount on interruptible transport capacity (uFZK). The assumption of the BNetzA that conditional capacity products are always more valuable than interruptible capacities is inaccurate from an economic perspective. The discount for conditional capacity products must be based on the value for the network user and should therefore reflect this. Hence, the limitation of the discount for conditional capacity products based on the lowest discount for interruptible capacity products as the only measure of price setting, appears incomplete.

Conditional capacity products are in practice frequently booked by network users who want to transport gas along a defined trading route. In such cases, the interruptible access to the VTP is not relevant for the determination of the economic value since the specific transport customer has no commercial interest in the VTP trade. [148] In contrast, a network customer who books an uFZK with the expectation of not being interrupted and acknowledges the value of VTP access, because its business model is based on this access. Through this difference in motivation and individual preferences between network users, it becomes evident that the access to VTP has different roles and value.

The above-mentioned arguments show that the assumption that conditional capacity products always have a higher value than interruptible capacities is not fulfilled and therefore not appropriate from an economic point of view.

of transit exit flows in the absence of complementary entry flows and thus prevent from unduly burdening the national supply security through transit exit flows." (Study on capacity products in the German gas market stock-taking and further development. English summary)

147 REGENT-GP, Recital no. 404

148 For example, the economic value of access to the VTP could realistically be very low, or close to zero, for shippers with delivery obligations to neighbouring countries (such as take-or-pay contracts) using the German network only for transit purposes.

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APPENDIX A: ROLES AND REQUIREMENTS OF NC TAR

Regulation (EC) 715/2009 requires "a network code for harmonised natural gas transmission tariff structures and the introduction of a union-wide regulation which contributes to market integration, increases supply security and promotes the interconnection of gas networks". Furthermore, Article 13 clearly states that this should concern an entry/exit tariff system, in order to ensure the appropriate degree of non-discrimination.

The motivation behind the harmonised transmission tariff structures is based on the following factors:

- The use of various transmission tariff structures can disrupt long-term cross-border flows, which leads to a sub-optimal result. An example of this could be that gas suppliers can opt to use certain transport routes which minimise their costs but not necessarily the overall costs across the system.
- Differences in transmission tariff structures may lead to cross-subsidies between cross-border and internal users.
- Differences in transmission tariff structures may disrupt competition and reduce market liquidity.
- A lack of consistency in pricing the "backhaul" and interruptible capacities could influence the attractiveness of such products.
- The harmonisation of transmission tariff structures aims to improve the consistency and transparency of pricing.

ENTSOG[149] sent the proposal on a "Network Code on Harmonised Transmission Tariff Structures for Gas" (NC TAR) to ACER in December 2014. The regulation (EU 2017/460) entered into force on 16 March 2017 and thereby obliges Member States to implement the necessary adjustments for the tariff system within a period of two years.

According to NC TAR, the calculated tariffs must be causally fair, non-discriminatory, objective and transparent and they must aim to minimise cross-subsidies between system-internal and cross-system network use. (Article 4 and 7)

The costs arising in connection with the regulated fixed assets are generally to be billed to the network user using capacity-based transmission tariffs. The allocation of costs should concern one of the following cost drivers:

- technical capacity,
- forecast contracted capacity,
- technical capacity and distance or
- forecast contracted capacity and distance

149 31 TSOs from 21 European countries founded the European Network of Transmission System Operators for Gas (ENTSOG) in December 2009.

The NC TAR also permits the introduction of a quantity-based tariff (pay tariff) to cover the costs subject to gas quantities. (Article 5).

The national regulatory authorities must determine or approve a reference price method, which defines a reference price for the entry/exit points in an entry/exit system. The NC TAR provides a methodology is to calculate the entry and exit tariffs requiring a harmonised and consistent approach (Article 6). Although the NC TAR does not provide a specific calculation method, the capacity-weighted distance methodology is suggested. This gives national regulatory authorities a certain degree of flexibility when selecting a calculation method. If an alternative calculation method is selected, this must be compared with the capacity-weighted distance method.

The reference price determined represents the non-interruptible capacity for a period of one year. This reference price is the basis for determining the tariffs during the year (such as seasonal or interruptible products), which are differentiated due to multipliers. The NC TAR requires the selected reference price method to meet the requirements set out in regulation (EC) 715/2009. The principles for this should be based on Article 13:

- Economic efficiency
- Cost causation
- Promotion of competition
- Transparency and practicability

APPENDIX B: INTERNATIONAL EXPERIENCES - IMPLEMENTING THE NC TAR IN FRANCE

In France, there are two transmission system operators, GRTgaz and Teréga. GRTgaz operates, maintains and develops a transport network of over 32,400 km, which covers much of France, with the exception of southwest France. The company transports around 646 TWh of gas per year.

Teréga operates, maintains and develops over 5,000 km of gas pipelines in southwest France. The company transports around 124 TWh of gas per year. In total, the internal consumption of gas amounts to 40% of the gas quantities transported.

The French transmission system is divided into main transmission and regional transmission networks (réseau principal and réseau régional). The reason for this division into main and regional transmission lies in the various functions and structures of the networks. The main transmission network links the interconnection points with the neighbouring networks (international connection of entry/exit points, PIR), underground storage (PITS), LNG terminals (interface terminal/main transport network, PITTM), the regional transmission network and large industrial consumers. It consists of high pressure (40-80 bar) and large pipelines (> 600 mm). It is more than 9,500 km long. Depending on the entry and exit points, the gas can flow in both directions to the connections. The direction of flow can vary from day to day and even within one given day.

The gas in the main transmission network can be fed into underground natural gas storage and can then be taken from there. It can also be traded at the PEG gas trading point.

The regional transmission network transports natural gas from the main transmission network to the local distribution networks (interface transport network/distribution PITD) and to directly connected consumers. It consists of medium pressure pipelines (20 bar) and the diameter of the pipelines is less than 600 mm. The network is more than 28,000 km long and gas flows are unidirectional. Typically, regional gas networks work using an “antennae system”, as the gas only flows in one direction from the main transmission network to the end consumer.

The tariffs for the main transmission network are established by using the capacity-weighted distance method. The costs of the main transmission network are allocated to the entry points (PIR entry, PITTM) and to the exit points (PIR exits, exits to the regional network) points using a 35%-65% split. The network tariffs for storage have an 80 % discount.

The French regulatory authority CRE calculates the distance using the most realistic and economically sensible gas transport paths. With regards to cross-border transmission, the regulatory authority considers Dünkirchen-PIR to be the leading entry point for gas transport to the PIRs Pirineos, Oltingue and Alveringem. The distance is estimated using the shortest pipeline distances between Dünkirchen and Pirineos, Oltingue, Alveringem PIRs respectively.

The entry tariffs for the PIRs are set uniform. The entry tariffs are also equal at the PITTMs but these differ from the entry tariffs for the PIRs. This implies that the network infrastructure within these two categories equally contributes to the availability of access capacities.

The calculation of gas transport distance to the consumers in France is more complex. The reason for this is the high number of main network exit points to regional transmission networks (1,123 in the GRTgaz network and 151 in the Teréga network), the availability of various gas procurement options and the presence of storage capacities.

CRE determines the entry points which supply each exit point, based on the principle that these entry points are geographically adjacent and have available contracted capacities. The distances are estimated for each exit point for a typical summer and winter scenario. The average summer and winter distances are then calculated. A single average distance is then calculated for all supplier points by weighting the number of months in each season (seven summer months and five winter months).

As the tariffs are determined for the whole main transmission network, including GRTgaz and Teréga, there is a balancing mechanism between the transmission system operators.

The pricing for the regional transmission network is separate from the pricing for the main transmission network. The tariffs in the regional transmission network are determined using a distance-based approach. The tariffs are determined using multipliers of (constant) specific capacity costs and (various) coefficients for the exact regional tariff level (depending on supply location, tariff levels 0 to 10). The specific features of the regional transmission networks are thereby taken into account.

APPENDIX C: INTERNATIONAL EXPERIENCES - IMPLEMENTING THE NC TAR IN ITALY

In Italy, 99% of the transported gas is consumed internally. The Italian gas transmission system is divided into the national transmission network (import/export pipelines, pipelines connected to storage and LNG systems, national main pipelines and compression stations) and the regional transmission network (all other pipelines for transporting gas to the local network supply points).

This difference is based on the Italian legal framework. The ministry (Ministero per lo Sviluppo Economico) is obliged to publish and update the lists of national and regional pipelines, in accordance with the criteria of Article 9 of Regulatory Act 164/00. The national transmission network (RNG, Rete Nazionale dei Gasdotti) is composed of offshore pipelines, import and export pipelines, pipelines connecting two or more administrative areas, pipelines connected to storage systems and pipelines which directly or indirectly serve the national gas network. On the other hand, the regional transmission network (RRT, Rete Regionale di Trasporto) transports gas regionally to industrial users and distributors.

The current gas transmission network consists of 19 entry points, including ten entry zones for gas fields (67 entry points from national production, including biomethane production), three LNG import terminals, three storage centres and six connection points. There are 13 exit points, including five connection points, three storage locations and six national supply areas. There are nearly 7,000 internal exit points integrated into the six internal supply areas. All supply points are located in the regional network.

The transmission tariff uses the capacity-weighted distance approach. This method applies to the entire transmission network, including the national and regional networks. The most important interception and extraction points (PIDIs), which connect to the regional networks are identified in the national transmission network. Several PIDIs serve bundles of supply areas. The national distance from one selected entry point to a selected PIDI is the shortest physical path along the pipeline system which connects them. The regional distance from a selected PIDI to a selected bundled supply area is the average distance from the selected PIDI to all of their underlying supplier points, measured by their capacities. The total distance from a selected entry point to a selected bundled supply area is the sum of the average national and regional distances for all PIDIs, which service the selected bundled supply areas, measured by the capacities of the respective PIDIs.

For the production points, the distance from each bundled production hub to the exit points is set equal to the distance of the production point with the largest volume.

The total transport distance obtained through the abovementioned steps is used in the CWD (capacity-weighted distance) matrix to calculate the tariffs. The costs of the national transmission network are allocated to the entry and exit points, using a split of 40%-60%. In contrast to this, the costs of the regional transmission network are fully allocated to the exit points. The result is that 28% of the whole transmission costs are allocated to the entry points and 72% to the exit points.

This split prevents to allocate costs of the regional network to the entry points. The latter aims to ensure a higher degree of gas supply competition at national level and to promote the harmonisation of the Italian gas hub prices to the European hubs. Moreover, this is in accordance with the function of the regional networks, i.e. the transport of gas to the internal exit points.