ewi Policy Brief

RETHINKING ENTRY-EXIT:

TWO NEW TARIFF MODELS TO FOSTER COMPETITION AND SECURITY OF SUPPLY IN THE EU GAS MARKET

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KEY MESSAGES

1. This paper argues that the current system of entry and exit tariffs charging full costs plus congestion fees for gas transits at the Intra-EU-interconnector points (IP) restricts competition in the EU-internal gas market. Instead, charges should be limited to short-term marginal costs plus congestion fees.

2. In order to keep the total revenues of the TSOs unchanged, those revenues recovered in the current system at the intra-EU-IPs, should be recovered instead at the domestic exits (EE model) or at the entry points at border of the EU (EEE model).

3. Both the EE and the EEE model would enhance gas-to-gas competition and market liquidity and therefore help achieving the goals of the EU internal market and hence, the Energy Union. Additionally, both models have the advantage that they could be designed in a way to remunerate security of supply provided by currently underutilized infrastructure, which is more difficult in the current tariff system.

4. The EEE model could be designed in a way, which would make non-EU suppliers co-finance the costs for European gas transports. For that purpose, the EU-entry points of lower cost non-EU suppliers would be charged with higher tariffs than the EU-entries of higher cost suppliers. Hence, the EEE tariff model could redistribute parts of the profit margin from gas suppliers to the EU gas users.

5. Rethinking the European entry-exit tariff system could significantly reduce the gas bill of EU end users. To illustrate the order of magnitude and the relevance of that topic: Redistributing transit charges of 1 EUR/MWh from the EU end users to non-EU low cost gas suppliers in the EEE model would imply a relief of 4.5 to 5 billion EUR for the EU gas consumers.

6. This paper intends to encourage a discussion of the fact that the design of entry-exit tariffs in the EU gas market has a substantial influence on competition, distribution of infrastructure costs, security of supply and end user prices. However, substantial additional research is required to understand in detail and quantify the economic advantages of redesigning the tariff system.

1 INTRODUCTION

In Regulation No 715/2009, the European Commission defines conditions for access to the natural gas transmission network with the objectives of enhancing market integration, security of supply, competition and cross-border trade. One important means to realize competition through liquid gas wholesale markets for gas is the switch to an entry-exit system for transport capacity booking instead of using the contract path model, which was predominantly applied before. Network users book entry and exit capacity for transporting gas within a market zone. In consequence, network users, paying entry and exit tariffs, remunerate full costs of European TSOs, which are usually regulated through a price or a revenue cap.[1] The national regulation agencies approve the entry and exit tariffs. In the current system a network user pays for the entry into a market zone A and for the exit, which can be, e.g. the transfer to an underlying distribution network or a neighbouring market zone B. In the latter case the shipper has to pay an exit from zone A as well as an entry into zone B, which both can be interpreted as a transit charge. Hence, transit charges contribute to full cost recovery of the TSO.

Transit charges create an incentive for network users to limit the shipping of gas through several zones, hence over large distances, in order to avoid inefficient transporting of gas (steering effect of prices). However, this paper argues that transit charges in their current design may lead to an inefficient market outcome for at least three reasons. First: transit charges may have a negative effect on competition by protecting high market concentration on the supply side in certain market zones. Depending on the location of a market zone, competition of different sources of gas supply may be distorted due to transit charges. Second: transit charges in their current design fail to remunerate infrastructure, which is normally underutilized but crucial for security of supply of certain countries. Third: for most required transport capacities in the European grid, transit charges for full-cost recovery, being well above short-term marginal costs may distort an efficient transporting of gas, especially in those situations when a pipeline is underutilized. Given marginal costs for gas transport are negligible compared to full costs, the distortive effect from full-cost-reflecting tariffs is expected to be relevant.

Although Article 29 of Regulation No 715/2009 states that network tariffs shall be cost-reflective, a fully cost-reflective determination of entry and exit tariffs is hardly possible such that it is always at least to some extent a distribution issue.

[1] In the following, this paper analyses the economics of different tariff systems focusing on revenue cap regulation. Clearly, there are TSOs regulated by price cap in reality. However, a discussion of price vs. revenue regulation is not the focus of this paper and it would require a separate analysis.

In this light, the paper at hand argues that transit charges above short-term marginal costs for gas transits within the EU should be abolished. Instead, revenues missing for keeping each TSO's revenue unchanged should be recovered by higher domestic exit tariffs and/or by higher tariffs for entering into the EU internal market. It is however important to stress the point that congestion costs for gas transits will continue to be paid by the network user in order to provide price signals for new investment. Abolishing and redistributing transit charges above short-term marginal costs will have three advantages in terms of an efficient market outcome: First, it will enhance competition of gas supplies "at the EU border" and within the different EU market zones. Second, redesigning entry-exit tariffs would enable decision makers to solve the issue of non-remunerated infrastructure, which is crucial for security of supply of certain member states. Third, the marginal cost approach will reflect the costs of the next unit of gas transport more properly and therefore lead to a more efficient use of existing transport infrastructure. Summing up, redesigning entry-exit tariffs has the power to decrease end user gas prices and to foster security of gas supply.

The paper is intended to encourage a discussion on the future entry-exit tariff design in the European gas market, yet not presenting a finalized analysis. Therefore, before drawing conclusions or policy recommendations, a variety of further research in this field is required. Given a stagnating gas demand, decreasing indigenous production, progressing market integration and constantly high needs for security of supply in Europe as well as new trends about non-EU pipeline gas suppliers and the global LNG market, rethinking entry-exit tariff design in the European gas market may help achieving the objectives of the EU internal gas market and hence contribute to the realization of the Energy Union. Two new models presented in this paper serve as a starting point for the discussion on how to develop an entry-exit tariff scheme suited to enhance competition and to achieve security of supply given the changes expected for the future European gas market.

After elaborating on the arguments to abolish transit charges within the EU in more detail (Section 2), the paper presents and discusses two options to redistribute missing revenues from charging gas transits (Section 3). In one approach, all missing revenues are charged at the exit points to the end user level. In the other model, entry tariffs for non-EU supplies are increased to compensate for missing revenues from transit charges. Section 4 provides an initial analysis of economic effects of both models. The paper concludes with Section 5, which develops relevant research questions necessary for a better understanding of the economic effects of the approaches presented.

2 TWO HYPOTHESES AGAINST CHARGING GAS TRANSITS WITHIN EUROPE

In the following, the paper discusses two hypotheses why it may be beneficial to abolish a charging of gas transits above short-term marginal and congestion costs.

Hypothesis 1: Charging costs for gas transits through Europe above short-term marginal and congestion costs distorts competition among different gas supply sources.

Reasoning:
In economic theory, in a perfectly competitive spatial market of some good, the sum of supply and transport (transit) costs has to be minimized for an efficient market result. Hence, transit costs need to be reflected in the economic decisions of a market participant in order to create efficient price signals in a market. Transit costs should incentivize an efficient a) use of given transport capacities, b) investment into new transport capacities and/or c) build-up of supply capacity close to a consumer (avoiding transit costs).

However, when accounting for the specifics of the European gas market, which is also a spatial market, there are several arguments why the current tariff system, i.e., charging gas transit costs above short-term marginal costs (with the exemption of congestion costs) does distort an efficient market outcome:

1. High supply side market concentration, first, among upstream suppliers, and, second, in countries with an incumbent gas utility, may limit perfect competition. This is amplified when smaller gas suppliers are charged with additional costs for transits to reach a market. Often, smaller, higher cost gas suppliers are the marginal and price-setting gas suppliers to a market. Lowering the costs of the marginal gas supplier by reducing transit fees to short-term marginal (and congestion) costs would have a direct (price-reducing) effect on the resulting end user prices.

2. The relevant price signal for efficient gas routing through existing infrastructure equals short-term marginal costs, hence the cost (not the price) resulting from shipping the next unit of gas. Charging gas transports above those costs leads to inefficient use of transport infrastructure, if (and only if) the pipeline is not congested, which is the case for many pipelines in Europe.[1] In case of congestion, congestion fees should be charged additionally, e.g., determined in an auction, in order to trigger new investment in transport routes where capacity is scarce.

[1] If congestion is not an issue, short-term marginal costs provide the efficient price signal for gas transport on existing infrastructure (and not long-term marginal costs, which are rather relevant for the efficient build-up of new capacity).

3. Unlike as e.g. in the power market, charging transit costs above marginal costs does usually not incentivize build-up of new gas production capacity closer to consumption centres because of limited or missing resource availability. In addition, even in the power market, where a full cost price signal could trigger generation capacity investment close to demand centres, transit charges are rather based congestion cost.

4. There may be a business case for certain investments into new interconnectors fostering market integration in the European gas market, which would not realize under the current tariff design since transit charges above marginal costs may distort the price signal (e.g. when they are prohibitively high for market participants to even reach the interconnector). In other words, the true economic bottlenecks of the European gas transmission grid will only be revealed, if the artificial ones resulting from the current tariff system are removed.

Summing up, charging transit tariffs above short-term marginal costs causes inefficient transporting of gas since it provides a distorted price signal. In addition, they reduce the level of competition in regional markets since transit charges may bar certain players from the market. Given the specifics of the current and future European gas market (e.g., regional market concentration, large infrastructure in place or security of supply requirements) enhancing competition in regional markets is crucial for an efficient gas market. Thus, in order to incentivize competition of different gas supply sources in all regional markets and to create liquid gas markets in the entire EU region, gas transits should not be charged with the exemption of a) short-term marginal costs, which deliver a price signal for efficient transport and b) congestion costs, which deliver a price signal for new investments.

Hypothesis 2: The current system of transit charges insufficiently remunerates transmission security of supply.

Reasoning:
In the current tariff system, only the booking (use) of transit pipelines is charged. However, certain transit pipeline can provide security of supply for other countries by transporting additional supplies in an emergency. If however this pipeline is not booked by a shipper on a regular basis, but only in rare events, there is almost no direct remuneration for the asset. Therefore, the regulated TSO has an incentive to reduce unrecovered costs, hence to decommission the pipeline, thereby lowering the level of security of supply for certain countries. This may cause an unintended reduction of transmission security of supply for European end users of gas.

3 TWO ALTERNATIVE TARIFF MODELS FOR THE EUROPEAN GAS TRANSMISSION SYSTEM

So far, this paper has advocated to limit transit charges to short-term marginal costs plus congestion fees. Given the fact that many pipelines in Europe are normally uncongested, this results in a decrease of average transit tariffs. Hence, in order to keep the revenues of the regulated TSOs unchanged, missing revenues from charging lower transit fees have to be compensated. In the following, the paper outlines and compares two alternative tariff designs for the European entry-exit system addressing this issue.

3.1 Tariff design

In the current market zone based entry-exit tariff system (abbreviation in this paper: MZEE) fixed tariffs are charged at the entries into the EU-network and at the domestic exit points, but as well at Intra-EU entries and exits (see Figure 1).

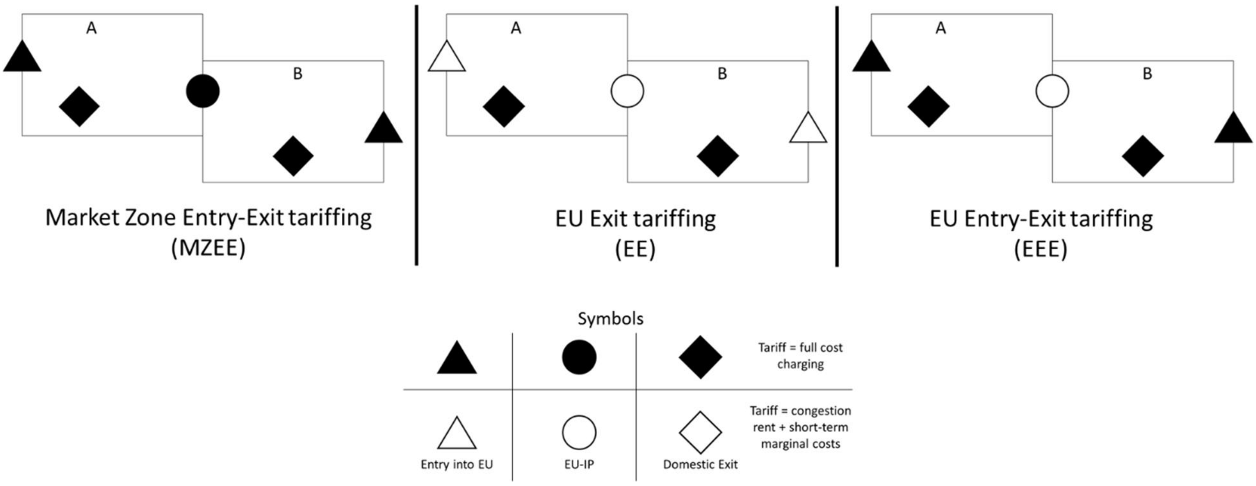

FIGURE 1: SCHEMATIC ILLUSTRATION OF THE CURRENT MODEL (MZEE) AND TWO ALTERNATIVE MODELS (EE/EEE) OF GAS TRANSMISSION TARIFF DESIGN IN EUROPE

The first of the two presented alternative models is the EU exit tariff model (EE). Under the EE model, total cost for gas transit and domestic gas transmission are charged at a member state's domestic exit. At the entries into the EU and the intra-EU interconnection points, only congestion rents and short term marginal costs (e.g. variable costs for compressor stations) are charged. Thus, tariffs at these points are determined based on auctions with a reserve price of zero plus variable costs. Therefore, the tariff would be at variable costs, if there is no congestion or otherwise correspond to the congestion rent plus variable costs. Tariffs at the domestic exits are charged according to the cost of their domestic gas transmission network plus costs of transit capacities required during normal operation and for security of supply scenarios. Total charges to domestic exits should be set in a way that, including revenues at the other network points, total allowed revenues of all TSOs are recovered. Hence, this model requires a mechanism of inter-TSO-compensation, which will be discussed later on.

The second alternative model is labelled EU Entry/Exit tariff model (EEE). As in the EE model, the EEE model charges short term marginal costs and congestion rents at the intra-EU interconnection points, the latter determined by auctions. However, unlike in the EE model, the EEE model charges entry fees at the EU-entries to recover the costs of transiting imported gas through Europe, hence the sum over all member states of the cost of transporting gas through and into a member state. In case there is scarcity of EU-entry capacity, the exact tariff can be determined by auction. At the domestic exit points, the EEE model suggests a charging according to the domestic transmission costs, hence the full transmission network costs reduced by the gas transit costs. This model requires a mechanism to determine the gas transit costs, which will be discussed later on.

Importantly, both alternative tariff models EE and EEE redistribute the costs of gas transmission, but do not increase the total network costs.

3.2 Cost allocation and revenues for TSOs

The revenues for TSOs are identical in the MZEE, EE and EEE models. However, the sources of revenue are distributed differently among the models presented.

In the MZEE model, the TSOs revenues are recovered by the fixed tariff and potential congestion rents at the EU-entries, the Intra-EU-IPs and the domestic exits. In the EE model, most of the total allowed revenues of the TSOs are allocated to the domestic exits except for short-term marginal cost and congestion rents charged at EU-entries and Intra-EU-IPs. In the EEE model, the major part of the total allowed revenues is allocated to the EU-Entries and the domestic exits, with the exception of short-term marginal cost and congestion rents charged at Intra-EU-IPs.

Figure 2 shows a stylized example of the different sources of revenues of a TSO. All numbers are fictitious and only serve for illustration purposes. For brevity, the graph focuses on fixed tariffs and congestion rents (i.e. short-term marginal costs are omitted).

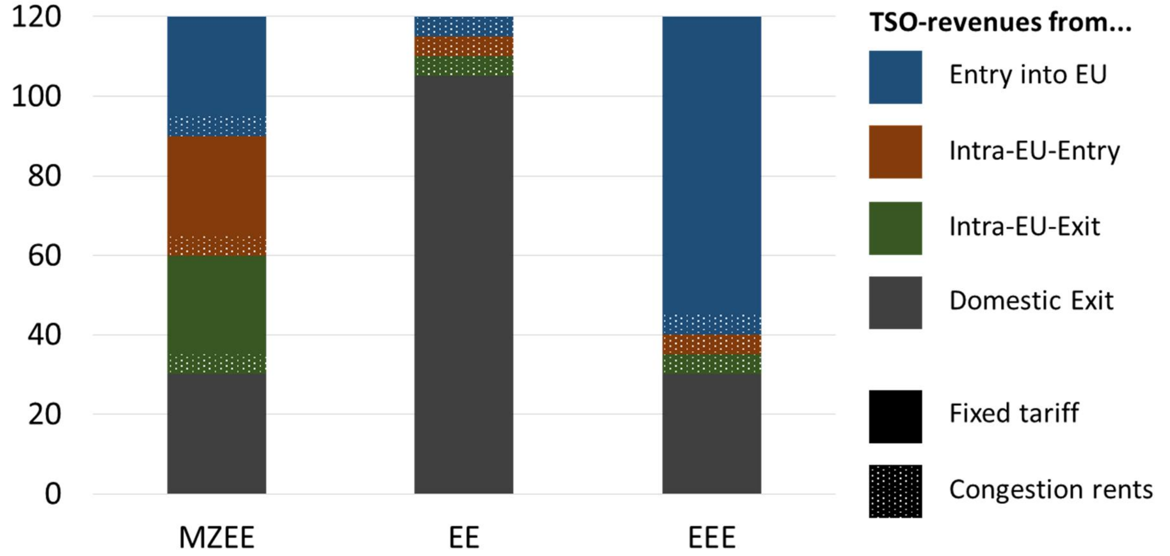

FIGURE 2: STYLIZED EXAMPLE OF REVENUE SOURCES OF A TSO IN THE DIFFERENT MODELS

3.3 Security of supply remuneration

As discussed before in Hypothesis 2 of Section 2, the current system of entry-exit tariffs (MZEE) insufficiently remunerates transmission security of supply. The proposed EE and EEE tariff designs address the remuneration of transmission security of supply.

In the EE model, the basic assumption is that the level of security of supply, hence the level of redundant transmission capacity and its costs incurred, varies substantially among the EU member states. Therefore, the EE model proposes that each member state charges the costs for achieving its individual level of security of supply at the domestic exits as a component of the total gas transmission costs charged there. For a cost-reflective charging, each member state defines its security of supply requirements and the infrastructure capacities needed to achieve it. Since important elements of the needed infrastructure may have to be made available in other member states, the approach requires a compensation mechanism to be established, which is discussed later on.

In the EEE model, the basic assumption is that the costs to achieve security of supply are more or less similar across the EU. Therefore, they can be charged at the EU-entries as a component of the total gas transit costs charged there. Since the costs for security of supply are somewhat socialized in this approach, the level of security of supply for the member states should be defined by an EU-body in order to avoid free-rider behaviour. Nonetheless, it is important to note at this point, that any entry-exit system socializes the costs of security of supply to some extent. In the EEE model, as Section 4.1 discusses below, a clever design of entry-tariffs can make low cost gas suppliers co-finance infrastructure required for security of supply, thereby limiting socialisation among member states.

3.4 Inter-TSO-compensation

Since in both models transit costs are widely redistributed to other network points, both models require some inter-TSO-compensations for the transit capacities provided but not remunerated directly by shippers. In the EE model, TSOs predominantly operating exit points collect more than their allowed revenues whereas TSOs predominantly operating EU-entries or Intra-EU-IPs collect less. In the EEE model, a mechanism needs to be established, in which TSOs operating transit pipelines receive their share from the revenues collected at the EU-entries.

It is far from trivial to implement mechanisms for Inter-TSO-compensation. Nonetheless, finding such a mechanism is not impossible, as the example of Austria shows, where two TSOs operate in the eastern market area under one tariff system and compensation payments take place. Organising cross-border TSO-compensation would be more complex, in particular, because of political and legal factors. One EU-wide approach could be to entrust an existing EU authority with that task. However, as discussed later on, different mechanisms should be evaluated in further research.

3.5 Market zones

The structural change of tariff design proposed in the two models EE and EEE does not affect the current spatial structure of entry-exit-systems. That is, market zones can be shaped irrespective of these alternative tariff models.

3.6 Transmission network planning

In both models EE and EEE, all investment decisions, which solely concern domestic gas transmission, will continue to be managed nationally. Concerning cross-border infrastructure, both models follow different approaches.

In the EE model, member states define their individual level of security of supply with regard to their choice of supply sources and the amount of redundant supplies. As discussed before, each member state's security of supply level will affect its respective domestic exit tariffs. Given the individual security of supply requirements, a coordinated European network planning process will determine the amount of existing and needed capacities necessary for meeting these requirements.

In the EEE model, member states could propose additional cross-border pipelines, e.g., for increasing transmission security of supply. A coordinated European network planning process should evaluate the necessity of such a pipeline since the costs associated would be socialized to some extent among several member states, as they would be recovered at the EU-entries.

3.7 New institutional requirements

Both models follow the same principle, i.e., to redistribute recovery of transit costs from Intra-EU-IPs to the exit points as in the EE model or to the EU-entries as in the EEE model, in order to enhance gas-to-gas competition. Since that kind of redistribution of cash flows takes place among different TSOs, it is necessary in both models that an EU-authority organizes the Intra-TSO-compensation. In the EEE model, the EU-authority should additionally be responsible for determining the tariffs at the EU-entries. The tariff determination should reflect the full costs of gas transit through the EU.

Besides managing distributional issues, an EU-authority would also be required in both tariff models to organize the network planning process in order to determine the appropriate level of existing and needed cross-border gas transport infrastructure.

In the EE model, member states determine their required level of security of supply. Since the costs of achieving the respective security of supply level translate into the domestic exit tariffs of a member state, each member state has an incentive to underestimate the costs of achieving individual security of supply. Therefore, an EU-authority should evaluate these costs.

In the EEE model, the core assumption is that security of supply costs are similar for each member state and should thus be charged at the EU-entries. Since this approach socializes security of supply costs among member states, member states would have an incentive to demand an increase of their individual security of supply level. Therefore, an EU-body is required to balance out country-specific security of supply levels and to use this information in the network planning process.

4 ECONOMIC EFFECTS OF REDESIGNING GAS TRANSMISSION TARIFFS

So far, this paper has argued that fixed (full-cost) charges for gas transits across Europe hamper competition and insufficiently remunerate security of supply. Therefore, two models were presented to abolish fixed (full cost) transit charges at Intra-EU-IPs and instead charge the full costs of gas transits at domestic exits (EE) or EU-entries (EEE). Next, the paper discusses economic effects of both models.

4.1 Tariff designs influence the supply costs and market equilibrium

Figure 3 presents a simplistic supply and demand model for a gas market where DEM is the demand function and S the supply function. ST_{MZEE} is the supply function including EU transport tariffs representing the current entry-exit system. Note, that in this example we assume that the lower cost suppliers also have lower transport costs whereas higher cost suppliers bear higher transport costs because of transit charges. Note that the quadrangle ABCD is the total sum of transport charges, which equals the allowed revenues of the TSOs. p_{MZEE} is the resulting market price.

In the EE model, the entire transport costs are charged at the domestic exits (for simplicity we assume marginal costs and congestions costs of zero). Therefore, transport costs are identical for all suppliers implying the supply function ST_{EE}, which is parallel to S. Note, that the quadrangle AEFG is the total sum of transport charges; which has an identical area as ABCD since the tariff model does not affect the total sum of transport revenues. The consumers' benefit from a market price p_{EE}, which is lower than p_{MZEE} and a higher quantity. Additionally, new suppliers can enter the market, which were not competitive in the MZEE model.

In principle, in the EEE model EU-entry prices can be set in a way that would result in the same supply curve as ST_{EE}. However, charging EU-entry prices allows even more flexibility for increasing gas-to-gas competition. ST_{EEE} illustrates an extreme example, how competition could be enhanced by charging different entry points with different tariffs. In this example, EU-entry points used by the highest cost suppliers are levied with almost no charges whereas the EU-entry points used by the the lowest cost suppliers are charged with higher tariffs. Note, that the overall transport revenues AHJ are identical to those of the EE and MZEE models. However, the price p_{EEE} is most advantageous for the consumers and competition is highest. Interestingly, the market result equals a market result as if there were no transport costs. Thus, in this simplistic example the entirety of transport costs is borne by the suppliers.

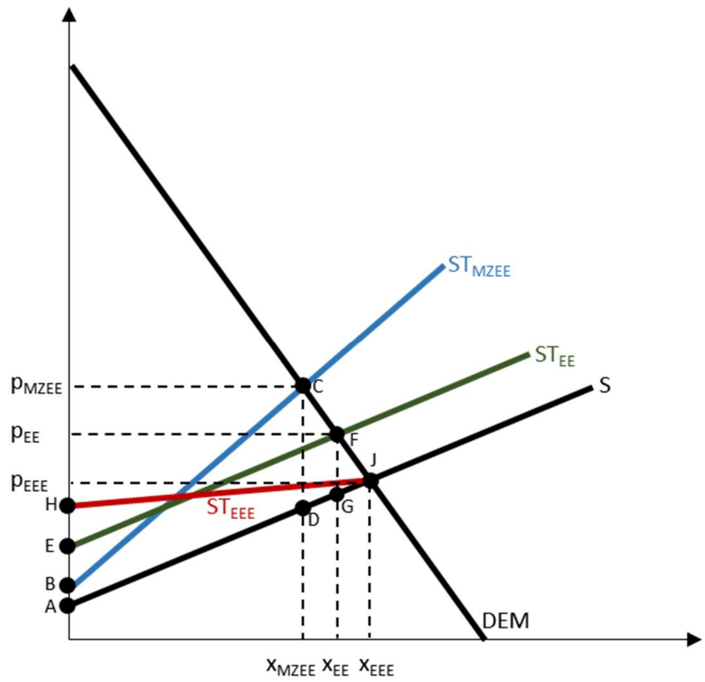

FIGURE 3: SIMPLE MODEL OF PRICE EFFECTS FROM DIFFERENT TARIFF DESIGN SCHEMES

This finding from the EEE model is interesting from an economist's point of view. Whereas the tariffs at the exits are borne by the consumer, tariffs at the EU-entries could be designed in a way that would shift a certain part of the gas transit costs from the EU end users to the extra-EU gas suppliers while denying them to raise prices accordingly. In other words, a properly designed EEE model is suitable to redistribute margins from low cost suppliers to the European end user.

In the MZEE model (additionally assuming lower cost suppliers facing lower EU-transport costs to reach a customer than higher cost suppliers), the opposite holds: lower cost producers can extract additional margins from EU-end users because of that specific tariff design. It is important to note here that the MZEE model represents the current EU gas transmission tariff design.

A simplistic calculation illustrates an order of magnitude of the expenses that EU end users could save by implementing the EEE model. Assuming that, by a clever design of EU-entry tariffs, each user saved 1 EUR/MWh for gas transit costs through Europe, which were instead borne by suppliers, and further assuming an annual gas demand of 450 bcm, the total savings would amount to roughly 4.5 to 5 billion EUR.

Another benefit for the European gas sector would be that the approach could make producers contribute to pipeline cost required for security of gas supply.

Even though, the example presented is a simplification of a far more complex reality it shows, how the design of gas transport charges can influence the market result and consumer prices in particular. Concerning the real market, more competition will also result in a higher liquidity at trading hubs. Nonetheless, further research is required for a better understanding of the outlined effects of different tariff schemes in the real European gas market.

4.2 Tariff designs influence the market power of an incumbent

Next, another economic effect of different tariff models is discussed. Since there may be gas markets in Europe, where an incumbent has a dominant position another simple model illustrates how a different tariff design can weaken the incumbent's dominant position and thereby enhance competition. In this model, illustrated in Figure 4, we assume a monopolist with low marginal supply costs including transport costs SM_{MZEE}. We also assume a competitive price-taking fringe of suppliers represented by the supply function SF_{MZEE} showing their supply costs including transport costs. The monopolist will adapt his behaviour to the demand curve DEM accounting for the fringe, which supplies some of the demand leaving a lower demand DM_{MZEE} for the monopolist. The Cournot point of the monopolist X_{MZEE} yields the market price p_{MZEE} and the market equilibrium (including the fringe supply volumes) E_{MZEE}.

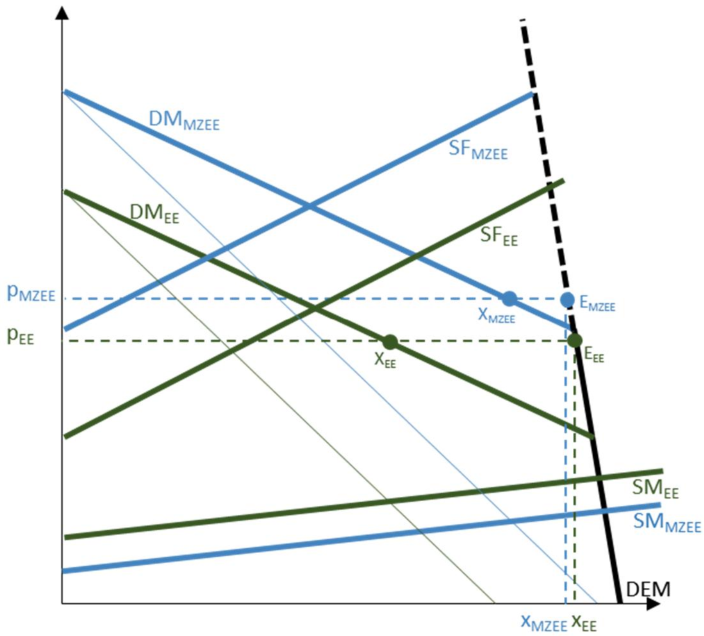

FIGURE 4: SIMPLE MODEL OF MONOPOLY WITH COMPETITIVE FRINGE UNDER DIFFERENT TARIFF SYSTEMS

In the two alternative tariff models EE and EEE, supply costs of the fringe SF_{EE} will be lower than in the MZEE model since transit charges are abolished in both models, whereas the supply costs of the incumbent SM_{EE} increase because of the redistribution of tariffs. Note that for this effect to be valid, we make the plausible assumption that the incumbent has lower transit costs to reach a certain market than the fringe players. Additionally, the reduction of the fringe's per unit transport costs is higher than the increase of the incumbent's per unit transport costs if it is assumed that the supply volumes of the incumbent are higher than those of the fringe. The resulting market equilibrium leads to lower consumer prices p_{EE} and a higher quantity supplied by the fringe suppliers indicating a more intense competition. Regarding the real gas market, more intense competition would also mean more liquidity at trading hubs.

This constructed example illustrates the effects of the proposed alternative tariff models regarding competition. However, since the gas market in Europe is a lot more complex (e.g. oligopolies, spatial and intertemporal interaction among market etc.) more profound research regarding this topic is necessary.

4.3 Distributional effects among member states

The restructuring of the tariff scheme in both proposed models EE and EEE would imply several distributional effects among the member states.

Consider two neighbouring countries A and B, with rather high transit costs from A to B. In market A, the competition intensity is rather high, however due to transit costs, players would not consider any arbitraging with market B. In the EE model or the EEE model, with zero transit costs from A to B, the competition intensity in B would increase since players would then be competitive. Therefore, prices in B would decrease, but may increase in A because of higher demand in the relevant market (i.e., demand in A plus export demand from A to B). The magnitude of that effect and other factors, which may also decrease prices in A, is unclear and calls for further research with regard to that topic.

The tariff model EEE, which redistributes the costs of European gas transits to the EU-entry points, implies another distributional effect among member states. Since most of the European transit costs are charged at the EU-entries, EU-entry tariffs can be higher than in the current model. If a higher entry tariff lead to higher end user prices, countries at the EU-entries would co-finance part of the transit costs of other member states. However, it needs to be emphasized that this kind of distributional effect among countries will not necessarily materialize: As the example in Section 4.1 has shown, EU-entry tariffs can be determined in a way, which has the potential to decrease the market price of gas because of increased competition and making extra-

EU-suppliers bear (at least a part) the transit costs. Further research is required to determine the level of the outlined distributional effect among member states in the real European gas market.

5 NEXT STEPS IN RESEARCH

Since this paper only intends to be a starting point for further discussions regarding two alternative entry-exit tariff models, numerous research questions are left open and need to be answered in order to get a sound understanding of both models in the European gas market.

1. How would a tariff structure for the EE and EEE models look like in actual numbers?
Using publicly available data of current transit tariffs and transit capacity bookings would allow for an approximate derivation of those revenues, which have to be recovered from domestic exits (EE) and the EU-entries (EEE) respectively. Modelling business-as-usual scenarios as well as security of supply scenarios with a pan-European market model such as the TIGER model by EWI would allow for a derivation of member-state specific infrastructure needs, which could be translated into exit tariffs in the EE model. Concerning the EEE model, EU-entry tariffs would be derived such that all transit costs are recovered at the EU-entries given business as usual gas flows, but, in a first step, all EU-entry tariffs are identical. Different EU-entry tariff schemes can be evaluated on that basis as well, in particular those, which may redistribute parts of the gas transmission costs from the EU end user to the suppliers.

2. How would the new tariff structures affect gas flows and infrastructure utilization in Europe?
As a next step, the new tariff structures from 1) would be applied in further simulations with the TIGER model in order to compare gas flow patterns and infrastructure utilization among the three tariff models MZEE, EE and EEE. In particular, bottlenecks would be accounted for implying additional revenues for the grid operators, which would again slightly affect the tariff structures. This interaction would be addressed by doing feedback loops of the TIGER model and the tariff structure. Comparing flow patterns would enable a first indication of increased or decreased competition in different market zones.

3. How would inter-TSO-compensation work in both tariff models?
Having derived consistent scenarios applying the new tariff structures, the required inter-TSO-compensation could be derived. For that to happen, a rough estimation of the TSOs allowed revenue would be required, which could be determined as a best estimate similar to the approach in 1). Comparing the allowed revenues with the revenues after applying the new tariff structures would enable to derive the direction and the amount of cash flows needed for inter-TSO-compensation. Taking into account that information, research is necessary to assess different mechanisms of inter-TSO-compensation and new institutional requirements to implement such mechanisms.

4. How would the new tariff models alter competition and prices when accounting for oligopolistic upstream suppliers to Europe? Could the EEE model be designed in a way to work against oligopoly behaviour?

For answering this question, one approach could be to use a model with the ability of simulating oligopoly behaviour such as the EWI gas market model Columbus. The model would simulate both tariff models and their effects on competition. In particular, the model would allow simulating different tariff schemes of the EEE model, hence assessing the ability of the model to decrease market power of upstream suppliers. This would allow for an assessment of the impact of the model on gas market prices.

There is a variety of further examples of potential research questions, which should be assessed: Would the economic effects analysed in this paper also hold for price cap regulation of gas transmission tariffs? How would the new tariff models alter competition and prices when assessing regional markets with a dominant incumbent? What are the distributive effects among member states of both models? Would it be useful to extend these models by abolishing entry-exit fees for storage interconnection points in order to increase competition for flexibility?