Analysis of potential impacts of price differentials between new and existing capacity contracts

CLIENT: National Grid

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Version History

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Limitation Statement

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1 Introduction

Background to the project

The European Network Code on harmonised transmission tariff structures for gas (TAR NC[1]) took effect in April 2017. It is the fourth European network code in the gas sector, supplementing and forming an integral part of the Gas Regulation and is one component of the Internal Energy Market. The TAR NC includes harmonised rules on cost allocation assessments, the application of a reference price methodology and calculation of reserve prices for standard capacity products. In short, the TAR NC is a set of harmonised transmission tariff structures for gas that applies directly in all Member States.

The current approach to gas transmission charging in GB is based on the incremental cost of expanding the network at different locations. To implement the TAR NC in GB, National Grid Gas (NGG) raised UNC621 to modify the charging arrangements in the Uniform Network Code (UNC) with the aim of better meeting the relevant charging objectives and deliver compliance with TAR NC. Through discussions with the UNC Workgroup eleven different proposals were made to replace the current charging methodology.[2]

In an initial assessment, Baringa undertook quantitative and qualitative economic analysis on a number of tariff methodology options to provide evidence for Ofgem's impact assessment of the different proposals. As part of its analysis, Baringa found that the removal of residual revenue recovery on existing transmission contracts through commodity charges meant that, on average, entry transmission tariffs for existing contracts would be lower than transmission tariffs for new contracts. This issue is only applicable to entry points, because there are no existing booking at exit points on the GB gas transmission system.

Ofgem rejected all modification proposals due to their lack of compliance with TAR NC. Following this, NGG raised UNC678, which requests that urgent procedures are implemented such that new transmission charging agreements are introduced.

Context

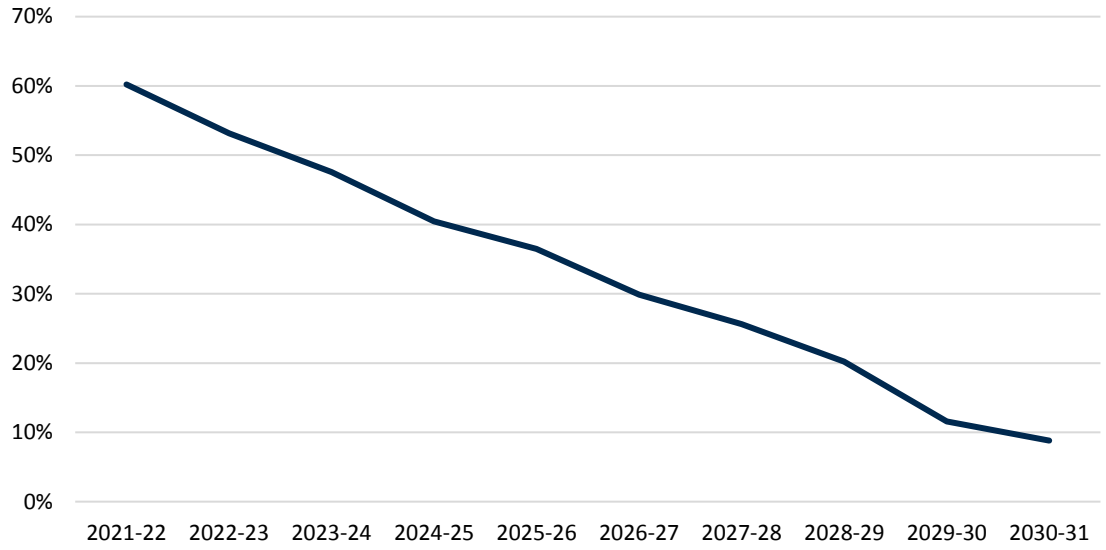
Fixed prices for long-term entry capacity bookings are a feature of the GB charging regime. With its recent decision under UNC621, Ofgem in effect decided that capacity contracts would be afforded price protection if they were allocated before 6 April 2017, and that contracts allocated on or beyond that date would be subject to "floating capacity charges". In the remainder of this report, we refer to the long-term contracts benefitting from price protection as 'existing contracts'.

[1] Regulation 460/2017.

[2] UNC621/A/B/C/D/E/F/H /J/K/L. We note UNC621G was later withdrawn by the Proposer.

For the gas year 2021-22, existing contracts amount to 60% of entry bookings based on Forecasted Contracted Capacity (FCC) in National Grid's UNC678 model.[3] Assuming constant FCC over time,[4] the share of existing bookings drops to 40% in 2024-25, to 30% in 2026-27 and to 9% in 2030-31. This is shown in Figure 1.

Figure 1: Ratio of existing entry bookings to Forecasted Contracted Capacity



Source: National Grid and Baringa modelling

To limit regulatory risk and to provide investors with a degree of certainty that enables them to undertake significant investments, regulators generally seek to avoid retroactive changes to contracts already agreed.

Scope of our work

Because existing entry bookings represent a significant portion of total anticipated bookings in the first years following the planned introduction of the new transmission charging regime, and this has the potential to affect gas market dynamics, National Grid has asked Baringa to:

- Assess the materiality of any tariff differentials between existing contracts and contracts which may be entered into under a new regime;
- Determine whether any tariff differential may have a negative impact on competition in the wholesale gas market and on consumer welfare; and
- Explore potential ways to mitigate any negative impact on wholesale market dynamics and consumers.

[3] At each point, we have capped existing contracts at the level of FCC for the purposes of this calculation.
[4] This chart assumes that gas transmission FCC is constant over time. However, actual capacity bookings and FCC are likely to be subject to a degree of uncertainty, for example in relation to the gas demand scenario that prevails. If FCC falls over time, the ratio of existing bookings to FCC would be slightly higher than presented above.

There are no existing contracts at exit points of the GB gas transmission network. Hence, our assessment focuses on tariff differentials between existing and new contracts at network entry points. Our analysis has been undertaken on the basis of information provided to us by National Grid, including National Grid's UNC678 model.

The rest of this document is structured as follows:

- In Section 2, we discuss the source of tariff differentials between existing and new contracts. We present our quantitative assessment of tariff differentials and their materiality in comparison to a number of relevant benchmarks;
- In Section 3, we introduce a theoretical framework to assess the effect of tariff differentials on wholesale gas market dynamics;
- In Section 4, we outline the potential impacts of transmission tariff differentials on wholesale market outcomes and consider the magnitude of those impacts;
- In Section 5, we discuss options for reducing tariff differentials between new and existing contracts;
- In Section 6, we summarise the findings of our assessment.

2 Tariff differentials between existing and new contracts

2.1 Causes of the tariff differential

Under the current transmission tariff regime, shippers are liable for a commodity-based charge, which is a charge per unit of gas flow, in addition to the charges for booking of capacity. The commodity charge is a residual charge determined by NGG to ensure the recovery of its regulated revenues from gas transmission users after revenue from capacity bookings has been accounted for. The total amount paid with respect to commodity charges is directly proportional to the amount of gas that shippers flow on the network. Under the current arrangements, storage facilities are exempt from the commodity charge.

Currently, capacity charges account for a relatively small share of the total gas transmission network revenue. For 2021-22, based on current transmission charging arrangements, we find that 76% of the total revenue requirement from entry would be recovered from commodity charges. Such charges would be payable by both new and existing contracts.

Assuming that existing contracts are kept whole following the introduction of new arrangements, holders of existing contracts would pay capacity charges as defined in their existing contracts and would also be subject to commodity charges if such charges form part of the charging regime.

However, the new transmission charging regimes under consideration aim to recover all transmission network revenue from capacity charges. Hence, holders of existing contracts should only expect to pay the capacity charges as defined in their contracts, and face lower charges overall. Capacity tariffs for users who are not in possession of existing capacity contracts would be determined approximately as follows:[5]

- Revenues associated with existing contracts would be subtracted from the total revenue requirement;
- Capacity bookings associated with existing contracts would be subtracted from Forecasted Contracted Capacity;
- Finally, a capacity charge would be calculated such that the remaining revenue requirements are recovered from new capacity bookings.

The absence of a commodity charge payable by existing contract holders would result in:

- A reduction in the total amount payable by holders of existing contracts;
- A corresponding revenue shortfall for NGG; and

[5] This description is a simplified explanation of the steps taken to determine the tariffs of new contracts. A number of additional parameters are taken into account in the determination of entry tariffs, such as any weight applicable to different points (in the CWD RPM), the share of firm and interruptible capacity and any discount applicable to certain categories of points.

- Recovery of such revenue shortfall on new contract holders in the form of a higher capacity-based charge.

Consequently, the introduction of tariff methodology options solely based on capacity charges would result in new bookings being more expensive than existing contracts. This is a temporary effect that would only hold in the years covered by existing contracts, although a small portion of contracts extend to 2030-31.

Table 1 shows our estimates of the shares of demand and revenue recovery for existing and new contracts in the absence of a commodity charge. Existing contracts account for 60% of FCC but only 12% of total revenue recovery in 2021-22, based on FCC and revenue requirements defined in UNC678. As a result, we expect that, in the years following the introduction of a capacity-based tariff and in which there are significant existing contracts, the capacity charge of new contracts would be significantly higher than that payable under existing contracts.

Table 1: Revenues from existing contracts (capacity charge only)

	Total requirements NGG UNC678	Existing contracts (capacity charge only)	New contracts (Implied)
Revenues (£m)	£390.0m	£46.5m (12%)	£343.0m (88%)
FCC (KWh/d)	5.84bn	3.51bn (60%)	2.32bn (40%)

In the remainder of this section, we set out our methodology and assessment of the tariff differential between existing and new contracts. We discuss our findings and compare them against a number of informative benchmarks to assess the materiality of the tariff differential.

2.2 Data and methodology

To undertake our analysis of existing contracts, we rely on an anonymised dataset of existing contracts provided by National Grid for each entry point. For each contract, NGG has provided us with the capacity booking, the unit price and the total contract value. Because contracts are specified for each shipper on a quarterly basis, we aggregate the data on a yearly basis and determine yearly bookings, unit tariffs and total revenue for each entry point in the system. We do not account for a potential commodity charge, because existing capacity bookings would not be liable for commodity charges under any new arrangements.

To determine entry tariffs for new bookings, we use outputs of the UNC678 tariff model provided by NGG. We determine the transmission tariffs applicable at each network entry points under different Reference Price Methodologies ('RPMs') and RPM parameters. To capture a broad range of RPMs under consideration, we use our results relating National Grid's proposal of Capacity-Weighted Distance tariffs ('CWD') and to a proposed Postage Stamp methodology ('PS'):

- Under the CWD methodology, entry tariffs are higher at points that are more distant from exit points, weighted by the capacity booked at those points.

- Under the PS methodology, revenue recovery is divided equally between all capacity bookings, subject to any discounts for specific types of entry point.[6]

We then present the magnitude of tariff differentials between existing and new contracts, by entry point and entry point category. We undertake our assessment for the gas year 2021-22. In this year, tariff differentials would be near their peak level because the share of existing contracts decreases over time, thus spreading revenue recovery over a larger number of bookings.[7]

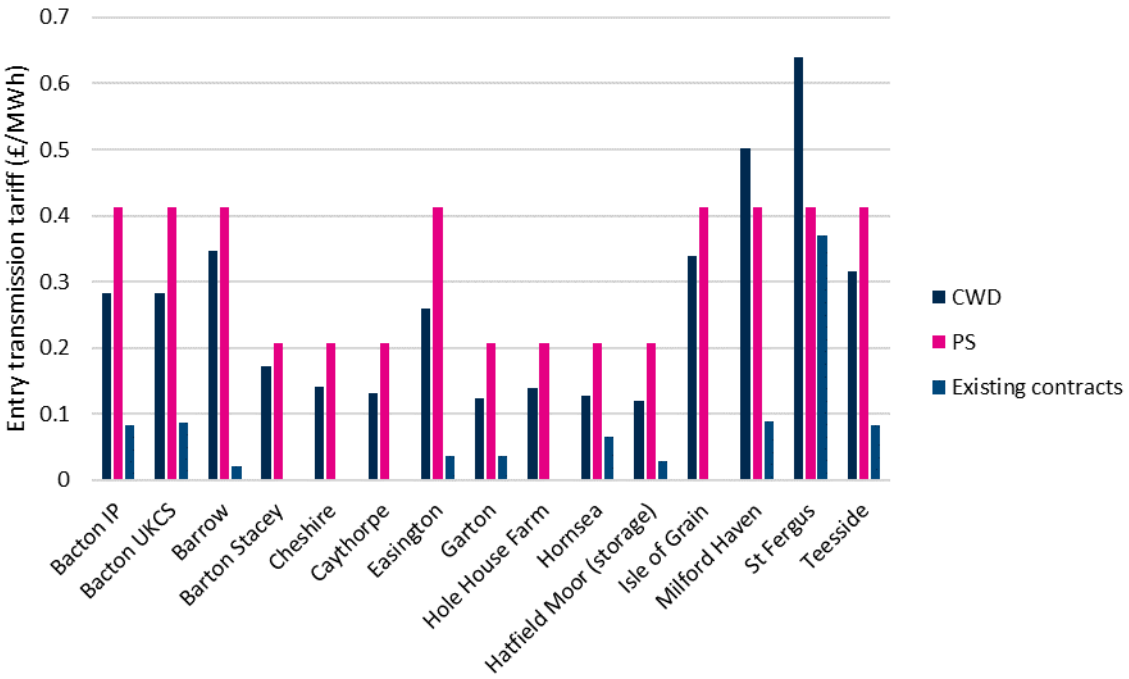
To assess the materiality of differentials between new and existing tariffs, we compare them to a number of benchmarks, including tariff variation at one point across different tariff methodologies, and tariff variation across entry points within the same tariff methodology, and wholesale (NBP) gas price variation.

2.3 Quantitative assessment of tariff differentials

In this section, we quantify the tariff differential between existing and new contracts by entry point and by category of entry points. We determine tariffs payable by new contracts at all entry points under two Reference Price Methodologies: CWD and PS.

We only show transmission tariffs for gas entry contracts for points at which there are existing bookings (and an associated tariff).

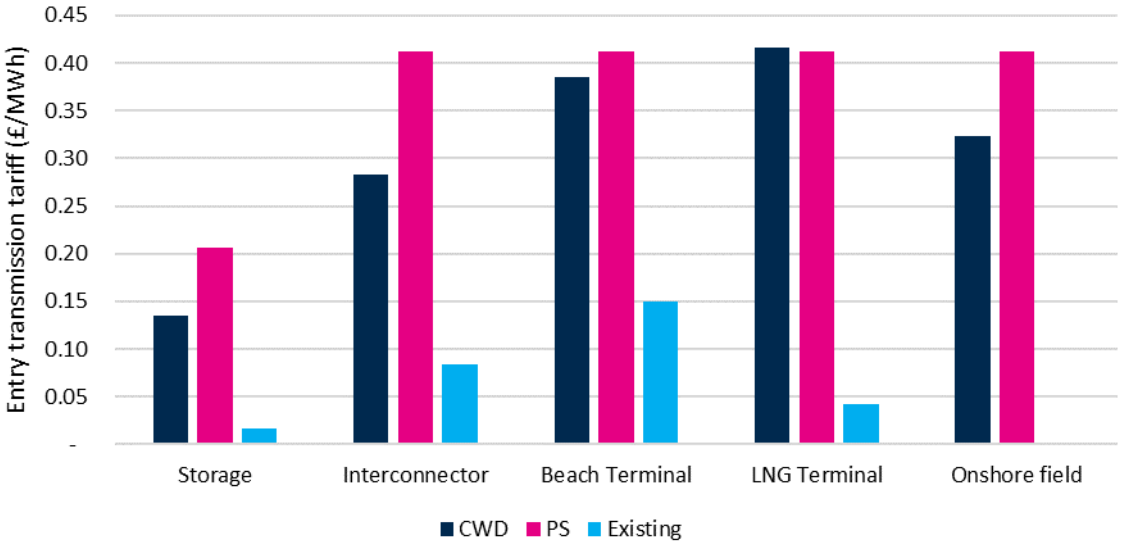
Figure 2: Point-specific gas entry transmission tariffs for new and existing contracts in 2021-22



[6] A 50% discount is applied to storage in both the CWD and PS methodologies.

[7] We note that revenue requirements under UNC678 increase from £658m in 2018-19 to £779m in 2021-22 remain stable at £802m after 2022-23.

Figure 3: Category-specific gas entry transmission tariffs for new and existing contracts in 2021-22



Note: Tariffs associated with existing contracts for onshore fields are not displayed on this graph because there are no existing contracts for such entry points.

We find that entry tariffs are significantly higher under new arrangements than for existing contracts for all points and all point categories. Across the different entry points, we estimate that shippers with existing contracts are liable for tariffs between £0.06/MWh and £0.41/MWh lower than new capacity bookings under the CWD methodology. Shippers with existing contracts are estimated to be liable for tariffs between £0.04/MWh and £0.41/MWh lower than new capacity bookings under the PS methodology. On an average basis, the capacity charges associated with existing contracts are estimated to be £0.20/MWh and £0.26/MWh lower than charges for new capacity bookings under the CWD and PS methodologies respectively.

2.4 Benchmarking against other measures of tariff differentials

2.4.1 Overview

To assess the materiality of the estimated tariff differentials set out above, we undertake a comparison against three benchmarks:

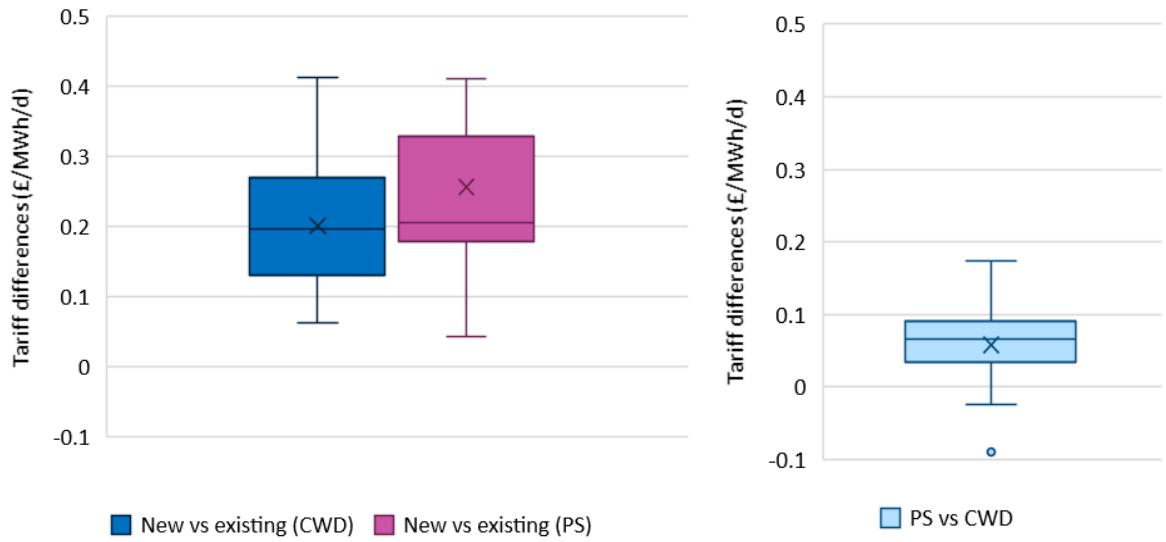
- Tariff variation which occurs at a given entry point under different tariff methodologies;
- The tariff variation which occurs across different entry points under the same tariff methodology; and
- The materiality of tariff differentials in comparison to regular variation in NBP gas prices.

These comparisons then inform our assessment of the potential effects of tariff differentials on competition, consumer welfare, and broader gas market dynamics.

2.4.2 Comparison with tariff variation under different tariff methodologies

For each point, we compare the tariff differences between new and existing contracts under the CWD and PS methodologies to the tariff differential for new contracts between the PS and CWD methodologies. Figure 4 shows the distribution of such differences at all entry points.

Figure 4: Tariff differences between new and existing contracts and comparison with tariff differences for new contracts between the PS and CWD methodologies (2021-22)[8]



We estimate that new contracts under the CWD and PS options respectively are £0.06-0.41/MWh and are £0.04-0.41/MWh more expensive than existing contracts. On the whole, these differences are larger than the tariff difference between CWD and PS tariffs at different entry points. We find that, on average across all entry points, the price for new entry capacity contracts under the PS methodology is around £0.06/MWh higher than under the CWD methodology, with the equivalent difference across all entry points ranging between £-0.23/MWh[9] and £0.17/MWh.

2.4.3 Comparison with tariff variation across entry points

In this section, we compare the difference in tariffs between new and existing contracts to the tariff variation across entry points under the same tariff methodology. The table below presents the estimated tariff difference between the points with the highest and the lowest tariff, for each methodology.

[8] At every entry point, we determine the difference between tariffs of new and existing contracts. The range of such differences is presented in the left-hand side graph, using the CWD and PS tariff methodologies to determine new tariffs. For every point, we also determine the difference between tariffs for new contracts determined under the PS and CWD option. The range of differences is presented on the right-hand side. The boxes in the charts represent the 25th to 75th percentile range, the line in the middle of the box represents the 50th percentile, and the cross represents the (unweighted) average. The lower and upper limits show the minimum and the maximum differences.

[9] Outlier excluded in Figure 4.

Table 2: Entry tariff differences (highest – lowest tariff), in £/MWh, for the gas year 2021-22

	CWD	PS
Tariff differential	£0.52/MWh	£0.21/MWh

Source: Baringa estimates

We find that the tariff differential between existing and new contracts is smaller than the differences observed across different entry points under the CWD methodology, and of the same order of magnitude as the differences observed across different entry points under the PS methodology. The PS methodology arguably provides a less useful point of comparison given that the only source of entry tariff differentials under that methodology is the discount granted to gas storage entries.

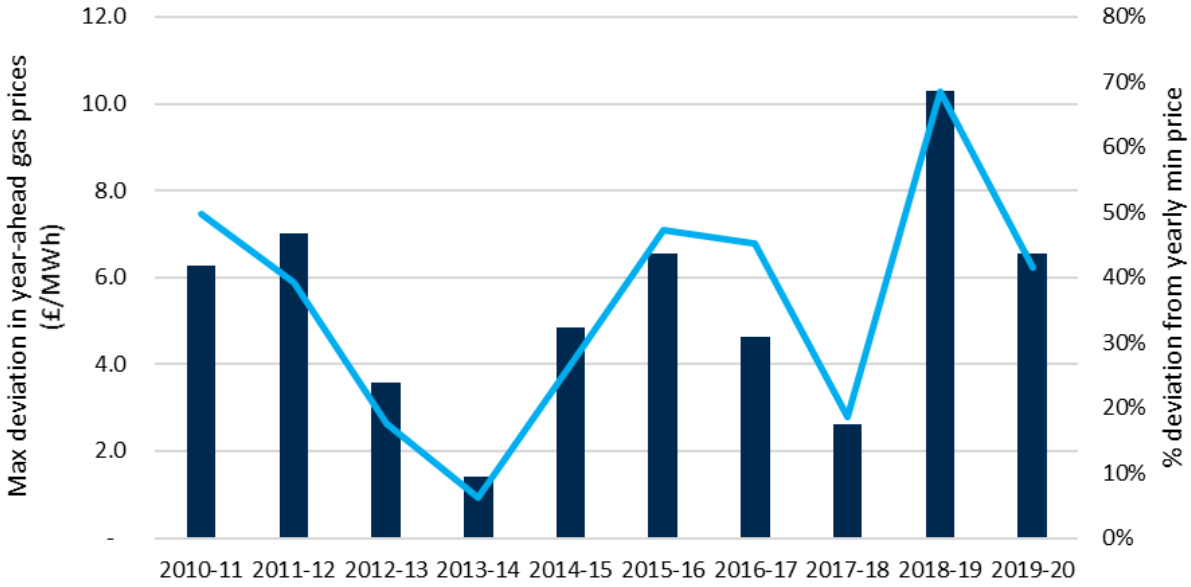
2.4.4 Comparison with wholesale gas prices

In this section we compare the tariff differential between existing and new entry contracts with GB year-ahead gas prices, as well as market variations in those prices.

The central assumptions on the average NBP gas price used in our assessment of alternative tariff methodology proposals for Ofgem was £19.78/MWh for 2021-22. Using this assumption, under the CWD option, the tariff differential between new and existing contracts is estimated to be 0.3 - 2.1% of the NBP price. Under the PS option, the tariff differential between new and existing contracts is estimated to amount to 0.2 - 2.1% of the NBP price depending on the entry point.

In Figure 5 we show historical variation in year-ahead gas prices. We find deviations of £5.4/MWh on average between the highest and lowest year-ahead prices over 2010-11 to 2019-20. Such deviations amount to 36% of the yearly lowest price. In the gas years 2018-19 and 2019-20, deviations in year-ahead prices have been particular high, with differences of £10.3/MWh and £6.6/MWh between the highest and the lowest year-ahead prices respectively. Tariff differentials between new and existing contracts are small in comparison to market variations in gas year-ahead prices.

Figure 5: Historical variation in year-ahead gas prices



Source: Baringa analysis

The relevance of variation in gas prices as a benchmark for differences in gas transmission tariffs is that shippers who book entry capacity on different entry points and compete with one another may be contracting gas purchases at different times at prices that are quite volatile. Hence, depending on when those contracts are struck, the costs of gas shippers can vary significantly due to gas price variation. These factors can be expected to have the same role in influencing the ability of a given shipper to compete as differentials in the cost of gas entry capacity.

3 Theoretical framework

3.1 Wholesale gas supply characteristics

As in many other markets, outcomes in the gas market are determined by interaction of demand and supply. In our theoretical analysis, we focus on supply-side dynamics and on the effect of differential tariffs on the merit order of supply sources since the tariff differential affects gas transmission entry tariffs that are levied on supply. We assume that demand for gas is relatively price inelastic in the near term, or in other words insensitive to changes in price, certainly for smaller users.[10]

To determine the wholesale gas supply curve in our theoretical framework, gas supply sources are ranked in ascending order according to their total marginal cost, such that gas is purchased first from supply sources with a lower total marginal cost. There are six broad categories of gas supply sources in GB: UK Continental Shelf ('UKCS'), Norwegian Continental Shelf ('NCS'), LNG imports, interconnector imports, demand response and gas storage withdrawals.

For each type of gas supply source, the total marginal cost of gas supply is composed of two elements:

- The marginal cost of gas: This component is the underlying cost of extracting and delivering one additional unit of gas to the grid. It may vary across supply sources (e.g. the cost associated with importing and re-gasifying LNG is different from the cost of extracting and bringing gas from the UKCS through a gas pipeline) and across gas producers of the same category (e.g. depending on the characteristics of the gas field or on productivity).
- The gas entry tariff: This is the tariff payable by shippers to put gas into the GB gas transmission network. Although capacity charges may be considered a fixed cost (as opposed to commodity charges), we assume that market participants are able to shape their capacity bookings to their expected commodity flows, making the cost of capacity bookings a marginal cost for the purposes of our analysis.

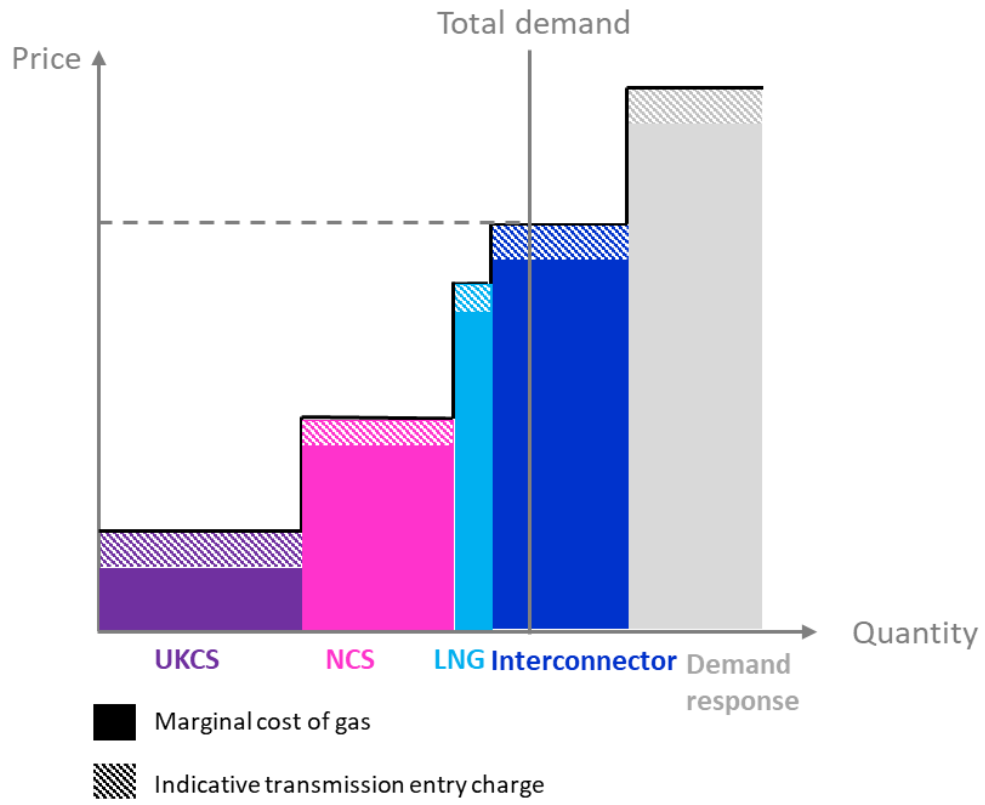
We assume that the gas market is a uniform price market and the system price is determined by the marginal cost of the highest cost supply source that is required to meet demand in every period. In this assessment, demand is assumed to be inelastic, i.e. demand is fixed at a given level for every time period.

Figure 6 is a stylised representation of the wholesale gas market. In this basic representation, the market price is the total marginal cost of gas supply for the marginal supply source. The marginal cost of gas and the tariff of the marginal supply source are passed on to consumers through the

[10] Gas demand from gas-fired generators and from industrial and commercial users is more elastic than gas demand from residential consumers. Because such users account for a significant share of consumption, gas demand exhibits a degree of price elasticity. However, we consider that relaxing this assumption would not materially affect our findings. Accounting for a degree of demand elasticity would only result in a limited reduction in consumption as prices rise.

wholesale price, and other infra-marginal supply sources[11] derive a margin equal to market price minus their marginal cost of supply.

Figure 6: Stylised representation of the wholesale gas market[12]



In practice, a number of elements influence the shape of the supply curve:

- Variation in the marginal cost of gas: Significant differences in the marginal cost of gas between different supply sources lead to a relatively steep curve and a clear merit order between different supply sources. In this case, supply is price inelastic: changes in price have a limited effect in the quantity of gas supplied.

  Smaller differences in the marginal cost of gas between supply sources lead to a relatively flat curve. In such a case, the merit order of supply sources may change significantly following small cost shocks. In this case, supply is price elastic.

  Variations in the marginal cost of gas may come from different cost structures of different supply sources, but also from the timing of gas purchase for shippers if the supply curve is seen as

[11] Suppliers whose marginal cost is below that of the marginal supply source.

[12] This figure relies on a number of assumptions (i) all suppliers within a supply category have the same marginal cost of gas and are liable for the same entry transmission tariffs, (ii) demand is inelastic at a given point in time, and (iii) the gas cost differences between different supply sources are sufficiently high, such that the transmission tariff does not affect the merit order of supply sources. The merit order of supply sources presented in this figure is also hypothetical.

consisting of shippers who contract for gas rather than the underlying sources participating in the market directly. Indeed, there is significant variation in the price of gas and shippers who contracted for gas in different time periods may face significantly different marginal cost for their gas.

- Variation in the gas entry tariff: Different supply sources are liable for different tariff levels depending on the network entry point and on the characteristics of the gas transmission tariff methodology option under consideration. This means that the transmission tariff above the marginal cost of gas is not flat as presented in Figure 6.

We illustrate supply curves with different elasticities and with transmission tariff differentials in Figure 7.

Figure 7: Relatively inelastic (left) and elastic (right) supply curves with entry tariff differentials[13]

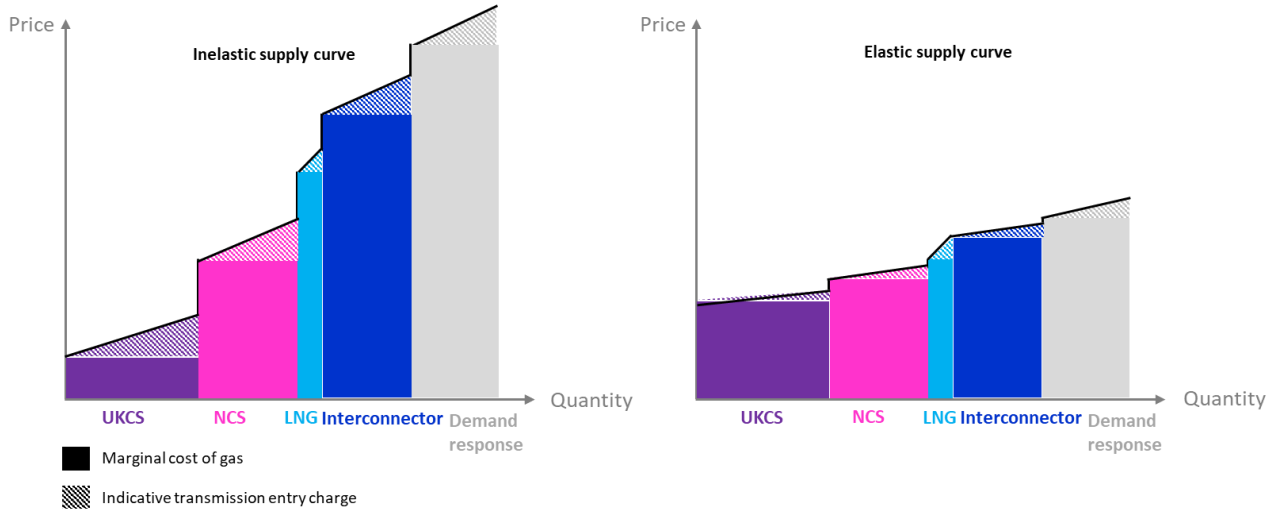


Figure 7 illustrates the merit order of gas supplies when there is a relatively continuous distribution of tariffs at entry supply points of the same category. As discussed in Section 2.3, the move from current charging arrangements to new capacity-based charges would imply that tariffs for existing contracts would be lower than tariffs for new contracts. The theoretical framework to assess the impact of tariff differentials between new and existing contracts is presented in the next section.

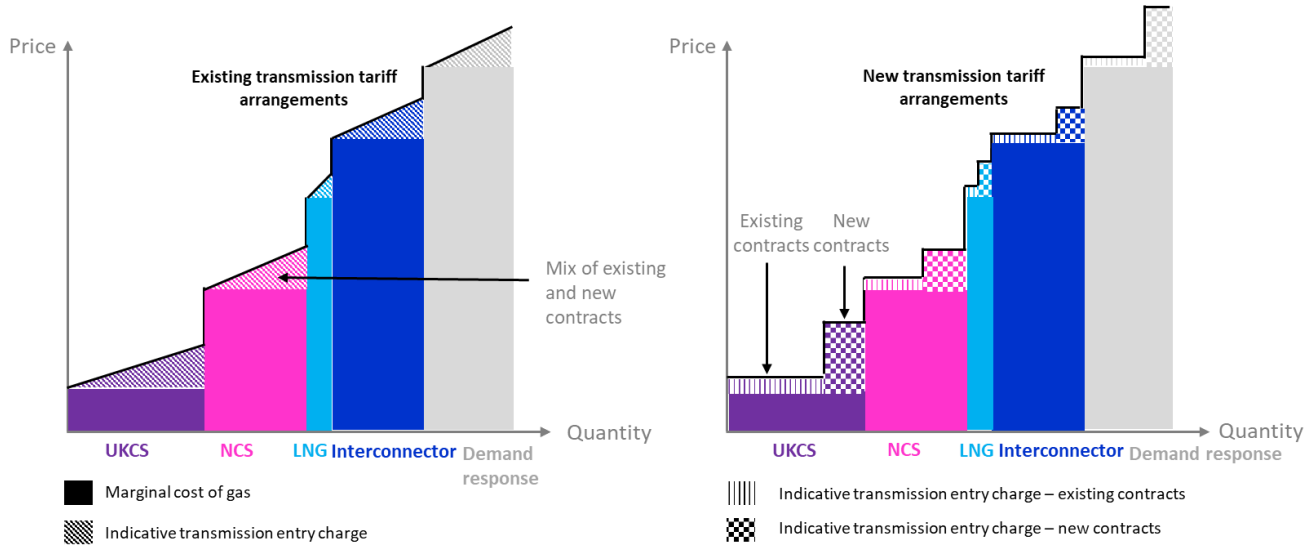
3.2 Theoretical framework: Impact of changes in transmission tariffs on gas supply

In this section, we argue that the impact of the tariff differentials between existing and new contracts on the merit order is significantly influenced by the elasticity of the supply curve.

[13] This figure relies on a number of assumptions (i) all suppliers within a supply category have the same marginal cost of gas, and (ii) the gas cost differences between different supply sources are sufficiently high, such that the transmission tariff does not affect the merit order of supply sources. The merit order of supply sources presented in this figure is also hypothetical.

For a relatively inelastic supply curve, the key driver of the merit order is the difference in the underlying marginal cost of gas between different supply sources. Transmission tariffs differentials are not a significant driver in comparison. Figure 8 shows that, when a price differential between existing and new contracts is introduced, the overall merit order of supply sources remains broadly unchanged.

Figure 8: Tariff differential between existing and new contracts in a relatively inelastic supply curve[14]

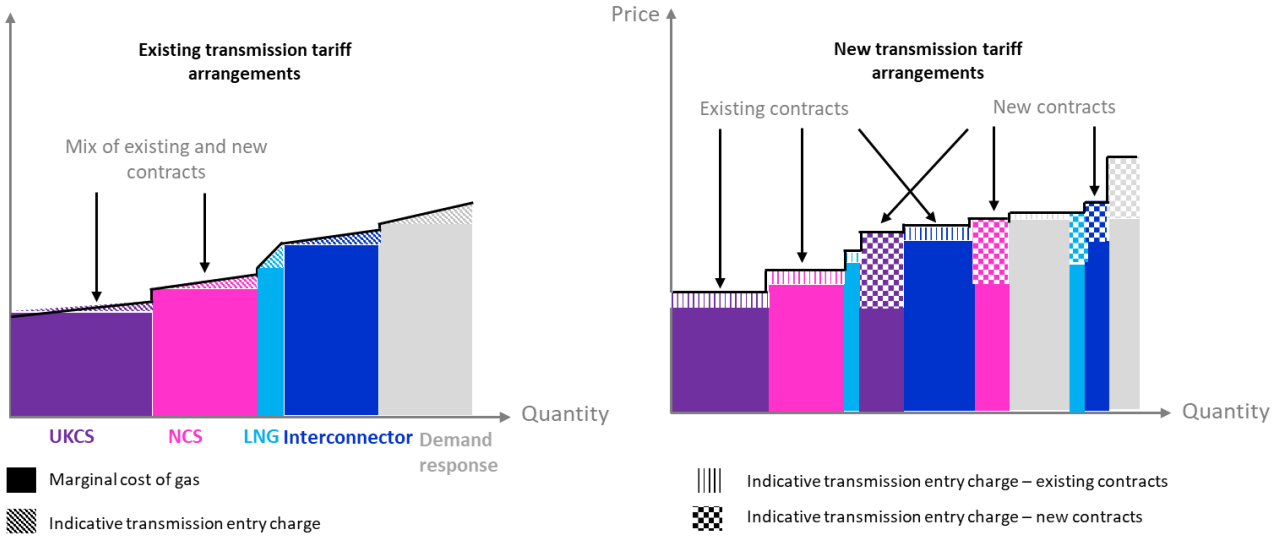


With a more price elastic supply curve, changes in tariffs are more likely to have an impact on the merit order. Because the marginal cost of gas for different supply sources is similar, a tariff differential is more likely to make a material difference to which supply source comes first in the merit order.

As shown in Figure 9, tariffs for existing contracts being lower than for new contracts results in a bunching of existing contracts with low tariffs at the bottom of the merit order curve and in a bunching of new contracts with high tariffs at the top of the merit order curve. In the context of a relatively elastic supply curve, the consequence of the cost advantage in the form of a lower tariffs is that shippers with existing contracts are likely to sell their gas first, whereas shippers with new contracts are more likely to sell their gas to meet the residual demand or to be pushed out of merit entirely and not sell their gas.

[14] This figure relies on a number of assumptions (i) all suppliers within a supply category have the same marginal cost of gas, and (ii) the gas cost differences between different supply sources are sufficiently high, such that the transmission tariff does not affect the merit order of supply sources. The merit order of supply sources presented in this figure is also hypothetical.

Figure 9: Tariff differential between existing and new contracts in a relatively elastic supply curve[15]



To summarise, the extent to which tariff differentials influences the relative position of existing and new contract holders in the merit order is largely dependent on the elasticity of supply. With a relatively inelastic supply curve driven by large differences in the marginal cost of gas between different sellers, tariff differentials between new and existing contracts are unlikely to significantly alter the merit order of supply sources in favour of existing contract holders. On the other hand, with a relatively elastic supply curve, tariff differentials between new and existing contracts are likely to generate a more significant change in the merit order of supply sources, with existing contracts bunching at the bottom of the merit order and new contracts towards the end. We comment on the likely shape of wholesale gas supply curve in Section 4.3.1.

[15] This figure relies on the assumption that all suppliers within a supply category have the same marginal cost of gas. The merit order of supply sources presented in this figure is also hypothetical.

4 Potential impact of tariff differentials on market outcomes

4.1 Overview

Based on the theoretical framework presented in Section 3, this section outlines the potential impacts of transmission tariff differentials between existing and new contracts on wholesale market outcomes, and then considers the potential magnitude of those impacts by analysing how certain features of the market and the entry capacity allocation mechanism may mitigate the effect of transmission tariff differentials. Finally, the section briefly considers some measures that can be taken to control the tariff differentials directly.

4.2 Directional impact of the tariff differential on market outcomes

4.2.1 Impact on new entry and competition

The fact that existing transmission tariffs are likely to be lower than transmission tariffs for new entrants represents a competitive advantage for existing contract holders. Assuming two supply sources have the same marginal cost, a gas supply source with an existing contract would be 'dispatched' before a gas supply source with a new transmission contract if both sources bid their true cost into the market. For this reason, new tariff arrangements may result in a reduction in new entry: as new entrants' costs increase by the amount of the tariff differential, the probability of such supply source being dispatched to meet gas demand reduces in any time period.

Our definition of a 'new entrant' would also encompass an established supply source that is not in a possession of an existing capacity contract and has alternative routes to market. An example of this could be Norwegian Continental Shelf ('NCS') gas, which can flow into GB or other European markets.

Any analysis of competition effects must consider the pricing behaviour of market participants with existing contracts, and in particular the extent to which they are likely to reflect changes in the marginal cost of entry capacity into their market bids. There are two potential ways for existing contract holders to respond to the competitive advantage of lower entry tariffs. One is not passing on the higher marginal cost of entry capacity into their bids, with the motivation that incomplete pass-on results in higher demand and lower new entry, which will yield higher profits later. The other is passing on the changes in the marginal cost of entry capacity into their market bids, with the motivation that short-term profits would be higher and the higher prices would not be undercut by new entrants, who face a higher cost of entry capacity.

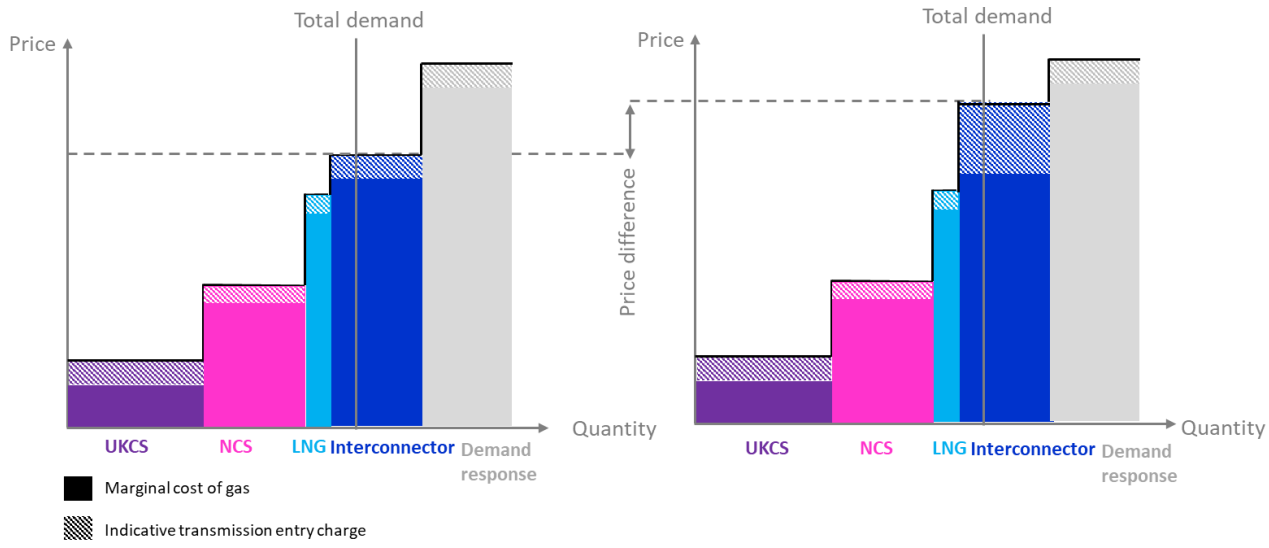
Economic theory suggests that the relationship between pass-on and competition is such that only market participants with a significant degree of market power have a motivation to engage in incomplete pass-on. GB gas market is generally a competitive one, with no market participant holding a dominant position. The relative competitiveness of the GB gas market was confirmed in

the CMA Energy Market Investigation, which concluded in 2016. Hence, we consider that shippers will attempt to pass on the changes in the marginal cost of entry capacity into their market bids to the extent that they are able. Sections 4.2.2 and 4.3 consider their ability to do so and the consequent effects on new entry and consumer welfare.

4.2.2 Impact on consumer welfare

Economic theory suggests that, in a competitive market, changes in tariffs are passed into the wholesale price when they affect the marginal supply source. This is demonstrated in Figure 10. Similarly, changes in tariffs paid by infra-marginal supply sources, or by supply sources which are out of merit, do not impact wholesale price levels.

Figure 10: Impact of a change in the entry transmission charge of the marginal supply source on price[16]



Tariff differentials between existing and new contracts may affect the merit order of the supply curve. If new contracts are more expensive than existing ones, in expectation, shippers in possession of existing contracts will be further up the merit order. Because the price is set by the highest cost supply source used to meet demand, new contract holders are more likely to be the price setting supply source in any period. In turn, this is likely to result in the higher tariffs for new capacity being passed on into the wholesale gas price to some degree.

A higher wholesale price of gas would lead to lower consumer welfare directly in the short-term. Also, to the extent that there is a negative impact on the probability of new entry and intensity of wholesale market competition, this would be expected to lead to higher prices and lower consumer welfare in the medium- and longer-run.

[16] This figure relies on a number of assumptions (i) all suppliers within a supply category have the same marginal cost of gas and are liable for the same entry transmission tariffs, (ii) demand is inelastic at a given point in time, and (iii) the gas cost differences between different supply sources are sufficiently high, such that the transmission tariff does not affect the merit order of supply sources.

4.3 Magnitude of the effects

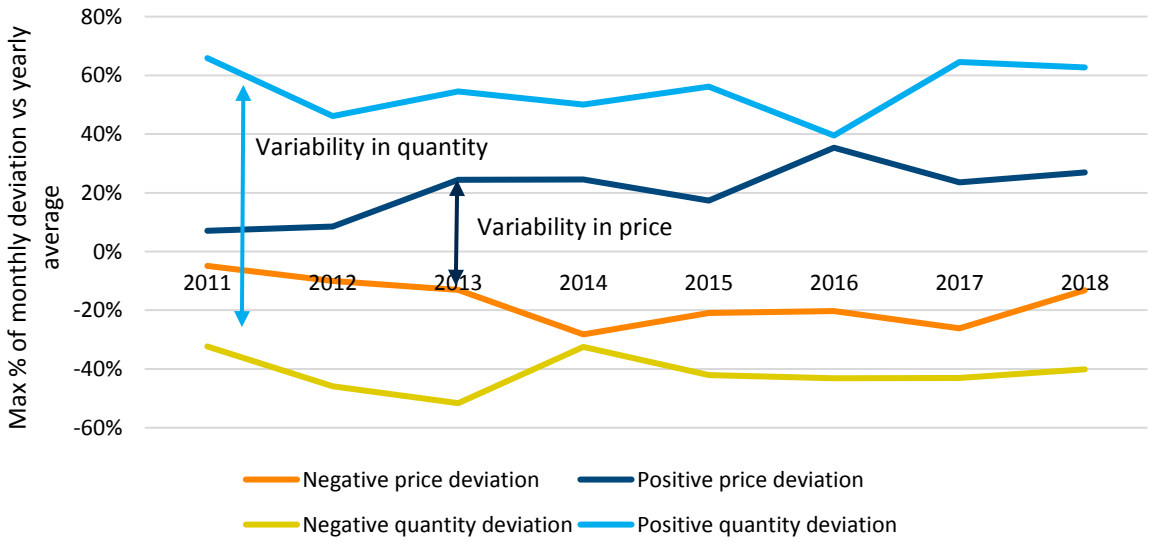
In this section, we explore the effect that a number of market characteristics and other factors may have in mitigating the impact of tariff differentials on market outcomes.

4.3.1 Shape of the supply curve

As set out in Section 3.2, our theoretical framework suggests that the magnitude of the impact of tariff differentials on market outcomes is largely dependent on the elasticity of the supply curve. More specifically, the impact on the merit order is expected to be limited when supply is relatively inelastic because variation in other costs dominates any transmission tariff differential. Pass-on of higher charges for new capacity bookings into the wholesale gas price, and the consequent negative impact on consumer welfare, is likely to be lower if tariff differentials do not affect the supply merit order. This is because there would be no tendency for supply sources subject to the new higher capacity tariffs to be bunched at the top of the supply curve which frequently determines the market price.

While a full analysis of price elasticity of gas supply is outside of the scope of our study, we assess the likely elasticity of the supply curve by studying historical data on gas supply and price variation. In particular, we compare the magnitude of monthly price and quantity deviation from the yearly average. The largest monthly deviations from the yearly average are plotted in Figure 11.

Figure 11: Maximum price and quantity deviation from yearly average



Source: Ofgem data and Baringa analysis

This chart indicates that variation in price tends to be significantly smaller than the variation in quantity. Similarly, we find that the standard deviation around the average is smaller for prices than for quantity. These results potentially indicate a relatively high degree of price elasticity of the supply curve.

Our benchmarking analysis shows that factors other than the price differential between new and existing capacity contracts are likely to drive the shape of the gas supply curve to a greater or comparable extent.

- Natural variation in the wholesale price of gas is larger than the price differential between new and existing contracts. The tariff differential between new and existing contracts is estimated to be around 0.2-2.1% of the wholesale gas price depending on the entry point and tariff methodology. This compares to regular variation of 36% between the lowest and highest year-ahead gas prices on average. If the shape of the supply curve is determined by the contracting strategies of different shippers, it is likely that their underlying costs are subject to a greater degree of variation than the price difference between new and existing capacity contracts.
- Price differentials between existing and new contracts are similar to the tariff differentials observed across different entry points in the CWD and PS methodologies. Hence, other aspects of the tariff methodology generate a similar degree of tariff differences for tariffs applicable to new contracts at different entry points.

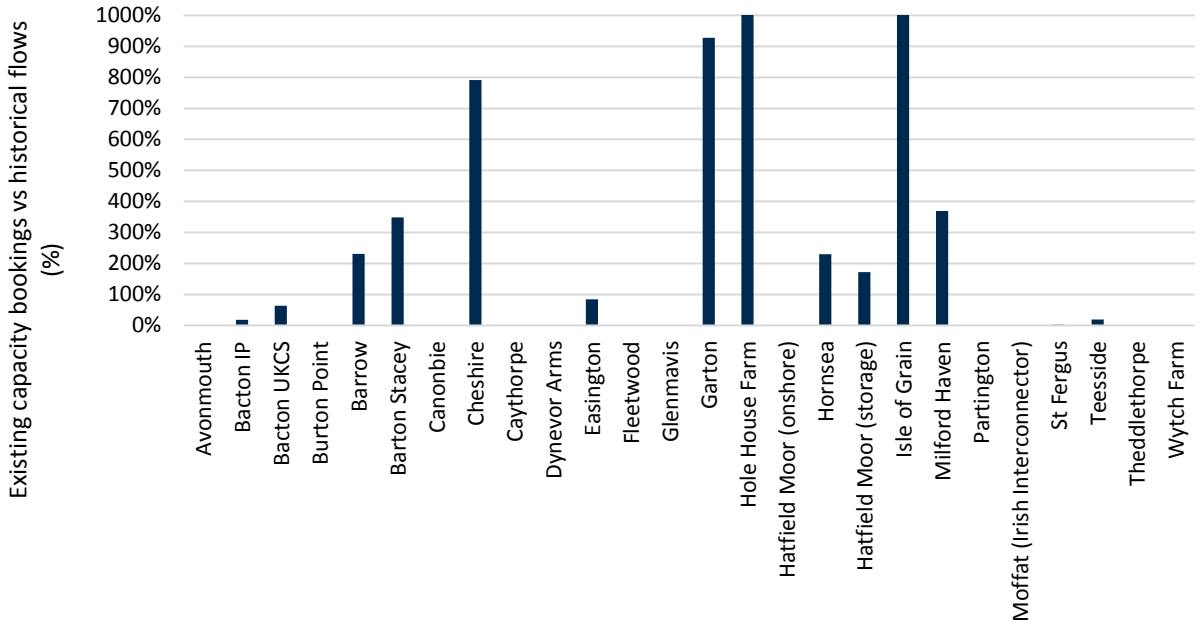
Overall, while simple analysis indicates that the gas supply curve is likely to be relatively elastic, the presence of significant variation in the wholesale gas price and in entry tariffs applicable to new contracts indicates that elements other than the price differential between new and existing contracts are likely to have a strong influence on the merit order curve of bidders. Although supply sources with new contracts are more likely to be price-setting due to their higher cost, supply sources with existing contracts would likely be price-setting in a significant number of periods. This would reduce the effect of bunching of new contracts at the bottom of the merit order and mitigate the magnitude of any wholesale price increase due to the tariff differential, moderating any adverse effect on new entry and consumer welfare.

4.3.2 Overbooking of entry capacity

One feature of the capacity allocation mechanism that may reduce negative impacts of tariff differentials on the prospects for new market entry and consumer welfare more generally is overbooking of entry capacity on the transmission network. Based on data on existing contracts and historical flows at entry points on the transmission system, which was provided to us by National Grid, we find that the weighted average overbooking ratio is 1.25 for 2021-2022.[17] This means that, closer to delivery time, shippers may not use all of the entry capacity booked. We also find that the extent of overbooking varies significantly by point, with some entry points with no existing bookings and others with a significant level of overbooking.

[17] Weighed by flows at each point. Excluding the Isle of Grain point (outlier), this ratio drops to 1.02.

Figure 12: Overbooking at transmission system entry points (2021-22)[18]



If existing capacity contracts at a given entry point belong to only one shipper, it is possible that this shipper may have the incentive and also the ability to maintain the price differential between new and existing contracts in the presence of overbooking by refusing to sell any surplus capacity to competitors. However, if there is more than one shipper with surplus capacity booking, economic theory suggests that the price differential between new and existing capacity bookings would not be maintained. Moreover, the price of that capacity is likely to fall close to zero as its marginal value to each shipper would be zero, and refusal to sell it to a new entrant at a low price would result in the other shipper transacting with the new entrant instead.

The fact that more than one shipper has booked capacity at different entry points suggests that there would be a degree of competition for the sale of existing capacity contracts, and new entrants may be able to access capacity for a price that is potentially lower than the price paid by the existing contract holders. Based on data on existing contracts, we find that several shippers have booked capacity at 80% of entry points with a degree of overbooking. The existence of competition among sellers is also confirmed by the weighted average Herfindahl - Hirschmann Index ('HHI') at points accounting for around 75% of total FCC under UNC678, calculated at 3,726. This level indicates that competition at such points is broadly equivalent to the level of competition on a market with 3 players with equal market shares.[19]

[18] The y-axis was truncated to be able to display the variability of overbooking ratios across entry points. For Holehouse farm, the ratio of bookings to historical flows is 33 and for Isle of Grain, the ratio of bookings to historical flows is 1,165.

[19] The HHI is a measure of market concentration. A HHI of 10,000 indicates a monopoly, a HHI of 5,000 is obtained with two players sharing the market equally, a HHI of 3,333 is obtained with three players sharing the market equally, and lower levels generally indicate higher lower market concentration and a more competitive market.

Overall, our findings indicate that, for a large number of entry points that are subject to overbooking of capacity, there is likely to be competition among sellers of capacity in the secondary market, which would be very favourable for the prospects of new entry and competition overall.[20]

[20] Our analysis effectively assumes that, subject to competition between existing capacity holders, existing capacity would always be used before new capacity, either by the original capacity holder or by a new entrant through a transaction in the secondary market. This may impact revenue recovery, and increase tariffs for new bookings contracted outside of the secondary market as new entrants may prefer to acquire existing capacity in the secondary market.

5 Potential options for reducing the capacity price differential

If action is considered to be necessary to mitigate any adverse impact of tariff differentials, a number of modifications to envisaged transmission charging arrangements could be made, which could reduce price differentials between new and existing entry contracts. We review a number of options for measures that could be taken, focussing on the economic aspects of those measures. All of them would also require a legal review to verify compliance with TAR NC and other relevant legal provisions.

Modifying the entry/exit split

One option is to modify the entry/exit split, which determines the proportion of total revenue requirements recovered on entry and exit points respectively. In the new transmission charging arrangements envisaged under UNC678, this split is 50%-50%, meaning that half of revenues are recovered on entry and the other half are recovered on exit. Reducing the entry share of total revenue recovery would lead to lower total revenues being recovered on entry. This would mean that existing contracts would account for a larger proportion of entry revenue recovery and the residual revenue recovered on other contracts would be lower, leading to lower capacity tariffs for new bookings. This would reduce the entry tariff differential between existing and new contracts.

It is likely that any increases in exit tariffs would be passed on to consumers since changes in exit tariffs are a common cost shock to any supplier that supplies customers connected to a given exit, and the supply market is competitive. Hence, overall consumer welfare would be influenced by the extent to which a reduction in entry tariffs to new capacity holders is likely to be passed into lower NBP prices, and whether this effect offsets the cost of higher exit tariffs.

Applying a revenue recovery charge to existing contracts

In the transmission charging arrangements envisaged under UNC678, the fact that existing contracts are no longer liable for a commodity charge leads to a revenue shortfall. The choice of the basis for the recovery of this shortfall has a significant impact on tariff differentials between existing and new contracts:[21]

1. Recovery on new contracts only: Under this option, existing contracts only pay their contracted capacity charge and the recovery of the revenue shortfall is entirely borne by new contracts. As discussed elsewhere in this report, this results in a tariff differential between new and existing contracts, whereby tariffs for new contracts are higher than tariffs for existing contracts (see Section 2.3);

[21] We do not discuss the type of charge through which revenue recovery occurs – capacity or commodity – because the choice of imposing a capacity or commodity charge does not significantly alter market outcomes and is likely to be driven by issues such as compliance with TAR NC. Implicitly, we assume that any revenue recovery would be achieved through a capacity-based charge, because charging arrangements envisaged under UNC678 do not include provisions for commodity charges.

2. Recovery on existing and new contracts: In this case, the recovery of the shortfall is shared between existing and new contracts. The fact that this amount is spread across a wider base results in lower tariffs for new contracts compared to option 1, and in increases in tariffs for existing contracts beyond the capacity rates already contracted. Although the tariff differential between new and existing contract decreases, it is not eliminated entirely. New contracts are still likely to be more expensive than existing contracts because the amount previously paid by existing contracts through commodity charges is now recovered on both new and existing contracts.
3. Recovery on existing contracts only: Under this option, the revenue shortfall is recovered through an additional revenue recovery charge on existing contracts, close to the level of commodity charges under current arrangements. In other words, a charge applicable to existing contracts only would be introduced to compensate for the absence of a commodity charge in the new regime. This option would increase total tariffs paid by existing contract holders to a level close to what they would pay if the commodity charge was not removed, while new contracts would not be paying towards the recovery of the revenue shortfall created by the removal of the commodity charge. This option is therefore the most effective at reducing the tariff differential between new and existing contracts.

Under these options, the decision to apply a revenue recovery charge on existing and/or new contracts involves a trade-off between:

- Ensuring that existing contracts are kept whole: imposing revenue recovery charges on new contracts only would avoid existing contracts paying a higher capacity charge than the contracted rate for capacity, although it must be noted that existing capacity holders would also be liable for a commodity charge under the current arrangements; and
- Reducing tariff differentials: imposing the revenue recovery charges on existing contracts would avoid new contracts paying a higher tariff than existing ones and would limit any tariff differential.

The choice of option is more likely to be influenced by legal considerations and considerations relating to practicability of implementation than economic considerations.

Repricing existing contracts

Finally, a more radical option to eliminate the tariff differential is to change the rates of existing contracts to new rates, determined under the new methodology, in effect cancelling the pricing terms of any existing contracts. This approach would eliminate any tariff differential between new and existing contracts associated with gas tariff reform.

The repricing of existing contracts could be accompanied by an option for existing capacity holders to hand the contract back if the new price is higher than the original price paid. This possibility would account for the fact that existing contract holders may rather return their booked capacity than pay the new higher price.

Allowing existing capacity holders to exit their contracts if the price of those contracts increases would mitigate the impact of the policy on existing contract holders to only a limited degree. Regardless of this option, repricing of existing contracts would constitute a retroactive change. Such change may result in reduced confidence in the regulatory framework related to gas transmission

charging, a greater perception of regulatory risk for market participants, and potentially negative consequences for future investment.

6 Conclusions

In the first years following the intended introduction of new gas transmission charging arrangements, we find that existing entry contracts amount to more than 50% of total FCC. If existing contracts are kept whole, shippers would pay the capacity charges agreed in their contracts. They would not be subject to a commodity charge or a capacity charge increase relating to revenue recovery. In transmission charging regimes relying on capacity charges such as those currently envisaged in UNC678, the absence of a commodity charge would result in existing contract holders paying significantly lower charges than new contract holders. We estimate that shippers with existing contracts are liable for tariffs between £0.06/MWh and £0.41/MWh lower than new capacity bookings under the CWD methodology and tariffs between £0.04/MWh and £0.41/MWh lower than new capacity bookings under the PS methodology.

In expectation, a regime that leads to higher costs for market participants who have not booked forward capacity creates a market distortion likely to reduce new entry to some extent and be detrimental to market competition. Additionally, because new contracts are further down in the wholesale merit order, they are more likely to be the price-setting supply source, and hence higher tariffs are more likely to be passed on in the wholesale price. Any increase in the wholesale price would increase the cost of gas for consumers and result in a reduction in consumer welfare.

However, we find that the impact of tariff differentials is likely to be limited for the following reasons.

- The fact that there is a degree of overbooking of entry capacity relative to expected demand means that there is likely to be a secondary market for capacity on the transmission network. Closer to real time, existing contract holders would have an incentive to sell excess capacity and new entrants may be able to purchase capacity at a tariff that is potentially lower than the tariff paid for existing contracts, depending on the level of competition at each entry point.[22] However, this dynamic would be moderated by existing capacity holders having a degree of market power and potentially holding on to some unused capacity or seeking to sell it at a price which is close to the price of new capacity.
- Our benchmarking analysis indicates that normal variation in the price of gas can create significant differences in wholesale cost of gas between different shippers. Also, tariff variation for new contracts is of a similar order of magnitude as the tariff variation across new and existing contracts. Both effects introduce random variation in the merit order that is likely to dominate any cost differential between new and existing contracts and limit the magnitude of the effects of the price differential between new and existing contracts on gas market dynamics.
- The tariff differential will fall away over time as the share of existing bookings in total flows falls and the extent of tariff under-recovery decreases. This will mean that the extent of any adverse

[22] Subject to competition between existing capacity holders, existing capacity may be used before new capacity, either by the original capacity holder or by a new entrant through a transaction in the secondary market. This may impact revenue recovery for the transmission system as a whole, and increase tariffs for new bookings contracted outside of the secondary market as new entrants may prefer to acquire existing capacity in the secondary market.

effects on competition, consumer welfare, and broader gas market dynamics, is also set to fall over time.

Any differential in the price of existing and new capacity contracts is a result of legal provisions, including those under TAR NC, combined with the nature of the current arrangements for recovering the cost of the gas transmission network. It does not have an economic justification and is not designed to incentivise any particular economic behaviour by gas market participants.

On the basis of the data available to us and our economic analysis, we consider that the likely effects of any such differential on consumer welfare and broader gas market dynamics are unlikely to be material or lasting. However, the tariff differential may have a noticeable impact on some network users in the short-term.

If measures to mitigate any adverse impact of tariff differentials were considered to be necessary, a number of options are available which achieve varying degrees of mitigation and may have wider implications for the gas market. The most radical way to deal with tariff differentials is to cancel the pricing terms of all existing contracts. While this would eliminate the differential, it is also likely to increase the perception of risk around the regulatory process, with potentially adverse consequences for the wider gas market. Reduction in the share of entry in revenue recovery would reduce the charge payable by new contracts, but would imply an increase in exit tariffs. Finally, introducing a revenue recovery charge on existing contracts would increase the total charge payable by existing contracts directly and can be applied to a varying degree depending on the extent to which elimination of a tariff differential between new and existing contracts is sought. Any measure would need to be discussed with legal advisors to ensure compliance with TAR NC and other applicable laws.