

# GAS TRANSMISSION CHARGING REVIEW ANALYSIS

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**A report for Energy UK**

11 June 2018

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# CONTENTS

Executive summary	4
1 Introduction	11
2 Models to be assessed	12
2.1 Status Quo Charging Model	12
2.2 CWD Approach	15
2.3 Summary of the two charging models	19
3 Decision making framework	20
3.1 Three sets of criteria for gas network tariffs	20
3.2 A common set of criteria for assessment	23
4 Qualitative assessment	31
4.1 Compliance	31
4.2 Cost reflectivity	35
4.3 Effective competition	39
4.4 Security of supply	43
4.5 Cost recovery	44
4.6 Effect of the charging model on end consumers	45
4.7 Possible improvements to CWD	46
5 Conclusions	48

## EXECUTIVE SUMMARY

### Context

Gas transmission charges have been the subject of significant recent debate. At the European level, Regulation 2017/460 was approved, establishing a network code on harmonised transmission tariff structures for gas (TAR NC) that leads to a number of requirements for change for Member States.

Ofgem launched the Gas Transmission Charging Review (GTCR) in 2013, published its policy position in 2014, confirmed the position in 2015 and updated it in February 2017.

Subsequently, National Grid National Transmission System (NTS) raised Uniform Network Code (UNC) Modification UNC 621, which aims to introduce a new gas transmission charging regime that is both consistent with European regulations and which, they argue, will also better satisfy a number of domestic tariff objectives.

Energy UK has engaged Frontier Economics and LCP to help them analyse how proposed changes to gas transmission charges could:

- create a cost or a benefit for the economy, and in particular whether new charges could result in any adverse consequences beyond those arising from a redistribution of allowed revenue recovery from charges;
- better satisfy the relevant objectives for the UNC in relation to charging; and
- better satisfy Ofgem's statutory duties.

### Charging models that we consider

Several different variants of UNC 621 have been proposed, most of which are based on the Capacity Weighted Distance (CWD) approach to setting reference prices.

Our main focus is to assess the CWD approach against the status quo charging model as the counterfactual. We assess the CWD approach that is Energy UK's interpretation of modification proposals and industry discussions to date. We do this qualitatively for two variants of the CWD approach: one that uses obligated capacity and one that uses forecast capacity to set tariffs.

While TAR NC describes the CWD methodology for setting reference prices for entry and exit tariffs, it does not require that this methodology is implemented. Indeed, in March 2018 Ofgem signalled to the UNC 621 workgroup that it would consider a reference price methodology other than CWD and that it would consider an entry:exit split other than 50:50.

Given this development, we also consider different design choices that could serve to avoid potential issues with the CWD based charging models.

The two charging models we assess are as follows:

- Status quo charging model (LRMC); and
- CWD approach.

The following table summarizes the main aspects of the status quo and CWD charging models.

**Figure 1 Charging models that we consider**

	Status quo Model	CWD Model*
Reference price method	LRMC	CWD
Entry / exit split	50/50	50/50
Complementary revenue recovery adjustments (TO charges)	Uniform commodity based charge	Uniform commodity based charge (capacity on IPs)
Floating reference prices	No, fixed	Yes, at all points
Storage discount on capacity prices	0%	50%
Storage (and IP) discount on complementary revenue recovery charges	100% (not IPs)	100% (not IPs)
Day ahead firm product reserve prices	Ref. Price * 0.67 at entry and Ref. Price at exit	Ref. Price
Within day firm product reserve prices	Ref. Price * 0 at entry and Ref. Price at exit	Ref. Price
Interruptible reserve price	0	Ref. Price

Source: Frontier

Note: \* With the CWD Model we consider two variants, one whereby obligated capacity is released and another whereby forecast capacity is released. With forecast capacity the expected complementary revenue recovery charge is small or even zero.

## Criteria for assessment

We develop criteria for assessing the charging models from the relevant objectives of the UNC, Ofgem's statutory duties and the requirements of the Third Energy Package, including TAR NC. We combine the three sets of criteria into four themes that we use for the assessment:

- Cost reflectivity;
- Effective competition;
- Security of supply; and
- Cost recovery.

In addition, the charging model must be compliant with TAR NC.

### Cost reflectivity

Network charges should reflect the forward looking marginal costs that users impose on the network through a change in their use. This is important to achieving an economically efficient outcome: if charges are cost reflective, users will internalise the network costs which they cause when making a decision about how to use the network. This will in turn ensure that overall value chain costs are optimised, and that customer interests are protected.

If there is an excess capacity in some locations as a result of a reduction in network use over time, then the marginal cost of using capacity may be close to or equal to

zero. If there is spare capacity everywhere and no demand growth is expected, the marginal cost of capacity everywhere may be zero. At this point, marginal cost based signals for capacity look very similar to postage stamp charges, i.e. uniform capacity charges throughout the network.

Efficient cost reflective charges may not recover all costs which have been incurred. Therefore, additional charges are required to recover costs. Such charges should have as an objective creating minimal changes in behaviour relative to a set of efficient charges. This implies that cost recovery charges should be structured in such a way as to target price-insensitive uses of the network, taking into account equity issues.<sup>1</sup>

### **Effective competition**

Here we focus on other potential effects from the approach to entry and exit pricing on the effectiveness of the competitive process itself. These typically relate to the impact that the regime has on:

- the number of different physical gas sources competing to serve demand;
- the ease with which shippers can enter and exit the market, and hence the liquidity of the NBP and the degree of competition on downstream markets; and
- the risk profile of shippers.

Different approaches to charging could result in impacts from:

- changes in availability of various sources of gas to compete at the NBP if certain approaches to pricing effectively exclude some sources of gas from the market;
- reductions in the volatility of charges, reducing risk for shippers which should represent a reduction in the barriers to entry to shipping; and
- increases in the level of potential NBP price volatility, increasing risk for shippers and representing a potential increase in barriers to entry.

### **Security of supply**

There is an overlap between the number of competing physical sources of gas and security of supply. If a particular approach to network pricing precludes (at some price levels) gas entering GB profitably through a particular route, then it will clearly have an impact on competition and expected NBP prices and, in the limit, it will also effect security of supply.

There may also be a security of supply effect in relation to domestic infrastructure, for example, if a particular pricing methodology resulted in high charges to gas storage sites at a level which jeopardised their future profitability.

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<sup>1</sup> For example, it may be seen as inequitable to target a disproportionately large share of cost recovery on a user or group of users simply because they are less likely to change behaviour. For example, a system that set higher cost recovery related exit charges for more efficient gas fired power stations (because they are less likely to change gas consumption patterns because they are always in merit) is likely to be seen as inequitable, even if such a charging regime were found to be economically more efficient.

**Cost recovery**

It is important that network companies can recover their allowed revenue. Here we consider the stability and predictability of its cash flows and the surety of revenue recovery.

**Other**

GEMA's duty to protect the interests of GB consumers could be interpreted as, all things equal, to minimise the cost to GB gas and power consumers. Therefore, we also assess the cost to GB gas and power consumers.

**Assessment****Compliance**

We take the view that the CWD Model has relatively low risk of non-compliance with TAR NC.

**Cost reflectivity**

In terms of cost reflectivity, the CWD Model appears to be worse than the status quo since it aims to allocate *historical costs* locationally and is therefore not a forward looking marginal cost based methodology.

Of the two CWD Model variants, obligated capacity would result in lower average reference prices than the forecast capacity variant (with complementary revenue recovery charges being correspondingly higher for the obligated capacity variant). If it is expected that spare capacity in Britain will be a major feature of the gas transmission network going forward, then marginal costs are likely to be low. This suggests that a methodology that results in lower reference prices is more efficient than a methodology that results in higher reference prices.

Under CWD some cost recovery shifts from a commodity to a capacity basis because CWD aims to allocate historical costs. A capacity charge means that shippers cannot pass on the entry charges directly into wholesale gas prices. This may distort flows if some shippers (e.g. those with higher cost supplies) no longer purchase entry capacity. The obligated capacity variant would reduce some of the potential distortions introduced by the CWD Model since it would move less cost recovery from commodity to capacity.

**Effective competition**

Much like the assessment of cost reflectivity, in terms of effective competition, the CWD Model appears to be worse than the status quo. Of the two CWD Model variants, obligated capacity would reduce some of the potential distortions introduced by the CWD Model since it would move less cost recovery from commodity to capacity.

**Security of supply**

The move away from cost reflective tariffs under the status quo to non-cost reflective charges under the CWD Model and the shift of revenue recovery from commodity to capacity charges is likely to increase the potential for distortions to the use of capacity compared to the status quo. As with the effect on competition

this could deter investment in new supply or lead to earlier closure of existing supply.

Under the CWD Model, storage would lose its current exemption from revenue recovery (since revenue recovery is shifted to capacity charges). This could inefficiently reduce the profitability of storage, delaying investment or bringing forward closure.

Finally, the increase in multipliers on short duration firm capacity and on interruptible capacity under the CWD Model prevents capacity prices falling to reflect short run marginal cost where there is spare capacity. This would tend to increase the likelihood of investment delay and accelerated closure of supply and storage.

### **Cost recovery**

Under the status quo charging model, volatile LRMC prices make complementary cost recovery charges unstable from year to year. The CWD Model may result in more stable prices and revenue recovery than the status quo. However, whether CWD prices are indeed more stable depends on the assumptions used to determine CWD prices. Of the two variants, obligated capacity is likely to result in more stable prices.

The move from fixed reference prices under the status quo to floating reference prices under the CWD Model would also tend to support stable tariffs.

Under the CWD Model, setting short term multipliers and the multiplier on interruptible capacity to 1.0 would also tend to support stable revenue recovery compared to having large discounts on short term firm capacity products and on interruptible capacity.

### **Effect on end consumers**

Whether a move to CWD or the improvements to CWD increase or decrease costs for gas consumers is an empirical question.

However, a move to CWD is likely to increase costs for electricity consumers. Currently, gas fired power plants are able to buy short-term exit capacity or pay the cheaper short haul charge, minimising capacity payments for gas transportation. Under the UNC 621 proposals, there is no short-term discount at entry or exit and hence gas fired power plants must incur the full capacity charge at exit. This would increase electricity prices through either the wholesale electricity price or the Capacity Market price, or a combination of both.

This effect could be reduced or avoided by continuing to allow the power sector discounts for short term capacity and for short haul capacity.

### **Possible areas of improvement to the CWD model**

The CWD model is not perfect and could potentially be improved in a number of areas and which would require further analysis. However, these additional changes have not been proposed as part of UNC Modification 621.

CWD could potentially be made more cost reflective by moving to a postage stamp model for capacity charges, with low multipliers on short term firm capacity



products and on interruptible capacity. Although postage stamp tariffs are not cost reflective by design they could effectively be cost reflective with increasing spare capacity on the GB network. In addition, low multipliers for certain products would allow the price of capacity to reflect marginal costs.

Moving in the direction of a 0:100 entry/exit split would allow lower reserve prices on entry and hence more cost reflective tariffs in the context of spare capacity, and it would reduce distortions by recovering revenue from load. However, no model with a 0:100 split has been put forward. Even with a 50:50 entry/exit split, low multipliers on short term firm capacity could allow cost reflective tariffs on entry.

Applying a 100% discount on entry and exit capacity charges at storage and exempting IPs from complementary revenue recovery charges would reduce the likelihood of making capacity uneconomic at storage and IPs, respectively, potentially improving effective competition and security of supply. Low multipliers on short term firm capacity products and on interruptible capacity would also allow storage and interconnectors largely to avoid capacity related cost recovery charges (CWD inherently includes an element of cost recovery in capacity charges) reducing the likelihood of inefficiently deterring storage use or investment, potentially improving effective competition and security of supply. However, exempting IPs from complementary revenue recovery charges would allow transit flows from the UKCS or LNG import terminals to flow to the continent without contributing to the cost of the GB gas network. This would increase the burden of cost recovery on GB gas consumers

These potential improvements to the CWD Model would have varying effects on revenue stability. A postage stamp approach to charging would likely result in more stable tariffs and certainty in tariff recovery from year to year than either the status quo or CWD Model. However, use of discounts for short term firm capacity and interruptible capacity would increase the ability of shippers to avoid paying capacity charges, tending to reduce the certainty of revenue recovery from year to year. Moving to recover a greater proportion of revenues from exit would reduce this problem.

## Conclusions

Overall, the qualitative assessment suggests that some aspects of the CWD Model would better meet the objectives of transmission charging than the status quo but other aspects would not.

The CWD Model appears to be more compliant with TAR NC than the status quo although CWD has some risks to compliance, e.g. around the multiplier on interruptible capacity.

However, the CWD Model appears worse than the status quo in terms of cost reflectivity and effective competition. Of the two CWD Model variants, the obligated capacity variant is likely to distort outcomes less than the forecast capacity variant because the obligated capacity variant shifts less cost recovery onto capacity.

The CWD Model may result in more stable prices and revenue recovery than the status quo. However, this depends on the assumptions used to determine CWD prices. The obligated capacity variant is likely to result in more stable prices than the forecast capacity variant. The move from fixed reference prices under the

status quo to floating reference prices under the CWD Model and setting short term multipliers and the multiplier on interruptible capacity to 1.0 would also tend to support stable tariffs.

Finally, the CWD Model would no longer provide a short-term discount at exit and hence gas fired power plants would incur the full capacity charge at exit under this model. This additional cost is likely to result in higher electricity prices which Ofgem could see as being detrimental to consumers.

The aspects of the CWD Model that appear worse than the status quo could potentially be improved although the potential improvements discussed in this report are not currently being considered as part of UNC Modification 621. The main areas for potential improvement centre on making tariffs more cost reflective and targeting cost recovery at less price sensitive users.

# 1 INTRODUCTION

Gas transmission charges have been the subject of significant recent debate.

Following intensive discussions at the European level and a number of iterations, Regulation 2017/460 was approved, establishing a network code on harmonised transmission tariff structures for gas (TAR NC). The establishment of this network code leads to a number of requirements for change for Member States.

Ofgem launched their Gas Transmission Charging Review in 2013, and in 2014 published a policy position on floating capacity charges and changing the arrangements for short term product pricing to reduce the discounts available.

Subsequently, National Grid National Transmission System (NTS) raised Uniform Network Code (UNC) Modification UNC 621, which aims to introduce a new gas transmission charging regime that is both consistent with European regulations and which, they argue, will also better satisfy a number of domestic tariff objectives.

Energy UK has engaged Frontier Economics and LCP to help them analyse how proposed changes to gas transmission charges could:

- create a cost or a benefit for the economy, and in particular whether new charges could result in any adverse consequences beyond those arising from a redistribution of allowed revenue recovery from charges;
- better satisfy the relevant objectives for the UNC in relation to charging; and
- better satisfy Ofgem's statutory duties.

In this report we describe our approach to the analysis and our conclusions as to the effects of the proposed changes to gas transmission charges. The report is structured as follows:

**Figure 2 Structure of the report**

No.	Section	Description
1	Introduction	Brief description of the context for the work and structure of the report.
2	Charging models	We describe the current gas transmission charges in GB and the charging models that we assess.
3	Assessment framework	We set out the criteria for assessing each of the charging models relative to the status quo.
4	Assessment	We describe our qualitative analysis of the charging models and the results of that analysis.
5	Conclusions	We draw conclusions as to the pros and cons of each charging model and the choice of preferred model.

Source: Frontier

## 2 MODELS TO BE ASSESSED

National Grid NTS raised UNC 621 to implement changes to the UNC in order to comply with European regulations and better satisfy a number of domestic tariff objectives.

Several different variants of UNC 621 have been proposed, most of which are based on the Capacity Weighted Distance (CWD) approach to setting reference prices. For example, two variants of CWD have been discussed, one of which sets tariffs using obligated capacity and one of which sets tariffs using forecast capacity. One variant of UNC 621 proposes a postage stamp model for capacity charges.

Our main focus is to assess the CWD approach against the status quo charging model as the counterfactual. We assess the CWD approach that is Energy UK's interpretation of modification proposals and industry discussions to date. We do this qualitatively for two variants of the CWD approach: one that uses obligated capacity and one that uses forecast capacity to set tariffs.

However, while TAR NC describes the CWD methodology for setting reference prices for entry and exit tariffs, it does not require that this methodology is implemented. Indeed, in March 2018 Ofgem signalled to the UNC 621 workgroup that it would consider a reference price methodology other than CWD and that it would consider an entry:exit split other than 50:50.

Given this development, we also consider different design choices that would introduce further changes to the status quo than CWD. Specifically, we qualitatively assess different design choices that could serve to avoid potential issues with the CWD based charging models.

In the remainder of this section we describe the salient aspects of the status quo gas transmission charging model in GB, and the CWD approach. The two charging models are as follows:

- Status quo charging model (LRMC); and
- CWD approach (we describe the generic CWD approach of which there are many variants).

In what follows, we focus on the NTS Transportation Owner (TO) charges. By comparison, the NTS System Operator (SO) charges are small and we therefore do not consider them as part of the assessment.

### 2.1 Status Quo Charging Model

#### 2.1.1 Introduction

The status quo transmission charging methodology is set out in the current version of the UNC.<sup>2</sup> Here we provide a simplified description of the charging model with the intention of drawing out concepts that are important for the assessment.

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<sup>2</sup> Uniform Network Code – Transportation Principal Document Section Y, Version 5.03 01 June 2017.

Broadly, 50% of the TO target revenue is recovered from entry charges and 50% from exit charges.<sup>3</sup> Entry capacity is procured through auctions which are subject to reserve prices. The amount of capacity made available through the auction is based on obligated capacity, i.e. the capacity that the TO is obliged to release. Booked exit capacity is procured at administered prices.

Reserve prices (p/kWh/day) in the entry capacity auctions are set relative to reference prices. The reference prices, and exit charges reflect the long run marginal cost (LRMC) of the gas transmission network.

A uniform TO commodity charge on entry flows is used where entry capacity auction revenues are forecast to be below the target revenue for entry. A uniform TO commodity charge on exit flows is used where exit capacity revenues are forecast to be below the target revenue for exit. Commodity charges are not applied to entry and exit points for storage facilities although they are applied to interconnector points.

## 2.1.2 Locational price signals

Locational signals in the reference prices are driven by estimates of LRMC, similarly to the way in which locational signals are derived for the electricity transmission network.<sup>4</sup>

National Grid uses a transport model to calculate the LRMC of transporting gas from each entry point to a reference node and from the reference node to each exit point. It then uses a tariff model to adjust the LRMCs to achieve expected revenue requirements at entry and exit.

The transport model is a linear program that first calculates the minimum flow distance (GWhkm) for a base set of entry and exit flows on the network that represent a peak demand and supply day. The supply is adjusted to ensure that supply and demand are in balance prior to determining the minimum flow distance on the network.<sup>5</sup>

The transport model then calculates the marginal change in flow distance for a small increment in gas supply at an entry point combined with a small increment in off-take at the reference node. It does this in turn for each entry point. The model then does the same for incremental offtake at each exit point combined with a small incremental injection at the reference node. Dividing the change in flow distance by the size of the incremental injection or offtake gives the marginal cost (in km) of injecting gas at each entry point and of off-taking gas at each exit point.

Depending on whether the incremental injection (or off-take) tends to reinforce or offset flows in each pipeline segment in the base set of flows, the marginal cost will

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<sup>3</sup> A number of adjustments may increase or decrease the precise amount of revenue recovered through entry and exit charges in any year. We do not describe these adjustments here since the important point is the broad proportion of revenue recovered through entry and exit charges.

<sup>4</sup> Indeed, in 2007 when the current regime was introduced, one of the key drivers was to harmonise the approach taken to setting charges for using the electricity and gas transmission systems.

<sup>5</sup> The way in which the pattern of entry and exit flows is set is done differently when calculating entry charges and exit charges. The important concept is that supply and demand are in balance.

either be positive or negative.<sup>6</sup> The marginal cost is then multiplied by an expansion constant which represents the cost of transmission required to transport 1GWh of gas over 1km.

A uniform adjustment upwards or downwards is made to the entry and exit marginal distances to meet expected revenue recovery targets at entry and exit. Finally, charges are converted to p/kWh/day.

An important concept in an LRMC based model is that capital costs are assumed to be variable. With the status quo charging model, the capital costs of investing in the network are avoided or incurred immediately on a continuous basis as modelled flows increase or decrease. This means no value is placed on spare capacity since in the model existing network investments can be reduced in size to match demand.

### 2.1.3 Reserve prices

At entry points the reference prices serve as reserve prices for auctions of annual capacity (and longer term products), quarterly capacity and monthly capacity. Exit prices are set directly using the model.

The reserve prices for short term capacity products at entry are based on discounts to the reference prices, as follows (seasonal factors are not used in GB):

- 33% discount from the annual reserve price for day ahead products;
- 100% discount from the annual reserve price for within day products (0 reserve price); and
- 100% discount from the annual reserve price for interruptible products (0 reserve price).

Since entry prices are set through auctions, it is possible that at congested entry points, capacity prices rise above the reference price. Conversely, at entry points with excess capacity, it may be possible to procure capacity at low or zero prices through short term capacity auctions.

In addition, interruptible products at exit are allocated through an auction with a 0 reserve price. We understand that some storage facilities make use of this potential discount at exit.

### 2.1.4 Rationale for review

A review of this charging model is being carried out after considering recent tariffs to be unstable and unpredictable.<sup>7</sup>

Furthermore, ongoing structural changes in the GB gas market and the requirement to adapt tariffs to be in line with European legislation have both led to

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<sup>6</sup> Here, for simplicity, we describe an increase in cost as being positive and a decrease in cost as being negative. The way the model is used, the marginal cost of exit is the inverse of the marginal cost of entry at a node.

<sup>7</sup> The Joint Office of Gas Transporters published sensitivity analysis in January 2017 of the current LRMC charging approach to changes to inputs to the charging model. The analysis showed that, depending on which inputs are changed, entry and exit charges could change by hundreds or even thousands of a percent. The study concluded that a wide range of changes to inputs could result in large changes to charges and that the sort of changes to the inputs assessed were not uncommon. See <https://www.gasgovernance.co.uk/ntscmf/subg1model>

calls to change the way charges are defined. In relation to structural changes, decreasing gas flowing on the NTS and excess capacity mean shippers prefer short-term capacity products at entry, given their cost discounts. This in turn increases the difference between allowed revenue and actual revenue recovery through entry capacity charges, leading to higher entry commodity charges.

## 2.2 CWD Approach

In the CWD approach we consider two variants, one where obligated capacity is used to calculate reference prices (CWD Model – obligated capacity variant) and one where forecast capacity is used to calculate reference prices (CWD Model – forecast capacity variant). This distinction affects the level of reference prices and the amount of revenue recovered through the capacity charge and commodity base revenue recovery charge.

Since obligated capacity is greater than forecast capacity, the obligated capacity variant has lower reference prices and greater revenue recovery through the commodity charge. If the forecast of capacity is unbiased, one might expect the revenue recovery charge to be close to zero under the forecast capacity variant of CWD.

### 2.2.1 Introduction

Here we define the charging model to assess the CWD approach to setting reference prices. We combine the CWD approach as described in the NC TAR with Ofgem's stated policy position on charges. We provide a simplified description of the charging model with the intention of drawing out concepts that are important for the assessment.

As with the status quo, booked entry capacity is procured through auctions which are subject to reserve prices. Booked exit capacity is procured at administered prices. Reserve prices in the entry capacity auctions are set relative to reference prices.

In 2013 Ofgem launched the Gas Transmission Charging Review (GTCR) with a call for evidence which served to analyse the current structure of gas transmission entry charges in GB. In 2014, Ofgem published its policy position. This policy position was then confirmed in 2015<sup>8</sup> and updated in February 2017.<sup>9</sup> The February 2017 update also extended Ofgem's policy position to cover exit charges. Two main changes to network charging were proposed in these documents:

- A move to fully-floating capacity charges for long-term capacity products, which will help to recover historical network costs. This mechanism will make all network users pay a price which will float up or down when NG under or over recovers the allowed revenues in the year the capacity is used. This will apply to interconnection points (IPs) and non IPs but would not be applied to storage.

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<sup>8</sup> Ofgem, Gas Transmission Charging Review: Confirmation of policy view and next steps. 13 November 2015.

<sup>9</sup> Ofgem, Open Letter: European Union Network Code on harmonised transmission tariff structures for gas (TAR NC) and the industry Gas Transmission Charging Review (GCR). 21 February 2017.



- Changes to short-term capacity products such that the reserve price discount on short-term capacity products will be less than 100% of the long-term capacity reserve price, i.e. avoiding zero reserve prices for short term products.

## 2.2.2 Locational price signals

The CWD approach to setting reference prices for tariffs is set out in the NC TAR (Art. 8). This approach calculates the proportion of entry costs to be recovered from each entry point and the proportion of exit costs to be recovered from each exit point.

The proportion of entry costs to be recovered from an entry point is the capacity of the entry point multiplied by the capacity weighted average distance to all exit points from that entry point, as a proportion of the sum of the entry capacity multiplied by the capacity weighted average distance to exit for all entry points. The proportion of exit costs to be recovered from an exit point is calculated in a similar way.

For each entry point, the approach calculates the exit capacity weighted average distance from each exit point to the entry point, considering only those feasible entry-exit flow paths. And, for each exit point, the approach calculates the entry capacity weighted average distance from each entry point to the exit point, again only for feasible paths. It is assumed that all possible combinations of entry – exit flow paths are feasible.

The CWD approach recovers all costs (whether incremental or historical) using the same proportions at each entry or exit point. The CWD approach therefore does not provide signals as to the short or long run marginal costs of providing capacity at different locations on the network. It is not cost reflective rather, it is a cost allocation approach.

## 2.2.3 Reserve prices

As with the status quo, the reference price sets the reserve price for annual capacity auctions.

NC TAR requires that multipliers for quarterly and monthly products cannot be less than 1.0. It allows more flexibility for daily and within day products, whose multipliers cannot be less than 1.0 unless justified, in which case they cannot be less than 0.

Ofgem has not elaborated on the multipliers on the reference price to use to calculate the reserve prices for short term and interruptible products, although it has set an expectation in its GTCR conclusions that discounts for short term products and interruptible discounts should be reduced. The various CWD proposals have a multiplier of 1.0, at least for the gas year beginning October 2019. Therefore, we assume that the multipliers for short term products will be set to the reference price, i.e. there are no discounts for short term products.

NC TAR requires that the reserve price for interruptible products is set on the basis of the probability of interruption or that ex-post compensation for interruptions is paid. With excess capacity, we assume that the probability of interruption is low.



This is reflected in the CWD proposals that apply a 10% discount for interruptible capacity at entry and exit. For the assessment, we describe the interruptible products as having a 0% discount to the reference price, which is similar to a 10% discount. The key point for the assessment is that under CWD the price of interruptible capacity would reflect the probability of interruption and would no longer be available at a zero reserve price.

NC TAR requires that a discount of at least 50% be applied to capacity based entry and exit tariffs at storage facilities. The CWD proposals apply a discount of either 50% or 86% on storage depending on the variant. For the purposes of assessment, we assume that a 50% discount is applied although we note that there is little or no difference in terms of the principles when assessing an approach with a 50% discount and an approach with an 86% discount.

Under the CWD charging model, storage facilities would no longer have the option of procuring entry and exit capacity effectively at a zero price, i.e. by buying capacity through auctions for interruptible capacity with a zero reserve price. (Note that a variant of UNC 621 introduced late in the day includes a 100% discount for off-peak exit capacity for storage). Furthermore, some of the revenue previously recovered through commodity charges, which storage is currently exempt from paying, would be recovered through capacity charges, which storage is only partially exempt from paying.

#### 2.2.4 Entry exit split

NC TAR requires that the CWD approach recovers 50% of costs from entry and 50% from exit, which is what we assume for this charging model.

However, we note that since the CWD approach itself is not required, any entry:exit split could be applied, even if the approach to setting reference prices followed the remainder of the CWD approach as described in NC TAR.

#### 2.2.5 Setting the reference price

Under the CWD approach to charging, as with the status quo, NG will be required to release obligated capacity to the market.

TAR NC specifies (Art. 8.2(e)) the CWD approach as determining reference prices by dividing the revenue to be recovered from an entry (or exit) point by the forecast capacity for that entry (or exit) point.

We consider two variants of the CWD charging model related to this calculation. Under one variant, the revenue to be recovered is divided by the obligated capacity (“CWD Model – obligated capacity”) that NG is required to release. Under a second variant, the revenue to be recovered is divided by the forecast capacity requirements (“CWD Model – forecast capacity”).

The choice between the obligated capacity and forecast capacity CWD Model variants affects the level of the reference prices. Since obligated capacity is greater than forecast capacity, the obligated capacity variant results in lower average reference prices than the forecast capacity variant. In turn, the obligated

capacity variant recovers a lower proportion of required revenues through capacity charges and a greater proportion through revenue recovery charges (see below).

## 2.2.6 Revenue recovery

Since obligated capacity exceeds the quantity of capacity used, setting reference prices on the basis of obligated capacity results in expected under-recovery of revenues at entry. However, where reference prices are set based on forecast capacity requirements, if the forecast is not systematically too high or too low, there would be no expected under or over-recovery of revenues at entry.

Revenue recovery at entry and at exit is assured by applying a complementary revenue recovery charge at entry and exit. This is a uniform commodity charge at entry and exit points other than IPs.

Since TAR NC prevents commodity charges on IPs, an equivalent revenue recovery capacity charge would be levied on entry and exit points at IPs. It is an empirical question as to whether a revenue recovery based capacity charge levied on IP entry and exit would be more or less distortive than levying no revenue recovery charge.

The uniform commodity based revenue recovery charge at non-IP entry points (which is only material on average for the obligated capacity variant) would increase the NBP price in the short term compared to not levying a uniform commodity based revenue recovery charge at entry.<sup>10</sup> Therefore, levying no revenue recovery charge at IP entry would distort flows on the interconnectors by encouraging imports. Whether levying the revenue recovery base capacity charge at IP entry removes this distortion is an empirical question. If capacity is booked short term then the capacity charge would effectively be commoditised and would remove the distortion. However, if the IPs could not pass through the capacity based charge, for example, if capacity was booked longer term, levying the revenue recovery based capacity charge on IPs at entry would not remove the distortion to short term flows. It may also accelerate the day when the interconnectors closed or delay the commissioning of new interconnectors.

Levying no revenue recovery charge at IP exit may not create a distortion. However, it could be seen as inequitable if it allowed transit flows from UKCS or from LNG imports to Europe to avoid network charges.<sup>11</sup> Conversely, levying the revenue recovery base capacity charge at IP exit may create distortions.

Finally, since storage is a price sensitive demand for network usage, to avoid distorting behaviour, the complementary revenue recovery charge would not be applied to storage. In our analysis, this applies only to the CWD Model – obligated capacity variant since under the CWD Model – forecast capacity variant the expected complementary revenue recovery charge is zero.

<sup>10</sup> Although the commodity charge will increase NBP prices, the obligated capacity variant still has a lower total combined cost than the forecast capacity variant for St Fergus. Therefore, the forecast capacity variant could lead to even higher NBP prices if St Fergus were marginal (or became marginal with the changes).

<sup>11</sup> If flows onto the GB system from the UKCS or LNG import terminals paid entry capacity charges they would contribute to the revenues of the network.

## 2.3 Summary of the two charging models

The following table summarizes the main aspects of the status quo and CWD charging models, described above.

**Figure 3 Charging models that we consider**

	Status quo Model	CWD Model*
Reference price method	LRMC	CWD
Entry / exit split	50/50	50/50
Complementary revenue recovery adjustments (TO charges)	Uniform commodity based charge	Uniform commodity based charge (capacity on IPs)
Floating reference prices	No, fixed	Yes, at all points
Storage discount on capacity prices	0%	50%
Storage (and IP) discount on complementary revenue recovery charges	100% (not IPs)	100% (not IPs)
Day ahead firm product reserve prices	Ref. Price * 0.67 at entry and Ref. Price at exit	Ref. Price
Within day firm product reserve prices	Ref. Price * 0 at entry and Ref. Price at exit	Ref. Price
Interruptible reserve price	0	Ref. Price

Source: Frontier

Note: \* With the CWD Model we consider two variants, one whereby obligated capacity is released and another whereby forecast capacity is released. With forecast capacity the expected complementary revenue recovery charge is small or even zero.

## 3 DECISION MAKING FRAMEWORK

We need to develop criteria for assessing the charging models described above. Our assessment needs to conform with that which would be undertaken by Ofgem. This means that the criteria for assessment need to align with both the relevant objectives of the UNC *and* Ofgem's statutory duties.

Below, we first list the three different sets of criteria (counting the EC regulations as a single set) which are relevant to an assessment, and then combine them into a single set of criteria, organised into themes, to use for the assessment.

### 3.1 Three sets of criteria for gas network tariffs

Three sets of criteria are relevant for the assessment of any modification to the UNC:

- The objectives of the UNC;
- Ofgem's statutory duties; and
- The requirements of the Third Energy Package (including the Network Code on gas transmission tariffs (NC TAR)<sup>12</sup>.

We note that Ofgem's statutory duties require it to comply with decisions under the Third Energy Package. The Third Package established the European Network Codes for gas and therefore we would interpret the Network Codes as falling within the auspices of the Third Package.

#### 3.1.1 Objectives of the UNC

In deciding whether to recommend a proposed modification for implementation, the UNC Panel must consider whether the proposed modification better facilitates achievement of the UNC's Relevant Objectives.

The Relevant Objectives in question are set out in paragraph 5 of Standard Special Condition A5 of the UNC:<sup>13</sup>

- (a) that compliance with the charging methodology results in charges which reflect the costs incurred by the licensee in its transportation business.
- (aa)(ii) the reserve price is set at a level:
  - (I) best calculated to promote efficiency and avoid undue preference in the supply of transportation services; and
  - (II) best calculated to promote competition between gas suppliers and between gas shippers.
- (b) that, so far as is consistent with sub-paragraph (a), the charging methodology properly takes account of developments in the transportation business.

<sup>12</sup> Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas.

<sup>13</sup> UNC, Standard Special Condition A5: Obligations as Regard Charging Methodology, para 5.

- (c) that, so far as is consistent with sub-paragraphs (a) and (b), compliance with the charging methodology facilitates effective competition between gas shippers and between gas suppliers.
- (e) compliance with the Regulation and any relevant legally binding decisions of the European Commission and/or the Agency for the Co-operation of Energy Regulators.

### 3.1.2 Ofgem's statutory duties

In determining whether or not a proposed modification should be implemented, the Gas and Electricity Markets Authority (GEMA) would consider the UNC Relevant Objectives and assess the proposed modification against its statutory duties.<sup>14</sup>

The most relevant of these are as follows:<sup>15</sup>

- The principal objective is to protect the interests as a whole of existing and future consumers, including in relation to the reduction of greenhouse gases, the security of supply of gas and the Authority undertaking its functions as set out in Art. 40 of the Gas Directive, namely (we list only the most relevant):<sup>16</sup>
  - Promoting a competitive, secure and environmentally sustainable internal market for gas;
  - Developing competitive and properly functioning regional markets;
  - Eliminating restrictions on trade in natural gas between Member States;
  - Ensuring that system operators and system users are granted appropriate incentives in both the short and long term to increase efficiencies in system performance and foster market integration; and
  - Ensuring that customers benefit through the efficient functioning of their national market, promoting effective competition and helping to ensure consumer protection.
- To meet the principal objective wherever appropriate by promoting effective competition between persons engaged in the shipping, transportation or supply of gas.
- The need to secure that:
  - So far as it is economical to meet them, all reasonable demands in Great Britain for gas are met;
  - Licence holders are able to finance their activities; and
  - Contribute to the achievement of sustainable development.
- Carry out its functions in a manner best calculated to:

<sup>14</sup> GEMA is Ofgem's governing body and is the designated regulatory authority for Britain. We refer to GEMA and Ofgem interchangeably in this report.

<sup>15</sup> <https://www.ofgem.gov.uk/publications-and-updates/powers-and-duties-gema>

<sup>16</sup> DIRECTIVE 2009/73/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC. Article 40.

- promote efficiency and economy on the part of those licensed under the relevant Act and the efficient use of gas; and
- secure a diverse and viable long-term energy supply, having regard to the effect on the environment.
- In carrying out these functions, the Authority must also have regard to the principles under which regulatory activities should be transparent, accountable, proportionate, consistent and targeted only at cases in which action is needed and any other principles that appear to it to represent the best regulatory practice.
- Carry out its functions in the manner that it considers is best calculated to implement or ensure compliance with any decision of the Agency or the European Commission under the Third Package.

### 3.1.3 Requirements from NC TAR

NC TAR sets out the requirements for the network tariff methodology. As the first step in the assessment of each charging methodology, we consider whether it complies with the detailed rules of the network code. Here we consider the higher level or over-arching criteria to be applied to the charging methodologies, which we apply as the second step in the assessment.

The tariff network code establishes these high level requirements as follows:<sup>17</sup>

- The reference price methodology shall comply with Article 13 of Regulation (EC) No 715/2009 and with the following requirements:
  - enabling network users to reproduce the calculation of reference prices and their accurate forecast;
  - taking into account the actual costs incurred for the provision of transmission services considering the level of complexity of the transmission network;
  - ensuring non-discrimination and prevent undue cross-subsidisation including by taking into account the cost allocation assessments set out in Article 5;
  - ensuring that significant volume risk related particularly to transports across an entry-exit system is not assigned to final customers within that entry-exit system;
  - ensuring that the resulting reference prices do not distort cross-border trade.

Article 13 of Regulation 715/2009 requires that (we include only the most relevant parts of the Article):

- Tariffs, or the methodologies used to calculate them, shall:
  - be transparent;

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<sup>17</sup> Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas. See Article 7.

- take into account the need for system integrity and its improvement;
- reflect the actual costs incurred, insofar as such costs correspond to those of an efficient and structurally comparable network operator and are transparent, whilst including an appropriate return on investments, and, where appropriate, taking account of the benchmarking of tariffs by the regulatory authorities; and
- be applied in a non-discriminatory manner.
- Member States may decide that tariffs may also be determined through market-based arrangements, such as auctions.
- Tariffs, or the methodologies used to calculate them, shall:
  - facilitate efficient gas trade and competition;
  - avoid cross-subsidies between network users; and
  - provide incentives for investment and maintaining or creating interoperability for transmission networks.
- Tariffs for network users shall:
  - be non-discriminatory; and
  - be set separately for every entry point into or exit point out of the transmission system.
- Tariffs for network access shall neither restrict market liquidity nor distort trade across borders of different transmission systems.

## 3.2 A common set of criteria for assessment

The three sets of criteria discussed above differ in the detail but are broadly aligned in terms of themes. In this section we set out a single set of criteria to use for the assessment of each charging model based on the key themes we have identified in the above criteria:

- Cost reflectivity;
- Effective competition;
- Security of supply; and
- Cost recovery.

We also briefly touch on other objectives that we do not propose to include as criteria for our assessment.

In addition, the charging model must be compliant with the specific requirements of TAR NC. Therefore, we also assess each model for compliance, highlighting where there are risks to compliance, for example, where there is ambiguity as to how to interpret TAR NC.

### 3.2.1 Cost reflectivity

Network charges should be cost reflective. By this, we mean that they should reflect the (forward looking) costs that users impose on the network through a change in their use. This is important to achieving an economically efficient outcome: if charges are cost reflective, users will internalise the network costs



which they cause when making a decision about how to use the network. This will in turn ensure that overall value chain costs are optimised, and that customer interests are protected.

The fact that it is forward looking costs which should be reflected is critically important. If there is a historical cost or forward looking cost that cannot be changed in any way going forward by different use of the network by shippers, there is no value in terms of economic efficiency in sending a signal to shippers about that cost. Cost reflectivity should therefore only relate to new costs which would be created in the future or existing costs which can be avoided in the future as a result of a particular change in use.

This argument points to network prices being set according to forward looking marginal costs, as these are the costs incurred or avoided by incremental use. It has been argued that marginal cost related signals may be less relevant for some networks than others. This is not supported by economic theory, which suggests it is always relevant to send marginal cost related prices.

However, it is important that marginal cost as a concept is interpreted correctly. If there is an excess capacity in some locations as a result of a reduction in network use over time, then the marginal cost of using capacity may be close to or equal to zero. If there is spare capacity everywhere and no demand growth is expected, the marginal cost of capacity everywhere may be zero. At this point, marginal cost based signals for capacity look very similar to postage stamp charges for capacity, i.e. uniform charges throughout the network.

We would argue that economic efficiency and therefore cost reflectivity are fundamental to protecting the interests of consumers today and in the future.

Below we list the objectives from the UNC, GEMA's statutory duties and EC Regulations that align with this criterion.

## UNC

- Compliance with the charging methodology results in charges which reflect the costs incurred by the licensee in its transportation business.
- The reserve price is set at a level best calculated to promote efficiency.
- The charging methodology properly takes account of developments in the transportation business.

We interpret the first of these objectives as relating to forward looking costs rather than historical costs even though the wording may appear to imply that it relates to costs that have been incurred in the past.

## GEMA's statutory duties

- The principal objective is to protect the interests as a whole of existing and future consumers.
- Ensuring that customers benefit through the efficient functioning of their national market, [...] and helping to ensure consumer protection.
- Promote efficiency and economy on the part of those licensed under the relevant Act and the efficient use of gas.



We take the view that the best way to protect consumers, both current and future, is to set network charges that are economically efficient.

### European network code

- The reference price methodology shall take into account the actual costs incurred for the provision of transmission services.

As with the first of the UNC objectives listed above, we interpret this objective as relating to forward looking costs rather than historical costs.

## 3.2.2 Effective competition

In some senses, the effectiveness of competition in delivering efficient outcomes depends on the cost reflectivity of entry and exit charges. If competition takes place against the background of non-cost reflective charges, it is unlikely to result in efficient outcomes.

There is no added value to repeating the efficiency criteria. Therefore, here we focus on other potential effects from the approach to entry and exit pricing on the effectiveness of the competitive process itself. These typically relate to the impact that the regime has on:

- the number of different physical gas sources competing to serve demand;
- the ease with which shippers can enter and exit the market, and hence the liquidity of the NBP and the degree of competition on downstream markets; and
- the risk profile of shippers.

Different approaches to charging could result in impacts from:

- changes in availability of various sources of gas to compete at the NBP if certain approaches to pricing effectively exclude some sources of gas from the market;
- reductions in the volatility of charges (and hence reduction in risk for shippers) which should represent a reduction in the barriers to entry to shipping; and
- increases in the level of potential NBP price volatility, increasing risk for shippers and representing a potential increase in barriers to entry.

We would argue that transparency and simplicity in charges are also related to ensuring effective competition. Transparency is important in order that shippers can understand how particular decisions (taken by themselves and by others) are likely to impact on charges. Simplicity is important as complexity can result in both difficulties in predicting charges and unintended consequences of the charges.

If a shipper could not understand, replicate and forecast network charges, it may be difficult for the shipper to take decisions that will be affected by future tariffs or the shipper may take decisions inconsistent with future charging outcomes. This could potentially reduce the effectiveness of competition.

Below we list the objectives from the UNC, GEMA's statutory duties and EC Regulations that align with this criterion.

## UNC

- The reserve price is set at a level best calculated to [...] avoid undue preference in the supply of transportation services.
- The reserve price is set at a level best calculated to promote competition between gas suppliers and between gas shippers.
- Compliance with the charging methodology facilitates effective competition between gas shippers and between gas suppliers.

## GEMA's statutory duties

- Promoting a competitive [...] internal market for gas.
- Developing competitive and properly functioning regional markets.
- Eliminating restrictions on trade in natural gas between Member States.
- Ensuring that system operators and system users are granted appropriate incentives in both the short and long term to [...] foster market integration.
- Ensuring that customers benefit through [...] promoting effective competition.
- To meet the principal objective [i.e. protect consumers] wherever appropriate by promoting effective competition between persons engaged in the shipping, transportation or supply of gas.
- Have regard to the principles under which regulatory activities should be transparent, [...], proportionate, [and] consistent.

## European network code

- The reference price methodology shall enabling network users to reproduce the calculation of reference prices and their accurate forecast.
- Ensuring non-discrimination and prevent undue cross-subsidisation.
- Ensuring that significant volume risk related particularly to transports across an entry-exit system is not assigned to final customers within that entry-exit system.
- Ensuring that the resulting reference prices do not distort cross-border trade.
- Tariffs, or the methodologies used to calculate them, shall:
  - be transparent;
  - be applied in a non-discriminatory manner;
  - facilitate efficient gas trade and competition; and
  - avoid cross-subsidies between network users.
- Tariffs for network users shall be non-discriminatory.
- Tariffs for network access shall neither restrict market liquidity nor distort trade across borders of different transmission systems.

### 3.2.3 Security of supply

There is an overlap between the number of competing physical sources of gas and security of supply. If a particular approach to network pricing precludes (at some price levels) gas entering GB profitably through a particular route, then it will clearly have an impact on competition and expected NBP prices.

In the limit, it will also have an impact on security of supply. This is particularly the case if there are inflexibilities in the upstream supply chain, as may be the case for LNG. For example, if LNG supplies are made less economic as a result of a particular methodology, this may result in a diversion of cargoes to other markets. If GB were then to suffer a shortfall of gas, the ease with which these cargoes could be diverted back would depend on the terms of the new supply contracts. It may be that the diversion back to GB could only occur with a time lag, which could result in a security of supply problem in the meantime.

There may also be a security of supply impact in relation to domestic infrastructure. For example, if a particular methodology resulted in high charges to gas storage sites at a level which jeopardised their future profitability, it could result in their premature closure. This would clearly weaken GB's security of supply position.

#### UNC

The UNC does not have criteria explicitly related to security of supply in the context of charging although arguably security of supply falls within the umbrella of economic efficiency. However, the UNC more broadly aims to assure system security and the UNC's Relevant Objectives refer to European legislation that has objectives related to security of supply.

#### GEMA's duties

GEMA's principal objective is to protect the interests as a whole of existing and future consumers, including in relation [...] the security of supply of gas.

Other duties of GEMA include:

- Promoting a [...] secure [...] internal market for gas.
- So far as it is economical to meet them, all reasonable demands in Great Britain for gas are met.
- Secure a diverse and viable long-term energy supply.

GEMA's duties include security of supply but also meeting demand for gas not at any cost, only so far as it is economical.

#### European gas network code

- Take into account the need for system integrity and its improvement.
- Provide incentives for investment and maintaining or creating interoperability for transmission networks.

The gas network code has objectives that reflect security of supply, with an underlying theme of network integration.

### 3.2.4 Cost recovery

It is important that network companies can recover their allowed revenue. It is also clear that efficient cost reflective charges, as defined above, may not recover all costs which have been incurred. Therefore, additional charges are required to recover costs.

It is typically argued that such charges should have as an objective creating minimal changes in behaviour relative to a set of efficient charges.<sup>18</sup> This is because, as previously established, there is no efficiency related reason to target historical costs or forward looking costs that cannot be changed at a particular set of users. By definition, they cannot be “un-incurred” and so there is no point in targeting them at a certain set of users as to do so will change behaviour in a way which reduces efficiency.

This implies that cost recovery charges should be structured in such a way as to target price-insensitive uses of the network. Equity considerations usually further constrain the way in which cost recovery charges are structured.

In assessing the charging models, we address the above issues when considering cost reflectivity since they relate to efficiency concerns. An additional issue for National Grid related to cost recovery is the stability and predictability of its cash flows and the surety of revenue recovery. We consider these latter issues when considering cost recovery.

#### UNC

- Compliance with the charging methodology results in charges which reflect the costs incurred by the licensee in its transportation business.

We take the view that this objective from the UNC means network charges should recover allowed revenues for gas transportation, in addition to implying cost reflective charges, as described above.

#### GEMA

- Licence holders are able to finance their activities.

This objective implies that gas network charges are set so as to recover allowed network revenues.

#### European gas network code

- Taking into account the actual costs incurred for the provision of transmission services.

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<sup>18</sup> For example, Ofgem implies this in its letter dated 4 August 2017 launching the Targeted Charging Review in electricity. It says “Forward-looking’ network charges are designed to incentivise the efficient use of the network, and are designed to reflect network users’ impact on network costs, including current and future investment costs. Residual charges are ‘top up’ charges set to ensure that the network’s efficient costs, as determined through price controls, can be covered, after other charges have been levied. [...] How network users respond to the residual charges can affect the development and use of the energy system. This can happen if the residual charges distort the incentives provided by the forward-looking charges or encourage other behaviour to reduce exposure to charges, which could increase overall system costs.”

- Reflect the actual costs incurred, insofar as such costs correspond to those of an efficient and structurally comparable network operator and are transparent, whilst including an appropriate return on investments, and, where appropriate, taking account of the benchmarking of tariffs by the regulatory authorities.

We take the view that these objectives from the gas network code mean network charges should recover allowed revenues for gas transportation, in addition to implying cost reflective charges, as described above.

### 3.2.5 Other

Other objectives that fall under GEMA's duties or in the gas network code relate to environmental sustainability. While clearly important, we take the view that objectives related to environmental sustainability *per se* would not help to differentiate between the different charging models.

To the extent using gas efficiently helps to achieve environmental sustainability, this would be captured within the criteria of cost reflectivity.

In addition, GEMA's duty to protect the interests of GB consumers could be interpreted as, all things equal, minimise the cost to GB gas and power consumers. Both the gas sector and power sector are relevant when considering the cost to consumers since both sectors fall within the auspices of Ofgem and the cost of gas, including transportation charges, is a potential driver of power sector prices. The contribution of flows that exit GB to the continent to the recovery of GB network costs is also relevant since a greater contribution from flows to the continent implies a lower contribution from GB consumers (directly or indirectly).

This point does not fall neatly within any of the four criteria set out above. Therefore, we assess the cost to GB gas and power consumers separately.

### 3.2.6 Summary of criteria for assessment

We have arranged the criteria that Ofgem will need to follow in assessing the charging models into four themes or categories, as listed below.

**Figure 4** Criteria for assessment

Theme or category	Description
Cost reflectivity	<p>We focus on the extent to which entry and exit charges reflect the costs that users impose on the system:</p> <ul style="list-style-type: none"> <li data-bbox="566 427 1337 495">□ Do charges reflect forward looking marginal costs (either long run or short run)?</li> <li data-bbox="566 510 1337 577">□ Do charges reflect spare capacity and capacity constraints at entry and exit points?</li> <li data-bbox="566 593 1337 689">□ Do charges aimed at cost recovery minimise distortions to behaviour relative to the behaviour due to marginal cost based charges.</li> </ul> <p>Charges that reflect the costs imposed by users, promote economic efficiency and thereby help to protect consumers in the short and long run.</p>
Effective competition	<p>We focus on the effect of charging on the ability to compete effectively:</p> <ul style="list-style-type: none"> <li data-bbox="566 891 1337 958">□ Do charges restrict the number of competing physical gas sources by excluding some sources from competing at NBP?</li> <li data-bbox="566 974 1337 1070">□ Does the volatility of charges affect the ease of entry/exit, and hence liquidity of NBP and the strength of competition downstream?</li> <li data-bbox="566 1086 1337 1153">□ Do charges affect the volatility of NBP prices and the ease of entry/exit?</li> </ul>
Security of supply	<p>We focus on the extent to which entry and exit charges affect the physical supply of gas to the GB market, including from storage:</p> <ul style="list-style-type: none"> <li data-bbox="566 1256 1337 1323">□ Do charges affect the ability of gas to enter the GB market via a particular route, including LNG?</li> <li data-bbox="566 1339 1337 1435">□ Do charges affect the future profitability of gas storage facilities in GB to an extent that they may close or future investment is deterred?</li> </ul>
Cost recovery	<p>We focus on the extent to which entry and exit charges affect the risk to the recovery of allowed transportation costs:</p> <ul style="list-style-type: none"> <li data-bbox="566 1541 1337 1637">□ Do charges affect the uncertainty and variability of cash flows to the network, in the context of declining gas volumes and spare capacity?</li> <li data-bbox="566 1653 1337 1700">□ Are some shippers able to avoid revenue recovery?</li> </ul>

Source: Frontier

## 4 QUALITATIVE ASSESSMENT

In this section we set out a qualitative assessment of the CWD Model with the obligated capacity variant and the forecast capacity variant. We also highlight how certain aspects of the CWD Model potentially could be improved to better meet the criteria set out in the previous section.

For each criteria we provide a summary of the key points from the assessment before going through the assessment for that criteria in detail. We go through the detail in full only for the CWD Model with obligated capacity. For the CWD Model with forecast capacity we describe only differences to the assessment of the CWD Model with obligated capacity.

In addition to the four sets of criteria that we described above, the charging models must comply with the detailed rules set out in NC TAR. Therefore, we include compliance with NC TAR as an additional assessment criteria, which we assess first.

Finally, in considering consumer protection, Ofgem will consider the effect on end consumers of any change to the gas charging model. While the best form of consumer protection in the short and long run is likely to be to adopt economically efficient charges, all things being equal Ofgem will prefer a charging model that results in lower costs to end consumers over one that results in higher costs. Therefore, we comment on the effect of the CWD charging model on the contribution of exit flows at IUK to cost recovery of the GB grid (since that affects the costs borne by the end consumer). And, as a final step in the assessment we qualitatively consider the effect of the charging model on end consumers in both the gas and power markets.

### 4.1 Compliance

TAR NC establishes a number of design requirements for the way in which gas network tariffs are set. The following table summarises the compliance assessment for the CWD charging model. Below the table we describe the main requirements of TAR NC in more detail and the extent to which the CWD model complies.

**Figure 5 Summary of compliance assessment**

Design elements	Assessment
Reference price method	<ul style="list-style-type: none"> <li>Complementary revenue recovery – small risk that capacity charge on IPs seen as discriminatory.</li> </ul>
Entry / exit split	
Complementary revenue recovery adjustments (TO charges)	<ul style="list-style-type: none"> <li>Risk for multipliers for interruptible products since TAR NC requires these to be defined based on the probability of interruption.</li> </ul>
Floating reference prices	
Storage discount on capacity prices	
Storage (and IP) discount on complementary revenue recovery charges	
Day ahead and within day firm product reserve prices	
Interruptible reserve price	

Source: Frontier

Our overall assessment is that the CWD Model has relatively low risk of non-compliance with TAR NC.

### Form of transmission tariffs

TAR NC requires (Art 4.3) that regulated revenue related to the provision of gas transmission shall be recovered by capacity-based transmission tariffs. However, it allows for a part of the regulated revenue to be recovered through commodity based charges in the following two cases:

- A flow-based charged for the purpose of recovering costs associated with gas flows (e.g. compressor costs); and
- A complementary revenue recovery charge for the purpose of managing revenue under or over recovery and that, importantly, cannot be applied at interconnection points.

TAR NC also requires that, where a price cap regime is not applied, tariffs should be set to recover transmission revenues. However, where a price cap is applied or a fixed payable price is applied, no revenue reconciliation is allowed.

The CWD Model would apply a floating reference price and therefore a revenue recovery charge would be allowed.

We see no risk to compliance with the form (i.e. capacity v. commodity) of transmission tariffs. The CWD Model would apply capacity charges at entry and exit, and only apply a commodity based charge for complementary revenue recovery at non-IPs. The complementary revenue recovery charge would be applied at entry and exit at non-IPs, targeting the 50:50 entry/exit split. A capacity based revenue recovery charge would be applied to entry and exit for IPs under the CWD Model.



## Reference price method and entry/exit split

In order to achieve cost-reflective charges TAR NC requires member states to define a reference price methodology that will be used to compute the reference price<sup>19</sup>.

The reference price methodology must satisfy a number of criteria (Art 7), as follows:

- Enable users to replicate price calculations;
- Take into account the actual costs incurred in the provision of transmission services;
- Ensure non-discrimination and avoid cross-subsidisation; and
- Not distort cross-border trade.

The regulation also specifies that the same reference price methodology should be used for all entry and exit points in an entry-exit system with only one active TSO.

TAR NC describes the Capacity Weighted Distance (CWD) reference price methodology (Art 8), although it does not require that this methodology must be implemented. We describe the CWD approach in section 2.2, above, and do not repeat that description here. If the CWD methodology is not used, CWD should be used as the counterfactual methodology to assess the methodology that is used.

We see no risk of non-compliance for the CWD Model with either the obligated capacity or forecast capacity variants. Both approaches intend to follow the CWD methodology set out in TAR NC and therefore would comply with TAR NC.

Applying the complementary revenue recovery charge in the form of a capacity charge on IPs might be seen as discriminatory or applying different rules to different entry and exit points in the same system. However, we would argue that excluding IPs from the complementary revenue recovery charge would be more distortive, favouring cross border flows over flows at non-IP entry points. We therefore take the view that the CWD Model complies in this area.

Finally, the 50:50 entry/exit split of the CWD Model is in line with the CWD methodology described in the regulation and therefore is also compliant.

Here we note that an alternative entry/exit split may also be compliant – TAR NC requires a 50:50 entry/exit split if CWD is applied but appears to be silent on the split if CWD is not applied. Indeed it may even be possible to argue that a charging methodology that follows CWD with the exception of the entry/exit split is not CWD and therefore is compliant. The interpretation of TAR NC in this area is unclear and therefore applying an entry/exit split other than 50:50 would carry some risk of non-compliance.

In addition, the TAR NC clearly allows for other approaches to setting charges other than CWD. Any cost reflective approach to setting charges would be permitted. For example, if the scenario in GB were to hold of spare entry capacity

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<sup>19</sup> The reference price is the price for a capacity product with duration of one year used to set capacity-based transmission tariffs.

and falling demand this would imply low cost reflective charges. In this context a postage stamp charge could be seen as cost reflective at entry. However, we note that there may not necessarily be widespread spare capacity at exit given the possible development of new CCGTs to replace coal plant.

### Discount for storage, LNG terminals and infrastructure that avoids isolation of a Member State

TAR NC requires (Art. 9) that a discount of at least 50% be applied to capacity-based transmission tariffs at entry and exit to storage facilities.

Additionally, the regulation allows a discount to capacity-based transmission tariffs at entry and exit for LNG terminals and infrastructure that avoids the isolation of a Member State.

The CWD Model applies a 50% discount on capacity prices for entry and exit at storage facilities, no discount for entry points at LNG terminals and no discount for exit to the pipeline to Ireland (which arguably avoids the isolation of a Member State). This complies with TAR NC.

Here we note that TAR NC permits a 100% discount on capacity prices for entry and exit at storage facilities. Indeed, some of the UNC 621 alternatives propose an 86% discount on capacity prices for entry and exit at storage facilities. In assessing the cost reflectivity of tariffs, we consider whether an 86% is more or less cost reflective than a 50% discount.

### Multipliers for short term products and interruptible capacity

TAR NC (Art. 13) requires that multipliers, which relate the reserve prices for short term capacity product auctions to the reference price, shall be defined such that:

- For quarterly and monthly products, the multiplier shall be between 1 and 1.5; and
- For daily and within day products, the multiplier shall be no less than 1 and no more than 3, unless a clear justification is made for the multiplier to fall between 0 and above 3.<sup>20</sup>

For interruptible products, TAR NC (Art. 16) establishes that reserve prices for standard capacity products for interruptible capacity shall be calculated by multiplying the reserve price for the equivalent firm product by the probability of interruption, computed *ex-ante*, or *ex-post* for interconnection points where there was no interruption of capacity due to physical congestion in the preceding gas year.

The CWD Model proposes to set the multipliers at entry and exit for all short term firm products and for interruptible capacity to 1.0. For short term firm products, this is consistent with the lower bound of the allowed range for multipliers established by the regulation. However, a multiplier of 1.0 at entry and exit for interruptible products implicitly assumes a 0% probability of interruption. There is the risk that

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<sup>20</sup> By April 2023 the maximum level of multipliers for daily and within-day capacity products shall be no more than 1.5 if by April 2021 ACER issues a corresponding recommendation.

this does not comply with TAR NC given that the probability of interruption is not used to calculate the multiplier.

## 4.2 Cost reflectivity

In this section we assess the CWD charging model against the criteria of cost reflectivity. Here we are looking to see whether the tariffs set under the charging model reflect the (forward looking) costs that users impose on the network through a change in their use.

The following table summarises the assessment of cost reflectivity for the CWD charging model relative to the status quo model. Below the table we assess each feature of the CWD Model and discuss possible design changes that would be more cost reflective.

**Figure 6 Summary of assessment of cost reflectivity**

Design element	Assessment
Reference price method	<ul style="list-style-type: none"> <li>Move away from cost-reflective tariffs based on forward looking costs may be less efficient.</li> </ul>
Entry / exit split	<ul style="list-style-type: none"> <li>Some of the basis of cost recovery moves from commodity to capacity, since CWD is inherently about cost allocation, not cost reflectivity. This increases the risk of distortions to use of capacity. This effect is potentially worse for the forecast capacity variant.</li> </ul>
Complementary revenue recovery adjustments (TO charges)	
Floating reference prices	
Storage discount on capacity prices	<ul style="list-style-type: none"> <li>Shift to floating reference prices prevents reference prices (that recover costs) being set on a reduced charging basis.</li> </ul>
Storage (and IP) discount on complementary revenue recovery charges	<ul style="list-style-type: none"> <li>Storage loses exemption from 100% of revenue recovery (since some revenue recovery is shifted to capacity), reducing efficiency of its use.</li> </ul>
Day ahead and within day firm product reserve prices	<ul style="list-style-type: none"> <li>Increase in multipliers for short term firm capacity and interruptible capacity creates risk of distortions to use of capacity.</li> </ul>
Interruptible reserve price	

Source: Frontier

In terms of cost reflectivity, the CWD Model appears to be worse than the status quo. **Of the two CWD Model variants, obligated capacity would reduce some of the potential distortions introduced by the CWD Model since it would move less cost recovery from commodity to capacity.** Here we refer to the design of CWD *per se* which is about allocating costs and therefore inherently includes an element of cost recovery in the capacity charges, i.e. we are not referring to the complementary revenue recovery charge.

### Reference price methodology

CWD is not a marginal cost based methodology since its focus is allocating *historical costs* locationally. Empirically, CWD may result in tariffs that are in some

way close to marginal costs. However, the chances of it deviating from a reasonable estimate of a “stable” marginal cost is non-trivial. If it does so, economic theory suggests it will result in inefficient outcomes relative to the status quo. Efficient prices could still result at entry points for which scarcity results in auction clearing prices above the CWD reference price.

Compared to the status quo, CWD implies a move away from cost reflective tariffs. Even if the LRMC approach to setting the reference price were no longer cost reflective in a region with excess capacity, zero reserve prices for short term products allow tariffs to reflect the short run marginal cost of capacity. The CWD approach envisages no discount on reserve prices for short term and interruptible capacity products.

The obligated capacity variant of the CWD Model results in lower average reference prices than the forecast capacity variant (with complementary revenue recovery charges being correspondingly higher for the obligated capacity variant). **If it is expected that spare capacity in Britain will be a major feature of the gas transmission network going forward, then marginal costs are likely to be low. This suggests that a methodology that results in lower reference prices is more efficient than a methodology that results in higher reference prices.** Given expected falling gas demand this could be a realistic scenario for the British transmission network.

### Entry / exit split

The CWD Model has no change relative to the status quo.

With spare capacity on the system, the marginal cost of transportation is very low or even zero, and the objective of tariff setting becomes one of recovering revenues in the way that minimises distortions to behaviour (relative to the behaviour with the set of tariffs that reflect marginal costs).

### Complementary revenue recovery

Under the status quo, the LRMC approach recovers costs in line with the cost reflective tariffs. Under the CWD variants, all forecast costs are allocated to capacity charges. However, with the forecast capacity variant, if the forecast is correct, the complementary revenue recovery charge would be zero, in which case capacity charges would recover all costs. A forecast error would lead to some commodity complementary revenue recovery charge (or payment). Furthermore, under the obligated capacity variant, the complementary revenue recovery charge would be positive and so a commodity complementary revenue recovery charge would be applied at all times.

This means that under CWD some cost recovery shifts from a commodity to a capacity basis. A capacity charge means that shippers cannot pass on the entry charges directly into wholesale gas prices. This may distort flows if some shippers (e.g. those with higher cost supplies) no longer purchase entry capacity.

Levying the complementary revenue recovery charge / payment on a commodity basis potentially reduces distortions compared to capacity charges that are not

cost reflective, since a uniform commodity charge can be passed directly through to the wholesale price of gas.

However, a revenue recovery commodity charge is not permitted at IPs and therefore the CWD Model proposes a complementary revenue recovery charge / payment levied on a capacity basis for IPs. This different treatment for IPs creates a potential distortion, which is likely to be greater with the obligated capacity variant of the CWD Model than the forecast capacity variant, since the revenue recovery charge is expected to be higher with the obligated capacity variant.

### Floating reference prices

If a large amount of capacity is sold under long-term contracts, under fixed tariffs, changes to costs must be recovered over a smaller entry charging base. If costs are increasing, this pushes reference prices (TAR NC does not permit revenue recovery charges with a fixed tariff) above the level they would be under a floating tariff regime. If costs are decreasing, this reduces reference prices below the level they would be under a floating tariff regime. Either way, a change to costs could lead to non-cost-reflective capacity charges, increasing the risk of distortions to flows.

Therefore, the shift to floating prices should improve cost-reflectivity since this allows for revenue recovery over a larger charging base and through the use of a commodity charge (or payment).

We note that the treatment of existing contracts with fixed capacity prices has a similar effect to fixed tariffs described above in that the remaining revenue has to be recovered from a smaller volume of capacity, i.e. net of existing contract volumes and revenues.

### Storage discount on capacity prices

Under the status quo, although storage faces LRMC based charges at entry and exit, storage facilities are able to procure exit capacity at low prices in summer in the form of interruptible capacity with a zero reserve price. Therefore, in effect, storage faces a 100% discount on exit and LRMC based charges on entry. Storage is also currently exempt from the complementary revenue recovery charge.

There is an economic rationale for storage to be exempt from non-cost-reflective charges since it is likely to be a price sensitive entry and exit point because its use depends on the achieved price difference for injections and withdrawals.

Under the CWD Model storage no longer faces cost reflective charges, and is only exempt from 50% of CWD charges, which in part relate to historical costs. This is therefore likely to lead to a reduction in the efficient use of storage facilities relative to the status quo. The obligated capacity variant results in lower capacity charges on average and therefore is likely to lead to fewer distortions at storage than the forecast capacity variant.

An improvement on the CWD Model would be to have a greater discount on capacity related charges for storage, which is allowed by TAR NC. This would reduce the incidence of non-cost reflective charges. A number of UNC 621 alternatives propose an 86% discount on capacity related charges for storage

which goes some way toward this and are therefore likely to be less distortive than the alternatives with a 50% discount.

### Storage and IP discount in complementary revenue recovery charges

Under the status quo, storage receives a 100% discount at entry and exit on complementary revenue recovery charges, which are levied on a commodity basis. IPs do not receive a discount.

Under the CWD Model, storage is exempted from the complementary revenue recovery charge, which means no change from the status quo. As noted above, with the CWD Model, storage would pay some cost recovery whereas under the status quo it does not. **Storage pays more cost recovery under the forecast capacity variant than under the obligated capacity variant.**

Under the CWD Model, IPs would pay a revenue recovery charge as they do under the status quo. However, the charge under the CWD Model would be on a capacity rather than commodity basis. **It is an empirical question as to whether levying the revenue recovery charge on IPs in the form of a capacity charge is more or less distortive than levying no revenue recovery charge in IPs.** At entry, levying no revenue recovery charge on IPs may over-encourage their use relative to entry terminals. However, a capacity charge may not be able to be passed through to the market price, potentially reducing profitability of the interconnector. At exit, levying no revenue recovery charge on IPs is likely to be less distortive than levying the capacity based revenue recovery charge. However, this could allow transit flows from the UKCS or LNG imports via the GB network to the continent to avoid network charges. This may be seen as inequitable and detrimental to GB consumers since they would need to pay for a greater proportion of the costs of the GB gas network.

### Short term firm product reserve prices

Under the status quo, quarterly and monthly product prices have a multiplier of 1.0 at entry. Day ahead firm and within day firm product prices have a multiplier of 0.67 and 0 at entry. All four firm product prices have a multiplier of 1.0 at exit.

The CWD Model retains multipliers of 1.0 for quarterly and monthly product prices at entry and for exit products. However, the CWD Model increases multipliers for day ahead firm and within day firm product prices to 1.0. This reduces the efficiency with which capacity can be used since it may sometimes result in reserve prices for entry that exceed the forward looking cost of the capacity. In other words sometimes capacity won't be used when it would have been economically efficient to do so. A zero reserve price would ensure maximum utilisation of fixed infrastructure in the short-term.

An improvement to the CWD Model would be to set lower reserve prices for short term products to allow capacity prices to fall to reflect the short run forward looking cost. For example, an improvement over the CWD Model would be to retain the status quo short term multipliers of 0.67 and 0 on daily and within day firm capacity at entry.



A lower reserve price would reduce the revenue recovered through capacity auctions and require a higher complementary revenue recovery charge, which is a commodity charge under the CWD Model (except at IPs). This has the effect of shifting non-cost-reflective revenue recovery from capacity to commodity, which would reduce distortions.

### Interruptible reserve price

The status quo charging model applies a 0 multiplier for interruptible capacity at entry and exit.

The CWD Model applies a multiplier of 1.0 for interruptible capacity at both entry and exit. Setting the reserve price for interruptible capacity to the same level as firm capacity implies a zero probability of interruption. As a result there is an increased risk of capacity inefficiently being withheld from the market compared to the status quo.

Similar to daily and within day firm product prices, an improvement to the CWD Model would be to set lower reserve prices for interruptible products to allow capacity prices to fall to reflect the short run forward looking cost. Applying a multiplier of 0 to interruptible capacity at entry and exit would therefore be an improvement over the CWD Model. However, this may be non-compliant since with excess capacity the probability of interruption is clearly not 100%.

## 4.3 Effective competition

Cost reflectivity is closely related to effective competition in that if tariffs are cost reflective then competition is able to take place on its merits without distortions. However, it does not add to the assessment to repeat the criteria of cost reflectivity here.

Beyond the impact of cost reflectivity on effective competition, two other potential areas to consider related to effective competition are concentration of the market and the number of supply sources serving demand, as described in section 3.

The following table summarises the assessment of effective competition for the CWD Model relative to the status quo model. Below the table we assess each feature of the CWD Model and, as above, we also discuss possible improvements to the CWD Model.

**Figure 7 Summary of assessment of effective competition**

Design element	Assessment
Reference price method	<ul style="list-style-type: none"> <li>Move away from cost-reflective tariffs based on forward looking costs and shift in basis of cost recovery from commodity to capacity increases potential for distortions in investment and closure decisions due to reduced profitability that is unrelated to cost reflectivity.</li> </ul>
Entry / exit split	
Complementary revenue recovery adjustments (TO charges)	
Floating reference prices	<ul style="list-style-type: none"> <li>But, if the CWD Model resulted in more stable tariffs, this could reduce the risks of distortions. In particular, the forecast capacity variant has the potential to result in more volatile tariffs than the status quo.</li> </ul>
Storage discount on capacity prices	
Storage (and IP) discount on complementary revenue recovery charges	<ul style="list-style-type: none"> <li>Shift to floating prices increases price risk for shippers.</li> <li>Storage loses exemption from some revenue recovery reducing its profitability.</li> <li>Increase in multipliers on short-term firm and interruptible capacity may inefficiently limit supply from some sources.</li> </ul>
Day ahead and within day firm product reserve prices	
Interruptible reserve price	

Source: Frontier

Much like the assessment of cost reflectivity, in terms of effective competition, the CWD Model appears to be worse than the status quo. Of the two CWD Model variants, obligated capacity would reduce some of the potential distortions introduced by the CWD Model since it would move less cost recovery from commodity to capacity.

### Reference price methodology

There is a risk that with the CWD Model, which inherently includes revenue recovery, entry charges for some supply routes are sufficiently high so as to inefficiently deter those supplies. Furthermore, there would be no zero reserve prices for short term and interruptible products to mitigate this effect. For IPs and some entry points (where the supply has multiple markets into which it can flow) deterrence might imply frequent short term decisions to send supplies to another market, reducing competition in Britain. For other points, where the supply is “captive” to an entry point, deterrence might not imply any change in supplies in the short term, but in the long term might result in the premature closure of the supply source or delayed entry.

In addition there is the risk that entry and exit charges to storage facilities are sufficiently high so as to inefficiently deter investment or cause premature closure, since storage facilities only see a discount of 50% on capacity prices and not 100% as in the status quo. Again, there would be no zero reserve prices for short term and interruptible products to mitigate this effect.

If tariffs under the CWD Model were more stable than under the current LRMC approach, this would potentially offset the two negative effects of the CWD Model described above. The LRMC model sets charges which will depend on flow



direction, which will therefore be (at least in theory) more unstable than the CWD model, which is an allocation of cost proportionate to capacity distance. However, the stability of the CWD Model tariffs will depend on inputs to the CWD tariff calculations, e.g. if forecast capacity use varied from year to year, tariffs would also vary. **Overall, the CWD model is likely to be more stable than LRMC.**

**The obligated capacity CWD Model variant appears to perform better than the forecast capacity variant across all three potential issues discussed.** The obligated capacity variant would result in capacity charges on average being lower than with the forecast capacity variant. This implies that the above two possible issues with capacity prices being sufficiently high so as to deter some supplies and to deter storage investment / cause closure would be less of a concern with the obligated capacity variant. However, whether there would be any concern of capacity charges deterring supplies and use or investment in storage remains an empirical question. **In addition, the obligated capacity CWD Model variant is likely to perform better than the forecast capacity variant with regard to stability because the level of obligated capacity does not vary significantly from year to year.**

### Entry / exit split

The CWD Model retains the 50:50 entry/exit split as in the status quo, and therefore in this respect there would be no change to effective competition.

### Complementary revenue recovery

Under the status quo with LRMC, capacity charges are aimed at being cost reflective with revenue recovery through a uniform commodity charge.

**With the CWD Model, there is a risk that shifting some cost recovery from a commodity basis to a capacity basis inefficiently deters supplies along some routes, and reduces the profitability of storage (since the discount is less than 100%) leading to deferred investment or closure.** However, the complementary revenue recovery charge will be lower under the forecast capacity variant than under the obligated capacity variant. Therefore, there would be fewer concerns about the complementary revenue recovery charge *per se* under the forecast capacity variant than under the obligated capacity variant. This, of course, comes at the expense of the forecast capacity variant recovering more costs through the capacity charge than the obligated capacity variant. There is also the issue that applying the complementary revenue recovery charge to IPs in the form of a capacity charge could reduce interconnector profitability leading to premature closure.

### Floating reference prices

The move from the status quo of fixed reference prices to floating reference prices under the CWD Model creates uncertainty as to the future level of charges. This may increase the risk of future investments, potentially deterring investments in new storage and supply routes. Therefore, all things being equal the CWD Model could result in a greater market concentration than the status quo.

That said, TAR NC appears to require that floating reference prices be used in order to allow complementary revenue recovery charges to be applied. Therefore, an approach with fixed reference prices would need to recover all costs through capacity charges, which we do not consider to be an improvement over the CWD Model.

### Storage discount on capacity prices

Under the status quo charging model, storage receives no discount on capacity charges and faces no cost complementary revenue recovery charges and, in practice, procures interruptible capacity at exit to avoid some capacity charges.

Under the CWD Model, storage would be exempt from 50% of capacity charges. This means storage would face at least some element of cost recovery charges since these are inherent in the capacity charges under CWD. In addition, storage could not procure interruptible exit capacity at a zero price to avoid some of the capacity charge. **This combination may inefficiently reduce the profitability of storage. On the margin this could lead to later entry and accelerated exit of storage.**

An improvement to the CWD Model would be to allow storage a greater than 50% exemption on capacity charges.

### Storage and IP discount in complementary revenue recovery charges

The CWD Model would imply a change relative to the status quo. Storage would continue to be exempt from revenue recovery charges. IPs would continue to pay the charge but in the form of a capacity charge in place of a commodity charge.

Whether replacing commodity based revenue recovery charges by capacity based charges on IPs is beneficial or not is an empirical question, as discussed above. As noted above, at exit levying no revenue recovery charge on IPs is likely to be less distortive than levying the capacity based revenue recovery charge. Even though this would not distort IP revenues, it may be seen as inequitable and cause competition concerns on the continent if it allowed transit flows from the UKCS or LNG imports via the GB network to the continent to avoid network charges. However, this would not cause competition concerns in GB.

### Short term firm product reserve prices

The increase under the CWD Model in multipliers for daily firm product prices at entry from 0.67 to 1.0 and for within day firm product prices at entry from 0 to 1.0 could inefficiently deter supplies along some routes and reduce the profitability of storage. The effect of the higher multipliers for daily and within day firm capacity products is exacerbated because the CWD Model moves to apply non-cost reflective charges as the reference price – with higher multipliers non-cost reflective charges cannot be avoided.

Conversely, the CWD Model could reduce the variability of charges (depending on the assumptions made as to the forecast capacity available), potentially reducing risks for shippers, and encouraging entry.

In both respects the CWD Model with the obligated capacity variant would be preferred to the forecast capacity variant. The obligated capacity variant would recover fewer costs through capacity charges and tariffs would be more stable.

An improvement to the CWD Model would be to retain the status quo multipliers on short term entry firm capacity. This would help to avoid potentially inefficiently deterring supplies along routes with excess capacity / low short run marginal costs of capacity.

### Interruptible reserve price

Under the CWD Model, interruptible capacity is priced at the same level as firm capacity, implying a zero probability of interruption. As a result there is an increased risk compared to the status quo of capacity being inefficiently withheld from the market. This could inefficiently deter supplies along some routes and reduce the profitability of storage.

An improvement to the CWD Model would be to retain the status quo multiplier on interruptible capacity at entry and exit. This would help to avoid potentially inefficiently deterring supplies along routes with excess capacity / low short run marginal costs of capacity.

## 4.4 Security of supply

**As described above, a pricing approach could reduce the availability of different supply sources if it effectively and inefficiently excluded some sources of gas from the market. To the extent that the pricing approach reduces the number of available supply sources, this could cause security of supply issues.** Here we note the possible consequences for security of supply of the CWD Model and how it might be improved to reduce this risk.

The main effect on security of supply is similar to that for effective competition. The difference with security of supply is that we do not consider volatility to be a relevant factor.

**Figure 8 Summary of assessment of security of supply**

Design element	Assessment
Reference price method	<ul style="list-style-type: none"> <li>▪ Move away from cost-reflective tariffs based on forward looking costs and shift in basis of cost recovery from commodity to capacity increases potential for distortions in investment decisions related to gas flows towards Britain.</li> <li>▪ Storage lose exemption from revenue recovery reducing its profitability.</li> <li>▪ Increase in multipliers on short-term and interruptible capacity may inefficiently limit supply from some sources.</li> </ul>
Entry / exit split	
Complementary revenue recovery adjustments (TO charges) [and SO charge]	
Floating reference prices	
Storage discount on capacity prices	
Storage (and IP) discount on complementary revenue recovery charges	
Day ahead and within day firm product reserve prices	
Interruptible reserve price	

Source: Frontier

The move away from cost reflective tariffs under the status quo to non-cost reflective charges under the CWD Model and the shift of revenue recovery from commodity to capacity charges is likely to increase the potential for distortions to the use of capacity compared to the status quo. As with the effect on competition this could deter investment in new supply or lead to earlier closure of existing supply.

Under the CWD Model, storage would lose its current exemption from revenue recovery (since revenue recovery is shifted to capacity charges). This could inefficiently reduce the profitability of storage, delaying investment or bringing forward closure.

Finally, the increase in multipliers on short duration firm capacity and on interruptible capacity under the CWD Model prevents capacity prices falling to reflect short run marginal cost where there is spare capacity. This would tend to increase the likelihood of investment delay and accelerated closure of supply and storage.

As with the assessment of effective competition, applying a greater than 50% discount on capacity charges at storage is less likely to inefficiently deter investment in or accelerate closure of storage facilities, when there is spare capacity on the network. A further improvement to the CWD Model would be to retain the status quo multipliers on short term and interruptible capacity at entry and exit. This would help to avoid inefficiently deterring investment in or accelerating closure of supply along routes with excess capacity / low short run marginal costs of capacity.

## 4.5 Cost recovery

Security in the ability of National Grid to recover its allowed revenues for the transmission grid is principally affected by the choice of reference price methodology.

**Figure 9 Summary of assessment of cost recovery**

	<b>CWD Model</b>
Reference price method	<ul style="list-style-type: none"> <li>■ CWD tariffs recover historical costs, but whether they are likely to result in more stable tariffs and certain revenue recovery from year to year depends on assumptions. Obligated capacity variant is likely to be more stable than forecast capacity.</li> </ul>
Entry / exit split	
Complementary revenue recovery adjustments (TO charges) [and SO charge]	<ul style="list-style-type: none"> <li>■ Short-term multipliers of 1.0 can reduce efficiency with which network is utilised but they remove the ability for shippers to avoid paying revenue recovery.</li> </ul>
Floating reference prices	
Storage discount on capacity prices	
Storage (and IP) discount on complementary revenue recovery charges	<ul style="list-style-type: none"> <li>■ Move to floating prices is positive because it reduces the risk of revenue recovery being focused on a subset of users.</li> </ul>
Day ahead and within day firm product reserve prices	
Interruptible reserve price	

Source: Frontier

Under the status quo charging model, volatile LPMC prices make complementary cost recovery charges unstable from year to year.

The CWD Model may result in more stable prices and revenue recovery than the status quo. However, whether CWD prices are indeed more stable depends on the assumptions used to determine CWD prices. In particular, with the forecast capacity variant prices could be unstable at a given entry or exit point if the forecast of capacity usage at that point varied from year to year. In this respect the obligated capacity variant is likely to result in more stable prices since the level of obligated capacity is unlikely to vary significantly from year to year.

The move from fixed reference prices under the status quo to floating reference prices under the CWD Model would also tend to support stable tariffs. This is because floating reference prices reduce the risk of revenue recovery being focussed on a subset of users.

Under the CWD Model, short term multipliers and the multiplier on interruptible capacity are set to 1.0. This would tend to support stable revenue recovery compared to having large discounts on short term firm capacity products and on interruptible capacity.

However, the use of discounts for short term firm capacity and interruptible capacity suggested as improving cost reflectivity, effective competition and security of supply would increase the ability of shippers to avoid paying capacity charges. This would tend to reduce the certainty of revenue recovery from year to year.

In addition, a move to not apply complementary revenue recovery charges to IPs at exit might be correct from an economic efficiency perspective (if forward looking costs are zero). Issues of equity could then be addressed via some form of inter-TSO transfer mechanism. In the absence of such a mechanism, however, some sort of adjustment to the “ideal” set of charges so that such a flow bears some cost recovery might be reasonable, though would have to be set against the potential distortive impacts. The issue is that any capacity charge on exit at the IP would be borne by the IP, potentially leading to premature closure.

## 4.6 Effect of the charging model on end consumers

A change to gas transportation charges will affect end consumers in the gas market through a combination of the effect on wholesale prices and the effect on exit tariffs, including the choice between commodity and capacity charges at exit. Very broadly speaking, to the extent that a change to transportation charges shifts charges from entry to exit, there will tend to be an offsetting effect on wholesale prices – wholesale prices will tend to fall. Whether wholesale prices change to offset precisely the change in transportation charges is an empirical question, related to how transportation charges affect the costs of the marginal gas supply, whether capacity charges are able to be passed through into wholesale prices etc.

In addition, a change to gas transportation charges could affect electricity prices through a change to gas wholesale prices and exit charges. Any changes that affect the cost of gas to the power sector will have material effects on the cost of power and the resultant cost to consumers. The gas transportation exit tariffs

imposed are incurred by power plants that then need to recover the costs in the power market. How they do this determines how consumers are affected.

Currently, gas fired power plants are able to buy short-term exit capacity or pay the cheaper short haul charge, minimising capacity payments for gas transportation. Under the UNC 621 proposals, there is no short-term discount at entry or exit and hence gas fired power plants must incur the full capacity charge at exit. These costs could feed through to the electricity market in different ways:

- Marginal gas fired power plants buying short-term capacity could include the additional cost in their SRMC of generation, as it is a cost associated with short-term operation. This would then feed through into the wholesale power price when a gas fired plant is on the margin, ultimately being paid by consumers.
- Gas fired power plants buying long-term capacity could include the capacity costs in their fixed costs and increase their bids into the electricity Capacity Market. The impact of this is uncertain as it is highly sensitive to which type of plant is on the margin in the auction.

The conclusion is that the move to the CWD Model is likely to increase exit charges seen by power generation since they will no longer be able to buy short-term exit capacity at a discount to the reserve price, which will increase electricity prices through either the wholesale electricity price or the Capacity Market price, or a combination of both.

This effect could be reduced or avoided by continuing to allow the power sector discounts for short term capacity and for short haul capacity.

## 4.7 Possible improvements to CWD

The CWD approach to charging is not better than the status quo in all areas. In the previous sections we have identified some potential improvements to CWD. Here we explore other potential improvements. We note that these potential improvements have not been proposed as variants of UNC Modification 621.

### Cost reflectivity

Postage stamp prices might be an improvement on CWD. Although postage stamp prices are not explicitly a marginal cost based methodology, the likely scenario of spare capacity on the gas transmission network going forward suggests that a postage stamp methodology that removes all locational differences could be an efficient way to set tariffs. In a scenario in which spare capacity is a more permanent feature of the gas transmission system, postage stamp prices, if combined with zero reserve prices for short term products, are likely to be no worse than the status quo model in relation to cost reflectivity regarding the reference price methodology.

Similarly, moving in the direction of a 0:100 entry/exit split might be an improvement as this would mean zero reserve prices at entry points, which would better reflect the marginal cost of entry with spare capacity. In addition, since users of entry capacity are likely to be more elastic than users of exit capacity, recovering allowed revenues from exit would tend to create fewer distortions than recovery at entry. However none of the proposed UNC 621 variants suggests this approach.



If they did, consideration would need to be given to the effect of existing capacity contracts which have a fixed capacity price.

A further improvement might be not to levy the complementary revenue recovery charge on IPs because they may not be able to recover capacity related charges from the market. However, at entry levying no charge on IPs is likely to introduce a distortion. While levying no complementary revenue recovery charge on IPs at exit might not introduce a distortion but it may be seen as inequitable since it could potentially allow transit flows from the UKCS and LNG imports to the continent to avoid GB grid charges (particularly if there was a move in the direction of a 0:100 entry exit split).

Lower multipliers for short term capacity and interruptible capacity at entry and exit would avoid the possibility of capacity being sterilised by setting prices above forward looking marginal costs.

### Effective competition

A postage stamp model that increased revenue recovery from exit and applied low multipliers on short term and interruptible capacity would reduce the likelihood of gas supply being inefficiently deterred from using a particular route. Further improvements would be to allow storage a greater than 50% exemption on capacity charges and not to levy revenue recovery charges on IPs at exit, to reduce the likelihood of inefficiently leading to early closure or deterring investment.

### Security of supply

The same potential improvements that apply to effective competition would also apply to security of supply.

### Cost recovery

A postage stamp approach to charging would likely result in more stable tariffs and certainty in tariff recovery from year to year than either the status quo or CWD Model. This is because postage stamp tariffs are based on cost recovery.

However, the use of higher discounts for short term firm capacity and interruptible capacity suggested as improving cost reflectivity, effective competition and security of supply would increase the ability of shippers to avoid paying capacity charges. This would tend to reduce the certainty of revenue recovery from year to year. Conversely, a move to recover a greater proportion of charges from exit would reduce this problem since short term products have a multiplier of 1.0 at exit (although the problem would not be eliminated since interruptible capacity has a multiplier of 0 at exit).

A move to recover a greater proportion of revenues from exit, with no complementary revenue recovery charge levied on IPs, would allow flows of gas from the UKCS or LNG imports to transit to the continent without contributing towards the cost of the NTS. This raises a potential equity issue that may fall outside Ofgem's evaluation criteria.



## 5 CONCLUSIONS

Overall, the qualitative assessment suggests that some aspects of the CWD Model would better meet the objectives of transmission charging than the status quo but other aspects would not.

The CWD Model appears to be more compliant with TAR NC than the status quo although CWD has some risks to compliance, e.g. around the multiplier on interruptible capacity.

However, the CWD Model appears worse than the status quo in terms of cost reflectivity and effective competition. This is because of the shift away from cost reflective tariffs and the shift of cost recovery away from commodity to capacity, with the potential to create distortions. In addition, not applying a discount to short term firm products or interruptible capacity increases the likelihood of capacity being inefficiently sterilised.

Of the two CWD Model variants, the obligated capacity variant is likely to distort outcomes less than the forecast capacity variant because the obligated capacity variant shifts less cost recovery onto capacity.

The CWD Model may result in more stable prices and revenue recovery than the status quo. However, this depends on the assumptions used to determine CWD prices. The obligated capacity variant is likely to result in more stable prices since the level of obligated capacity is unlikely to vary significantly from year to year. The move from fixed reference prices under the status quo to floating reference prices under the CWD Model would also tend to support stable tariffs. Finally, setting short term multipliers and the multiplier on interruptible capacity to 1.0 would tend to support stable revenue recovery.

Finally, the CWD Model would no longer provide a short-term discount at exit and hence gas fired power plants would incur the full capacity charge at exit under this model. This additional cost is likely to result in higher electricity prices which Ofgem could see as being detrimental to consumers.

The aspects of the CWD Model that appear worse than the status quo could potentially be improved. If there is enduring spare capacity on the GB system, a move to a postage stamp model appears better than the status quo and the CWD Model in terms of cost reflectivity. Applying a greater than 50% discount on entry and exit capacity charges at storage and exempting IPs from complementary revenue recovery charges would reduce the likelihood of making capacity uneconomic at storage and IPs, respectively. Reducing the likelihood of making capacity uneconomic in a way that is not cost reflective not only improves efficiency but it also tends to improve both competition and security of supply. However, exempting IPs from complementary revenue recovery charges would allow transit flows from the UKCS or LNG import terminals to flow to the continent without contributing to the cost of the GB gas network. This would increase the burden of cost recovery on GB gas consumers.

Moving a greater proportion of revenue recovery to exit would also potentially improve the CWD model, if there is spare capacity throughout the network, since exit flows tend to be less price sensitive than entry flows.

A postage stamp approach to charging would also likely result in more stable tariffs and certainty in tariff recovery than the status quo. However, use of discounts for short term firm capacity and interruptible capacity would increase the ability of shippers to avoid paying capacity charges, reducing the certainty of revenue recovery from year to year. Exempting IPs from complementary revenue recovery charges also creates an issue around the contribution of transit flows towards the cost of the NTS.

