Options for Intraday Capacity Pricing: Final Report

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Final	21/10/2014	Ofgem	Oliver Rix	Duncan Sinclair

Contact

Oliver Rix (oliver.rix@baringa.com + 44 7790 017 576)

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1. Introduction

The European Target Model has as its core objective the harmonisation of wholesale market arrangements across all timeframes, to be achieved through the implementation of the Network Codes. The ability to trade energy close to real-time will be an important objective of the Network Code on Capacity Allocation and Congestion Management (CACM), given that fundamentals can shift significantly following the market schedule determined in the day-ahead auction. Liquid intraday markets are thus critical to the efficient functioning of the market, to enable market participants to adjust their positions and avoid imbalance exposure. This becomes even more important as the penetration of intermittent renewable generation increases, as market positions may need continuous fine-tuning right up to gate closure. Interconnection can serve as an important source of flexibility in a system with high renewables (alongside other sources), provided that the intraday markets provide the right signals – both in the short-term from an operational perspective as well as in the long-term to drive new investment.

CACM requires intraday trading to take place on the basis of continuous implicit cross zonal capacity allocation, and for that capacity to be priced to reflect market congestion. While some progress has been made in establishing a continuous intraday trading platform, there is not yet a solution for pricing intraday capacity at an advanced stage of development. To stimulate thinking and ideas as to how this could be done, Ofgem has commissioned three experts, including Baringa, to consider the issues and potential options for how capacity could be priced.

We present our thinking in this area in this report. We discuss the issues that make this a challenging problem, define a number of principles that we believe any options should aim to comply with, outline options we have developed, and then assess these against our principles and compliance with CACM.

2. Principles and challenges

2.1. Concepts

One of the key objectives of CACM is to ensure the most efficient use of interconnectors. At the Day-Ahead (DA) stage, this is achieved through the implicit inclusion of interconnector capacity in an auction for electricity for the following day at hourly granularity on a pan-European basis. Participants may place bids and offers in each bidding zone, and an algorithm matches bids and offers in the most efficient manner either in or between bidding zones, constrained by the interconnection capacity available.

If the interconnection between two bidding zones is not a constraint, then the resulting clearing price will be equal in both places. If however the interconnection is a constraint on the outcome, the interconnector is said to be congested, and prices will "split" and a different clearing price will be set in each zone.

Where congestion occurs, the interconnector is deemed, as a result of the auction, to have a physical delivery obligation in each bidding zone (a 'buy' in the exporting zone, and a 'sell' in the importing zone). A congestion rent is returned to the interconnector owner equal to the difference between the clearing prices in the connected bidding zones[1].

There is no direct allocation of interconnector capacity to particular market participants, and no direct bids or offers for interconnector capacity itself: the allocation is "implicit". It is important to note that no capacity rights are transferred as a part of this process. Conceptually, one can think of the exchanges co-ordinating the DA auction as agents acting on behalf of interconnector owners to arbitrage a cross-border spread by buying and selling in the respective bidding zones. We note in this light that the terminology used of "pricing" intraday capacity (a convention we follow in this document) has some potential to be confusing (as no rights are being bought or sold). To the extent that this remains implicit for the intraday market, then "pricing" here is essentially a short-hand for setting the price differential at which interconnector capacity is deployed to arbitrage between the bidding zones.

The DA process is designed to return all the rents associated with the interconnector to the interconnector owner. An auction facilitates this as it reveals the full supply and demand curves simultaneously (as participants are incentivised to bid or offer based on marginal costs). In contrast, in a continuously traded market, information available at any time is partial, as participants will have a range of trading strategies designed to maximise rents, in part by concealing underlying positions and costs.

2.2. Principles

The intent of CACM is to combine implicit allocation of interconnector capacity intra-day with a continuously traded market. The concepts described above immediately suggest a number of challenges. In particular, the partial information visible in a continuously traded market at any moment means that it is not possible to know the cross-border price differentials at which the market would clear until after capacity has been allocated – but clearly it needs to be priced before this is done.

[1] Losses are taken into account in this process. For simplicity, we do not consider losses in this document, but we believe that these could be accounted for appropriately in the options we consider without affecting the basic concepts.

This suggests that any price-setting mechanism will only be an estimate, which in turn leads to a number of other challenges around allocative efficiency, potential distortion between trading horizons, fairness of allocation, and price signals for investment. We have defined a set of principles that capture these, set out in Table 1 below.

It is worth differentiating here between the fact that, at any given time, the expected spread is not observable prior to allocation of capacity, and the fact that the expectation of congestion, and hence the expected price spread, will change over time due to changing information. The challenges above are associated with the first point. The second point is just a normal feature of market behaviour but poses a different question, which is whether an intraday pricing method should incorporate a concept of "holding" some or all capacity (by pricing higher than the current expected congestion price) in the event that fundamentals change prior to Gate Closure. This does not form a principle but we return to this in considering our options.

A final principle that we have included is simplicity. It will be important that any methodology is clear and transparent for market participants, and does not lead to practical difficulties or complexities that could be barriers to liquid trading.

Table 1 - Principles

Principle	Description
Allocative efficiency	Allocation of interconnector capacity during the intraday timeframe should aim to achieve allocative efficiency (through minimising production costs to the extent possible, constrained by available interconnector capacity).
No distortion	The intraday allocation and pricing solution should not distort the incentives to trade between different timeframes.
Investment signals	Intraday trading should contribute to long term investment signals from the interconnector arising from revenues generated, hence properly valuing the role that interconnectors can play in the efficient integration of intermittent renewables.
Fairness of allocation	Participants trading at the same time should pay the same price for capacity, or, where capacity is constrained, those prepared to pay a higher price at that time should receive the allocation.
Simplicity	Direct benefit in terms of transparency and minimising costs and barriers to trading.

2.3. CACM Compliance

The latest draft Guideline on CACM has entered Comitology[2]. There is some level of uncertainty as to the appropriate interpretation of some parts of the text in the context of intraday capacity pricing. Ofgem has

[2] http://ec.europa.eu/energy/gas_electricity/electricity/doc/204108-cacm_formal_proposal_for_comitology.pdf

identified the objectives from the draft Guideline that it considers to be relevant, and has also provided the experts with specific guidance on a number of areas that we have used to inform our assessment of compliance.

Table 2 identifies these objectives, together with an indication of how we have interpreted them. As we indicate in the Table, some of these are already captured within our principles. For the remainder, we provide a separate specific assessment.

Table 2 - CACM compliance points

Reference	Requirement	Notes	Assessment
Article 2	Single intraday coupling	The definition for single intraday coupling is as follows (from Article 2): "'single intraday coupling' means an implicit cross-zonal capacity allocation mechanism which collects orders for each bidding zone from wholesale market participants and matches them continuously into contracts to deliver electricity while respecting cross-zonal capacity and allocation constraints, and is available in the intraday market timeframe once the day-ahead market allocation process has taken place" From this we have identified a requirement that allocation of capacity intraday should be implicit, and that the mechanism should be consistent with a continuously traded market.	Specific assessment
Article 53	The intraday cross-zonal capacity charge shall reflect market congestion…	We interpret this to mean that the price should be in some way dependent on expected congestion at the time of allocation. As we discuss in this report, there is no observable measure of expected market congestion prior to allocation (without an auction) and hence we interpret this to mean that the price should take account of directional indicators that may be reasonable proxies for changing expectations of market congestion.	Specific assessment
Article 53	… and shall be based on actual orders	Following Ofgem's guidance, this is taken to mean that the pricing mechanism must use orders that have actually been submitted by market participants. Note that we do not interpret this to mean that the price should be calculated directly from actual order information and nothing else.	Specific assessment
Article 53	This mechanism shall ensure that the price of intraday cross-zonal capacity is available to	Following Ofgem's guidance, we take this to mean that market participants should know in advance, or at the time of	Specific assessment

	the market participants at the time of matching the orders.	matching, the price of cross-zonal capacity.	
Article 3	Ensuring optimal use of the transmission infrastructure	Following Ofgem's guidance, we interpret these to mean that intraday pricing should be economic and efficient. As these aspects are covered under our assessment of principles above, we have not separately assessed this.	Covered by principles
Article 49	Aims at maximising economic surplus for single intraday coupling per trade... by allocating capacity to orders for which it is feasible to match in accordance with the price and time of submission		
Article 3	Promoting effective competition in the generation, trading and supply of electricity	We consider that this is measured through the assessment of the principles we have defined.	
Article 3	Providing non-discriminatory access to cross-zonal capacity	We consider that these are captured by our "Fairness of allocation" principle	Covered by fairness of allocation principle
Article 3	Respecting the need for a fair and orderly market and fair and orderly price formation		
Article 49	[Matching algorithm should be] repeatable and scalable	We consider that this is captured by our "Simplicity" principle.	Covered by simplicity principle

2.4. Challenges

2.4.1. Allocative efficiency

The concern here is a situation where interconnector capacity remains unutilised (at gate closure) despite a price difference between the connected bidding zones. This would imply that production costs are not minimised. This could occur if a price was set for interconnector capacity during the within-day trading period that (with hindsight) was higher than the efficient level.

2.4.2. No distortion

As noted above, the DA market is designed to return all rents associated with interconnection to the interconnector owner. During the process of within-day trading, the final price differential between neighbouring markets will not be known. To the extent that the price at which interconnector capacity was available within-day was below this level, then the difference would represent rent being captured by trading market participants, rather than the interconnector owner. If these rents were material, then there might be an incentive on market participants to trade preferentially in the within-day market (other things being equal), given the opportunity to take advantage of this relative to DA.

2.4.3. Investment signals

A directly connected challenge is that to the extent that potential intra-day congestion rents for the interconnector are eroded, so the investment signal may be distorted. In the extreme case, were interconnector capacity to be made available at zero price within-day, then there would be no value returned to the interconnector associated with the flexibility it can provide to enable participants to respond to changing fundamentals on a very short term basis. This may in turn start to undermine the DA value. Where this would otherwise form a material part of an investment case, this could lead to inefficient decisions (either by private investors or as part of a regulated process).

2.4.4. Fairness of allocation

A feature of the DA auction is that, due to the simultaneous optimisation of all bids and offers, all participants are on an equal footing in regard to the treatment of interconnector capacity. In a continuously traded market, where bids or offers are manually "clicked", or automatically matched, then interconnector capacity is essentially being used sequentially to support matching until constrained. When it is constrained, the outcome will clearly then be dependent on the timing of bids and offers placed on the exchange. To the extent that the outturn price differential is higher than the price used within-day, the associated rents will have gone to particular market participants over others. Under "normal" trading conditions this is a normal aspect of a continuously traded market. However, where more extreme sudden changes occur (for example, a sudden large outage), which could lead to a number of market participants submitting bids or offers almost simultaneously, then the allocation becomes essentially arbitrary (or favours those with extra investment in systems which are unlikely to be contributing to social welfare).

2.5. Illustration of principles

To illustrate these challenges, we consider two simple options. These are not options we are proposing, but are useful in considering the above principles. These two options are:

- The use of a number of regular intraday auctions with implicit allocation of capacity
- Making intraday capacity available on a "First Come First Served" basis at zero price in a continuously traded intraday market

In the first of these, each intraday auction would work in the same way as the current DA auction. In the second option, bids and offers in the intraday market would be matched between markets without any threshold on the price difference.

In Table 3 below, we show how each of these options perform against the principles outlined above, using a red/orange/light green/dark green colour coding with increasing compliance with the principle.

Table 3 - Illustrative principles application

Principle	Auctions	First Come First Served (zero price)
Allocative efficiency	There is a chance of inefficient allocation to the extent that there are changes in fundamentals between the final auction and gate closure. This will depend on the frequency and timing of the auctions.	As long as there was sufficient liquidity (and low transaction costs) in the within-day market, then an efficient allocation would be expected through trading of market participants.
No distortion	DA and intraday markets would be operated on the same basis, with all congestion rents going to the interconnector owner.	All congestion rents would accrue to market participants, rather than the interconnector owner, unlike the DA market.
Investment signals	The intraday price would reflect congestion and price differences between bidding zones, and the associated revenues would provide an appropriate investment signal for new capacity.	No revenues would accrue to the interconnector owner after DA, and hence there would be no investment signal associated with the value of the interconnector on an intraday timeframe.
Fairness of allocation	Participants in the auction would be on the same footing.	Where fundamentals change quickly, there could be arbitrary allocation of congestion rents where bids and offers that could be matched are placed effectively simultaneously.
Simplicity	Same process as DA.	Straightforward to understand and implement.

In Table 4, we also show an assessment of these options against our additional points of CACM compliance.

Table 4 - Illustrative options - CACM compliance

CACM requirement	Auctions	First come first served zero price
Implicit allocation	Allocated implicitly through auction	Allocated implicitly with trade matching
Consistent with continuously traded market	Auctions would replace a continuously traded market	Would work with continuously traded market
Reflect market congestion	Expected congestion would be revealed through auction	No reflection of congestion given zero price
Based on actual orders	Direct outcome of bids and offers in auction	No interaction between orders and price
Price available at time of matching	Price is determined as an outcome of the matching process	Price is always zero

Whilst the regular intraday auction option scores well against our economic principles, it diverges from the continuous trading approach in the Target Model. Given that we believe options are available that work within a continuous trading context, and that can also score well against the principles (as we discuss in the next section), we do not consider that the fact that auctions could be a good solution to the intraday pricing problem in itself would be sufficient to justify proposing this option. However, we do recognise that there may be broader questions (extending beyond intraday pricing) around the role of auctions relative to continuous trading in the intraday market, for example the potential challenge around information asymmetry as a barrier to entry under a continuous trading model. Whilst we have not explored this within the scope of this analysis, it is apparent from the assessment above that approaches incorporating auctions could help support intraday pricing. We would also expect that the set of approaches we have termed 'Price rules', described below, could be adapted to fit with a formulation of the intraday market that incorporated both auctions and continuous trading.

The First Come First Served (zero price) option scores poorly against the principles and is also non-compliant. We discuss approaches in the next section that we believe present better alternatives.

3. Options

3.1. Overview

The essence of the problem is that the outturn price differential between two bidding zones is not known in advance, and hence it is not possible to "price" capacity at this level ex-ante. The simplest approach would be to estimate the price in advance and allocate capacity based at that level. However, it is clear that such an estimate will almost always be wrong. Where the price is too high, capacity will not be utilised efficiently (our first principle). Where it is too low, our other three principles will not be met (as for the most extreme case of zero pricing described above).

This suggests that we require an approach that provides for more price 'discovery' during the within-day period. This could be done through allocating tranches of capacity incrementally at different price levels, rather than setting a single price for all capacity. This is the essence of our first option. This would mean using pre-defined rules to calculate a price for incremental tranches of capacity in each flow direction and settlement period. This would be the threshold spread required to match bids and offers over the interconnector for that tranche. The associated congestion rents would be returned to the interconnector owner. Whilst there are of course many ways in which the pricing rules could be defined, we have created three examples, building from a simpler case to a more complex one. These are:

- "Price scaling" based on level of implied interconnector use, with a price profile that is fixed in advance,
- a variant of this ("Move to zero price") in which the price then declines (eventually to zero) if there is unused capacity prior to Gate Closure, and
- a further variant ("Dynamic pricing") in which the price profile can dynamically adjust within-day based on the rate at which capacity is allocated.

We describe each of these in Section 3.2 below.

In one sense, the challenge we have described above is equivalent to aiming to mimic through defied rules the way in which the owner of the capacity rights might look to exercise these to maximise congestion rents in a continuously traded market. An alternative approach is to enable market participants to do this directly. This could be achieved by selling the explicit capacity rights into the market following the DA auction. We describe this option Section 3.2.4 below.

3.2. Price rules

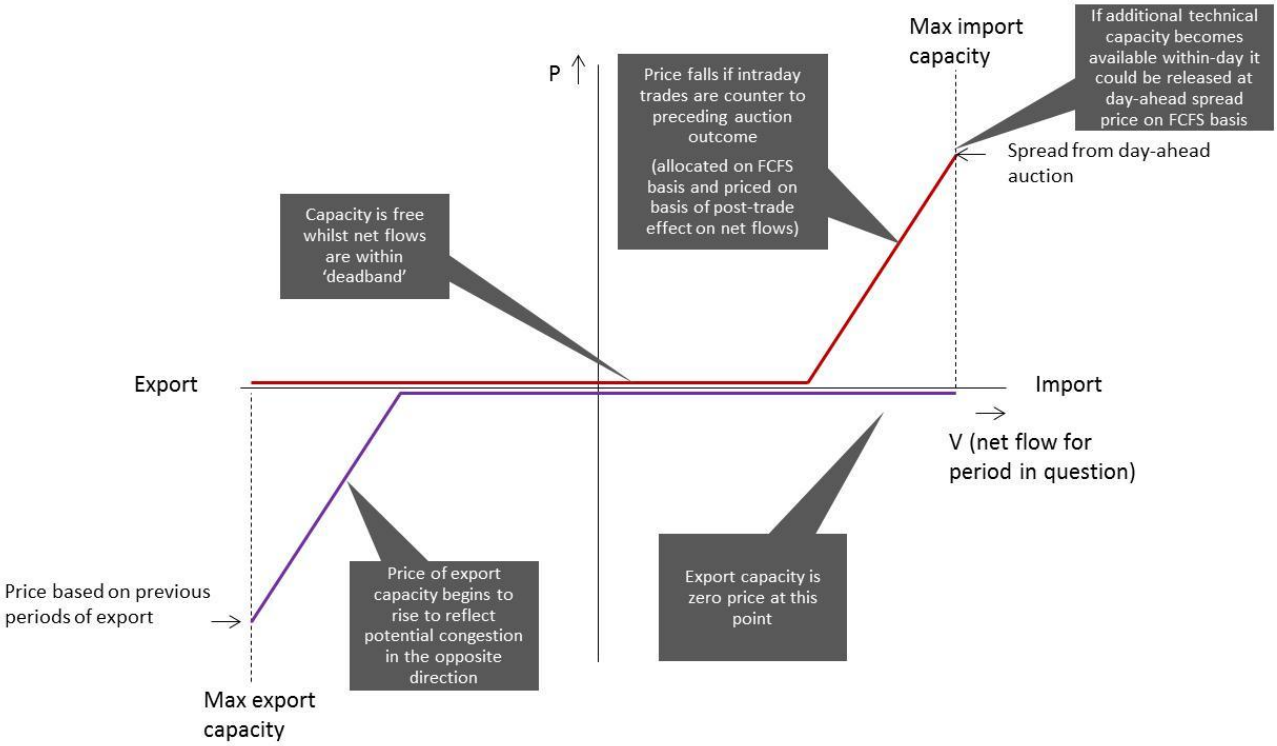
3.2.1. Price scaling

The simplest of our example options involves setting a series of prices for different tranches of interconnector capacity based on the implied net flows given matched bids and offers to date. This price profile would be fixed in advance. It would consist of a 'dead band' at zero price for some portion of capacity, followed by a linear increase in price as implied net flows moved closer to maximum capacity. The price at the full export/full import point could be set based on the price differential from the most recent auction in which the settlement period in question was constrained in each respective direction.

In many cases, the starting point for a given delivery period, following the DA auction, will be that the net flow position is fully importing or fully exporting (when the interconnector is constrained). Thus, in the opposite flow direction, capacity would initially be available for allocation at zero price, and no capacity would be available in the constrained direction.

We illustrate this "Price scaling" option in Figure 1. In this example, we assume import capacity was fully allocated at the preceding DA auction.

Figure 1 - Price scaling



The amount of available capacity on any particular interconnection is not a fixed quantity. The price scaling approach would thus need to accommodate changes here. The price 'curve' illustrated in Figure 1 would need to adjust to the new capacity level. One way this could be done would be to 'reset' the overall price curve based on the new end-point, but alternative methods could be considered as part of a more detailed design.

3.2.2. Move to zero price

One particular concern with this option is that there would be an inefficient allocation in cases where the "boundary" prices are higher than the bidding zone price differential[3] (as observed ex-post), as capacity

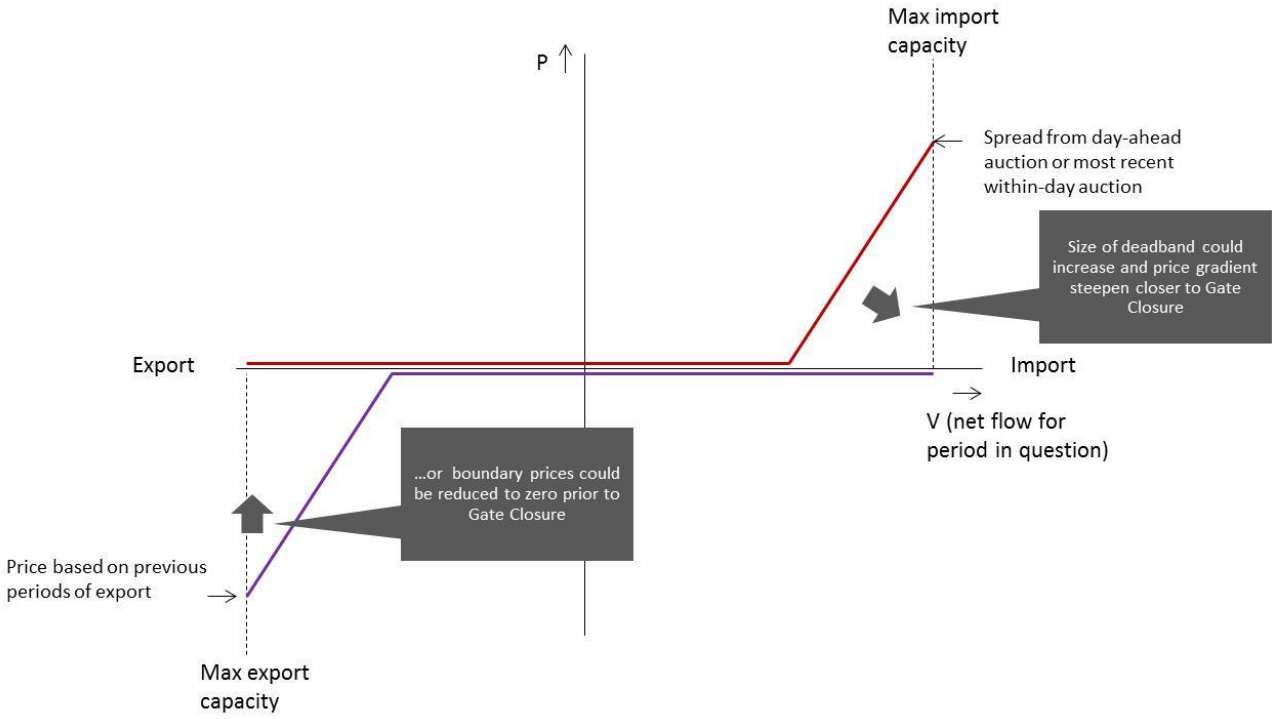
[3] In practice there are a number of ways of determining what the "final" price differential is at Gate Closure. The important point here is not exactly how this is defined (eg whether it is an average of executed trades over a period of time, or the last executed trade price), but simply that it may be non-zero with residual capacity still available.

would remain unused. To address this, a "Move to zero price" variant could incorporate an additional rule which would reduce the boundary price to zero for settlement periods as Gate Closure is approached. There a clearly a number of ways in which this could be done. For example:

- Set all unused capacity to zero price [4] hours prior to Gate Closure
- Gradually increase deadband size between [8] and [4] hours prior to Gate Closure
- Gradually reduce "boundary" prices to zero between [8] and [4] hours prior to Gate Closure

We consider that the times in square brackets represent reasonable choices for this, but we have not considered these in detail. Whilst it is the simplest, the first option would miss congestion rents where capacity may be allocated at a price greater than zero, so we would propose one of the other options. These are illustrated in Figure 2.

Figure 2 – Move to zero price



The timing of the "move to zero price" would need to be sufficiently in advance of Gate Closure to account for the path dependency of decisions market participants will be making, particularly in regard to generation assets with technical constraints (such as ramp rates and minimum on- and off-times) or high start costs.

One possible consequence of this is that there may be an incentive on market participants to adjust their strategies such that trades are executed later even when congestion is expected. If trades that changed capacity flows were executed after the price had reached zero, but capacity was still ultimately constrained, then the congestion rents would be shared between market participants rather than the interconnector owner. In the solutions in which the price reduction was gradual, however, there would also be a competitive tension in the 'first come first served' nature of the allocation that would offset this. The dynamic pricing variant described below could help address this further if it was a material concern.

3.2.3. Dynamic pricing

There are two other potential concerns with the Price Scaling approach. The first is that the "boundary prices", as ex-ante estimates, are likely to be poor proxies for the actual outturn price differential. Where they are too low, then this will not affect efficient allocation, but would reduce congestion rents accruing to the interconnector owner. (The case where they are too high is captured by the "Move to zero price" variant, albeit at a late stage.) The second is that when allocation is occurring following a sudden change in fundamentals, then the fact that the price of capacity only rises in a pre-defined way as net imports change means that there may be issues of "fairness" in allocation (since it may be effectively arbitrary in terms of the bids/offers matched at different price levels as the allocation occurs), and, correspondingly, congestion rents will again be lower for the interconnector owner.

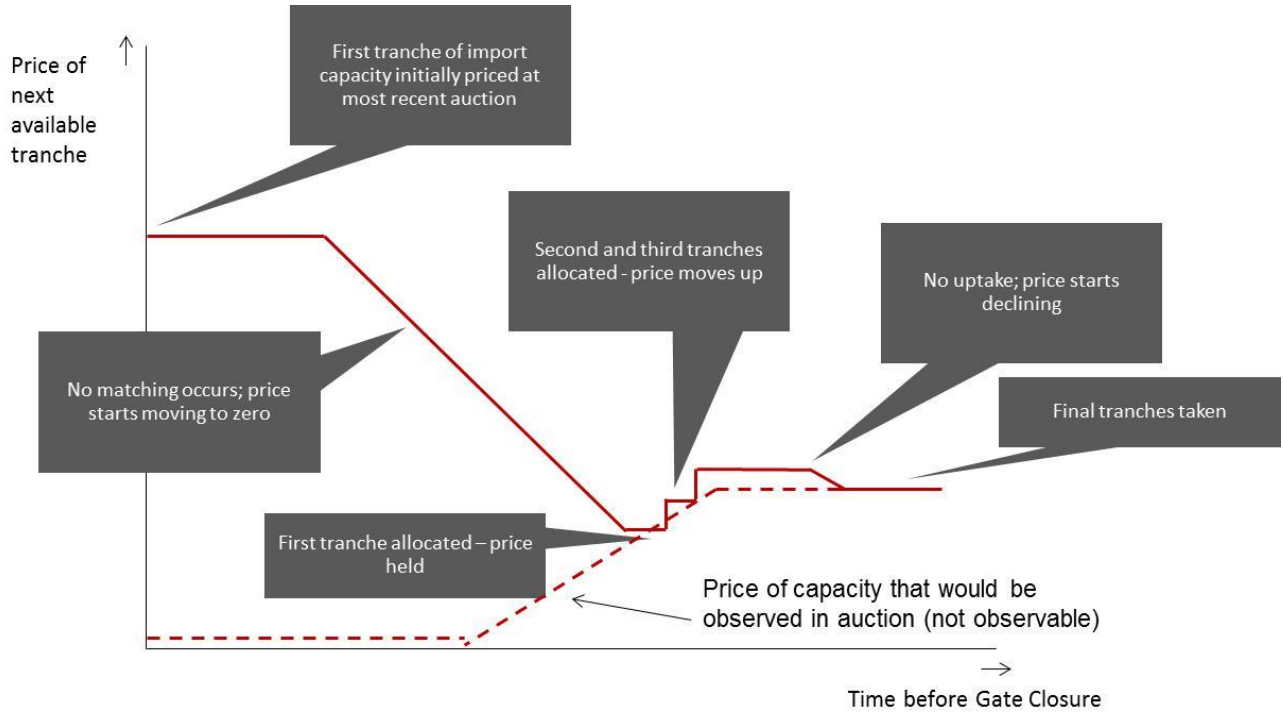
A way to reduce the materiality of these issues would be to make the change in price from each tranche to the next a dynamic parameter, rather than pre-determining this. One way to achieve this would be to make the price change from one tranche to the next a function of the time taken for the previous tranche to be allocated. Fast allocation would lead to larger steps in price, with the aim of "finding" the right price more quickly.

The "move to zero price" would still be incorporated in this variant. However, given the objective of reducing the erosion of congestion rents, another adjustment would be to remove the 'deadband' and instead price the first tranche of capacity initially at the prior auction price, but start to reduce the price gradually with time if it is not allocated. The intent behind this would be two-fold. First, it would be able to 'discover' a congestion price following a change in fundamentals more quickly (rather than starting from zero), whilst ensuring that capacity is still available at zero price before Gate Closure if there is no congestion. Second, by starting at a non-zero price for all capacity, it would introduce some element of "holding back" (as discussed in Section 2.2). Since capacity would not initially be allocated at a zero price, additional congestion rents would be achieved if fundamentals changed later to increase expected congestion.

We demonstrate how this could work with two illustrative examples. Note that we have presented these examples differently from Figure 1, where we showed price versus allocation level (and hence implied net flows). Here we show how the price of the next available tranche varies with time. There are two contributors to this. First, where a tranche is not allocated, then its price will start to decline. Second, after one tranche is allocated, the price for the next tranche available will differ by an amount determined by the time taken for the previous tranche to be allocated.

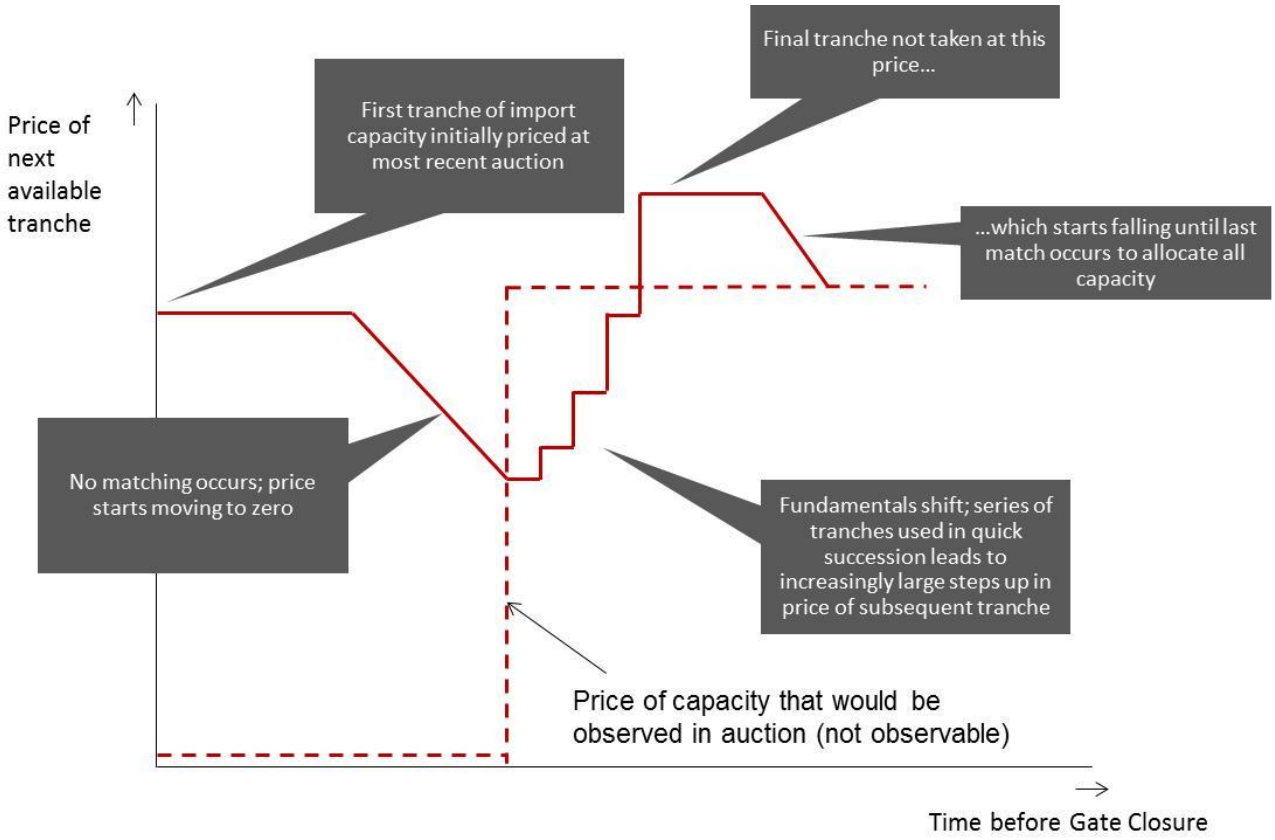
The example in Figure 3 is for a case where there is a gradual change in fundamentals during the course of the day, which at some point creates an expectation of congestion that then increases. To illustrate this schematically, we show (with the dotted line) the congestion price that would conceptually be observed if an auction was held at that point. This is of course not observable directly at the time – but is essentially the price that the dynamic pricing algorithm is attempting to discover.

Figure 3 - Dynamic Pricing: gradual change in fundamentals



In Figure 4 we show a similar diagram, but this time where there is a very sudden change in fundamentals.

Figure 4 - Dynamic Pricing: sudden change in fundamentals



3.2.4. Developing the details

There would be a range of detailed parameters that would require specification as part of the design and implementation of any of these options, for example, the size of the deadband, the timings for 'move to zero price', and the definition of the function determining step sizes for dynamic pricing. Recognising that these options are all simplified and imperfect means of creating some form of price discovery, the goal here would be to select parameters that lead to "sensible" behaviour under as wide a range as possible of market conditions.

However, there are few data currently available to help gauge how the market may behave once intraday market coupling is implemented. We would therefore suggest that a simple set of parameters are specified initially (for example, that the 'deadband' is set such that the price starts rising from zero once net flows cross the 'midpoint' to be in the same direction as the capacity used), but that an ability to change the parameters with reasonable frequency is enabled with an appropriate governance process. As empirical data becomes available, particularly in the early stages of the operation of the market, this can be taken into account in determining any parameter updates. A number of metrics could be defined to support this process, reflecting the underlying principles. This could include, for example, a measure of achieved congestion rent compared to the theoretical rent based on the gate closure spread, and distributions of change in implied capacity use (net flows) relative to changes in price (which would give information on whether the pricing function is delaying efficient trades).

3.3. Auction of intraday rights

Under this option, the interconnector capacity rights would be sold shortly after the DA implicit auction was complete. This could take place through a second auction. A market participant that bought the rights would then be entitled to 'match' its own bid or offer with a matching bid or offer in the connected bidding zone, benefiting from any associated spread (effectively receiving the congestion rent).

As an example, we assume that the interconnector is fully constrained from market A to market B in the DA auction. The rights would then be sold in the auction. Participants could elect how much they would be prepared to pay for the rights, which would give them the option to match trades in the B->A direction if fundamentals shifted to create congestion in that direction prior to Gate Closure. (From an option pricing perspective, the rights would have zero intrinsic value but a positive extrinsic value, with a level dependent on the probability distribution of the potential outturn B->A spread.)

From the interconnector owner's perspective, there would be a revenue stream that should reflect the extrinsic value of the rights at the DA point (to supplement the intrinsic value generated through the DA implicit auction), which would replace the revenue stream of congestion rents generated through the price rules approaches described in Section 3.2.

Market participants would then make their own decisions as to how best to maximise the congestion rents from the rights in the market. To avoid hoarding concerns, UIOLI protection may be needed to release the rights if they remain unused close to Gate Closure.

The process would need to account for the 'state' of the interconnector following the implicit auction. In our example above, we discussed the value of rights where fundamentals changed expected congestion from one direction to the other. Further value might accrue if this then changed back, with a participant then able to match trades again in the A->B direction. But the implied net position at any time must respect the capacity in each direction, as well as taking into account the original flow obligation from the DA auction. One approach to this would be that the right assigned would come with a 'net flow' account. For example, if the interconnector was constrained from market A to market B at a capacity of 100, then a participant acquiring the rights for 10 units of interconnector capacity would receive these tagged with a net flow account of 10 A->B. This would mean that the rights could not be used to match further in the A->B direction, but could be used to match in the B->A direction. If a trade of 1 unit was matched this way, the net flow account would be adjusted to 9 A->B. At this point, the participant could match a further 9 units B->A , or match 1 unit A->B. The net flow account would continue to be updated as trades were matched through to Gate Closure. The ability to track and manage this could be incorporated in the intraday trading platform. However, a drawback of this is that the rights would not be fungible in a secondary market, as the value would depend on the 'net flow' account level in each case.

It may also be difficult with this approach to handle changes to capacity after the auction for explicit rights had taken place. There would need to be a mechanism to introduce further rights into the market. This could be done through a further auction but if this is irregular or infrequent then this could be impractical and burdensome for market participants. An alternative might be to scale up the capacity held by rights-holders, pro-rated to their day-ahead allocations, but this would make pricing for the original rights complex.

4. Assessment of options

4.1. Assessment against principles

We assess each option against our five principles in Table 5 below.

Table 5 – Assessment against principles

Principle	Price Scaling	Move to zero price	Dynamic pricing	Auction of intraday rights
Allocative efficiency	Can leave capacity unutilised	Assuming liquidity close to Gate Closure	Assuming liquidity close to Gate Closure	Assuming UIOLI provision, but complexity in trading of secondary rights.
No distortion	Some congestion rents accrue to market participants	Some congestion rents accrue to market participants	Reduced congestion rents for market participants	Asymmetry between implicit DA and explicit intraday could lead to distortions
Investment signals	Some loss of congestion rents	Some loss of congestion rents	Improved congestion rents for interconnector in continuous trading context	Assuming competitive auction for explicit rights with extrinsic value priced in
Fairness of allocation	Potential for different prices for trades at (effectively) the same time	Potential for different prices for trades at (effectively) the same time	Reduced potential for different prices for trades at (effectively) the same time	Via auction
Simplicity	Fixed price profile ex-ante makes this simple to understand and implement.	Small extra complexity associated with changing price with time.	Significant extra complexity associated with the dynamic price steps (although no practical impact on trading process).	Additional auction of different type, and complex to capture participant-level rights and secondary market in intraday platform.

4.2. Assessment of compliance with CACM

Table 6 shows our assessment of each option against the CACM requirements. In summary, we consider that, for points other than the requirement to be economic and efficient covered above, our "price rules" options are all CACM-compliant. The auction of intraday rights is clearly non-compliant.

Table 6 - CACM compliance assessment

CACM requirement	Price Scaling	Move to zero price	Dynamic pricing	Auction of intraday rights
Implicit allocation	Allocated implicitly with trade matching	Allocated implicitly with trade matching	Allocated implicitly with trade matching	Uses explicit allocation
Consistent with continuously traded market	Works with continuously traded market	Works with continuously traded market	Works with continuously traded market	Works with continuously traded market
Reflect market congestion	Price rises with implied net flows (as indicator of congestion)	Price rises with implied net flows (as indicator of congestion), and falls if capacity not allocated	Price responds directionally to trading activity as indicator of congestion	Pricing in explicit auction reflects probability of change to congestion
Based on actual orders	Price changes based on actual orders matched	Price changes based on actual orders matched	Price changes based on actual orders matched	Price based on bids and offers in auction
Price available at time of matching	Rules are pre-defined and current price can be displayed on trading screen	Rules are pre-defined and current price can be displayed on trading screen	Rules are pre-defined and current price can be displayed on trading screen	Price consistent with bids and offers in auction