Marginal Imbalance Pricing

A Paper by National Grid Transco

This paper has been prepared by the Transmission Company to support BSC Modification Proposals "Marginal Definition of the 'main' energy imbalance price" and "Marginal SBP during periods of Demand Reduction". The purpose of this paper is to discuss how the calculation of imbalance prices could be changed from the current averaging methodology, to a marginal methodology, and the likely impact that a marginal methodology would have on the level of imbalance prices.

Current position

At present imbalance prices are calculated using the P78 Methodology (P78). Under P78, market length is calculated by summing up all the balancing actions taken in a particular Settlement Period (this includes our pre-gate actions as well as the acceptance of bids or offers in the Balancing Mechanism). This determines the market length i.e. short or long. One of the main principles of P78 is that if a participant is out of balance in the opposite direction to the market (i.e. effectively helping to balance the system), that imbalance should be treated in a neutral way. This means that the participant would receive/pay a representative amount related to what it would have cost to resolve the imbalance in the short-term markets.

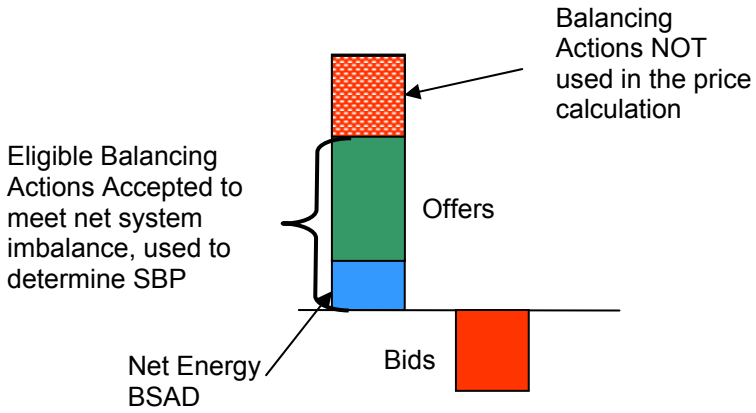
Pre-gate closure actions are submitted via Balancing Services Adjustment Data (BSAD) in accordance with the BSAD Methodology Statement. BSAD includes the costs and volumes of these actions to ensure they can be included in the calculation of market length. BSAD also splits our actions into 'system' and 'energy' actions. 'System' actions are actions we take to ensure the system balances from a technical point of view (for example maintaining system frequency). Energy actions are those actions taken purely to ensure gross energy balance.

System actions are used solely in the calculation of market length, whilst energy actions feed into both the calculation of market length and energy imbalance prices.

The Net imbalance Volume (NIV) is calculated by creating two stacks of balancing actions – one for actions taken in the *buy* direction, and one for actions in the *sell* direction. NIV is then calculated by subtracting the volume of actions in the "short" stack, from the volume of actions in the longer stack. This represents the volume of energy that was required in order to balance generation and demand.

When the market is short, SBP is the 'main price' and is calculated as the <u>average</u> of all eligible[1] actions in the short direction which were taken to resolve the net energy imbalance - i.e. the average of all energy pre-gate purchases and offer acceptances. This is shown in the diagram below.

[1] Actions that are <u>NOT</u>: Bids or Offers which have a Continuous Acceptance Duration of less than 15 minutes; De Minimus accepted Bids or Offers; Arbitrage accepted Bids or Offers; NIV Tagged Bids or Offers; System actions identified in the BSAD methodology.



In this case, SSP (the 'reverse price') is set by a 'market price' i.e. a representative price from the short-term power exchanges.

Conversely, when the market is long, SSP is the main price and is calculated as the average of all energy actions in the long direction which were taken to resolve the net energy imbalance, i.e. the average of all energy pre-gate sales and bid acceptances. In this case SBP is the 'reverse price' and is set by a 'market price'.

Market Signals

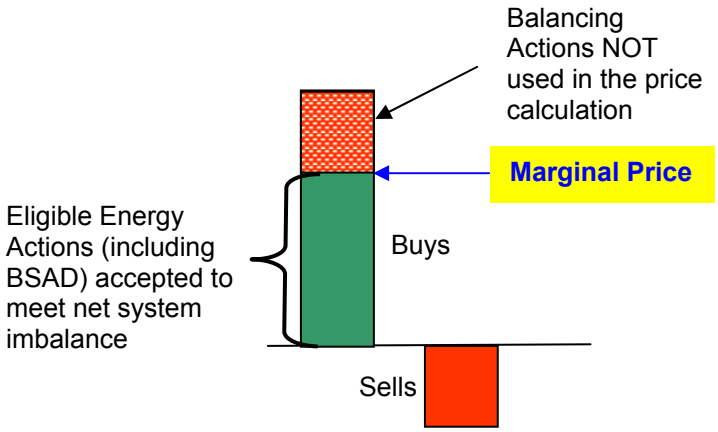
The System Operator may take a number of actions in order to provide balancing energy. It is clearly not possible to pair an action with an individual party's imbalance (with the associated cost of the action being reflected in the cashout price paid by the party), as there is no "order" in which imbalances are corrected in real time. In this respect, everyone who has an imbalance in the same direction as the market (e.g. short when the market is short) is contributing to the requirement for the marginal action required to match generation and demand.

Imbalance prices should provide signals to the forward markets as to the cost of supplying balancing energy. In a perfect market, the average price of these actions should tend towards the price of the marginal action. Experience of imbalance prices to date shows that this is not the case, particularly in times of energy shortage, when the average imbalance price understates the cost of the marginal balancing action. This sends inappropriate signals to the forward markets, as it does not provide sufficient incentives for market participants to contract sufficiently to mitigate the risk of not being able to balance at Gate Closure.

The calculation of the main imbalance price, using a marginal methodology, will provide more appropriate signals to the forward markets as it will be representative of the underlying marginal cost of balancing energy. This is particularly important in times of energy shortage when the marginal cost of balancing energy (and hence imbalance price) is high. It will provide more appropriate incentives for participants to contract forward to mitigate the risk of not being able to balance at Gate Closure.

Marginal 'Main' Imbalance Prices

This section provides a brief description of how Main imbalance prices could be calculated using a marginal methodology. The Bid and Offer stack would be constructed in the same way as the current methodology defines, in order to calculate market length. This includes accepted Bids and Offers in the BM and Pre-gate actions submitted via BSAD. Actions that are not eligible energy actions (as previously defined) will then be removed from the stack before the price calculation is performed. The main price could be calculated as the most expensive energy action (whole or part) in the stack. This is illustrated below:



Clearly marginal pricing requires a change to the BSAD Methodology Statement to ensure the calculation of BSAD is consistent with a marginal methodology. These changes will be progressed by National Grid, via a BSAD Methodology Statement consultation, in parallel with this BSC Modification.

Effect on Prices

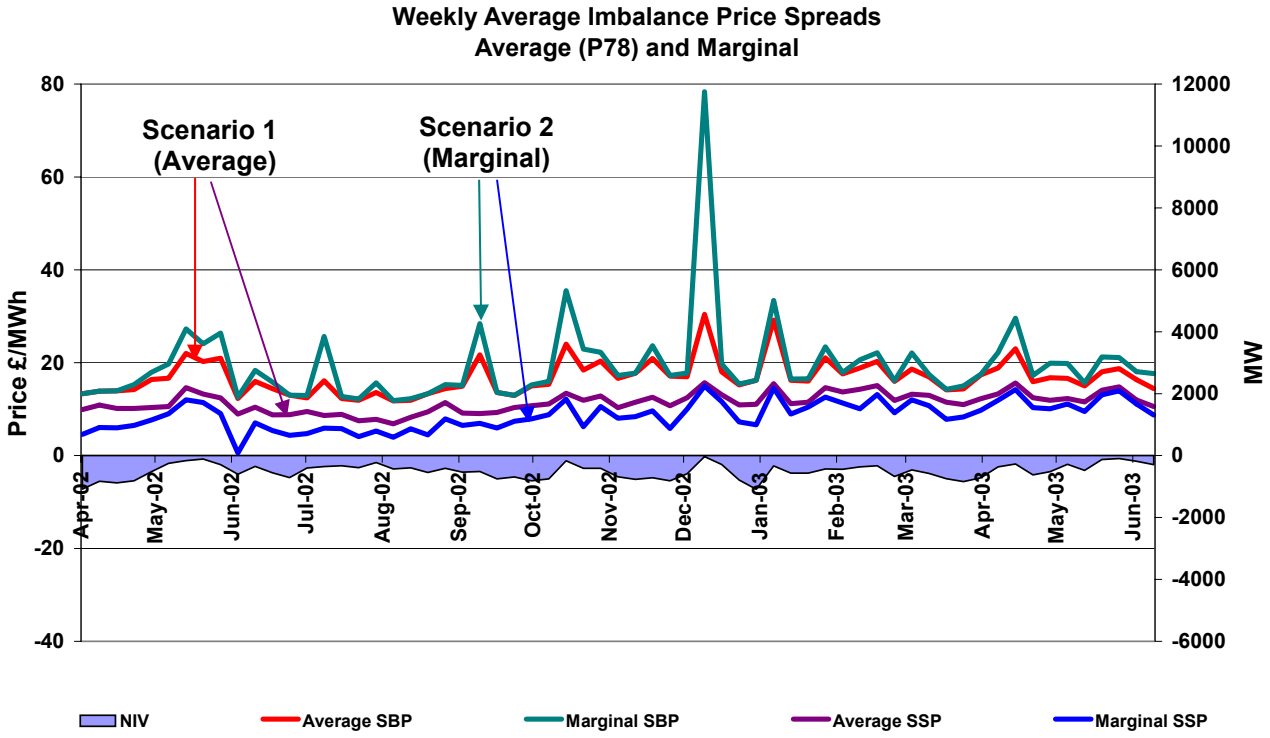
Some simplified analysis, on historical market out-turn data, has been performed to investigate the effect that calculating imbalance prices using a marginal methodology, may have on imbalance prices. The simplifications are:

1. analysis considers the 'main' price only, assuming that the reverse price will remain as a 'market price'.
2. Arbitrage actions have not been removed from the stack. This should have little impact in determining the marginal price.
3. BSAD actions have been included as a single action in the stack, at the average cost. This should have little impact, as, in general, an action captured via BSAD is unlikely to set the marginal price. The BPA and SPA adjustments to SBP and SSP are included.

As the methodology for calculating imbalance prices has changed over time, two scenarios were constructed in order to make a fair comparison between average and marginal imbalance prices:

Scenario 1 – both SBP and SSP have been calculated using the current P78 averaging methodology for the 'main stack'. As the current methodology has only been in force from 11th March 2003, actual prices before this date will be different from those calculated in this analysis.

Scenario 2 – both SBP and SSP have been calculated using the marginal methodology for the main stack, where the most expensive 'eligible' Offer is used in the calculation of the relevant imbalance price.



Clearly the volatility of imbalance prices will increase in a marginal pricing world. The following table shows the headline averages for SBP and SSP over the period April 02 – June 03 using the scenarios given above.

	Average Methodology (£/MWh)	**Marginal Methodology (£/MWh)**
System Buy Price	16.84	18.97
System Sell Price	11.44	8.65

Other Issues

It is worth considering the reasons why average pricing was proposed for NETA, and why we now believe that these reasons are not valid.

Under the rules of the Electricity Pool, a marginal pricing methodology was used to set the price that generators were paid for generating electricity "SMP" (System Marginal Price). There was a perception that this methodology could be gamed i.e. generators could deliberately set SMP via their bidding strategy.

Moving into the NETA world, this perception may have been carried forward, and therefore the calculation of imbalance prices was designed using an

averaging methodology to avoid any possibility of gaming. However, the key issue is that NETA is 'pay as bid'. We consider that gaming is much less of an issue for marginal imbalance prices as (in the case of SBP), it is paid by market participants or (in the case of SSP) marginal prices will be lower than average prices.

We think that another reason for the decision to adopt marginal imbalance prices was market theory that suggests that, in a 'pay as bid' market, an average pricing methodology should produce imbalance prices that tend toward the price of the marginal action. This has not been the case in practice, with experience to date showing that the average imbalance price can significantly understate the cost of the marginal balancing action, especially in terms of energy shortage.

One issue to consider is the robustness of the marginal methodology if small volume actions are setting the imbalance price. It may be appropriate to consider supplementary measures to ensure that the action(s) that sets the marginal price is reflective of energy balancing e.g. to avoid a small volume of an action that has been partially NIV tagged setting the marginal price. One example of how this could work is to define a small 'marginal volume' as a block at the top of the NIV stack. The marginal price could then be set using the average price of actions in this block. Such a measure, in addition to the NIV tagging methodology, could prevent inappropriate actions from setting the marginal price and reduce inappropriate volatility (though clearly it could also reduce the sharpness of the marginal price signals). We feel that the merits of this could be considered by the Modification Group.

Conclusion

The proposed modification(s), to introduce marginal imbalance prices, build on the concepts that were introduced by BSC modification P78. These concepts were:

- imbalances that were in the opposite direction to the overall system imbalance should be cashed out at a 'market price' based on prices seen in the power exchanges;
- NIV tagging methodology for removing 'system' actions from the calculation of imbalance prices.

The proposed modification(s) retain these concepts whilst enhancing the signals provided by the "main" imbalance prices by ensuring that they represent the true underlying marginal cost of balancing generation and demand. Providing appropriate signals to the forward markets will encourage market participants to adopt a contracting strategy that will ensure they are able to adopt a balanced position at Gate Closure.