

## NATIONAL GRID COMPANY

### **Mitigation of System Balancing Actions in Imbalance Prices BSC Modification Proposal (Paper by National Grid)**

*Extreme imbalance prices can arise from expensive Offers or Bids accepted in the BM for short-term frequency control. We believe that it is inappropriate that market participants should be exposed to these extreme prices. This paper proposes two alternative modifications to the BSC that will moderate imbalance prices in such circumstances.*

#### **I. BACKGROUND**

A feature of the Balance Mechanism to-date, is that National Grid is accepting a number of Bids and Offers of short duration, usually on plant of fast dynamics. These are high value services, and are often expensively priced. The imbalance prices, System Sell Price and System Buy Price, are set as the average of accepted Bids and Offers, which are not tagged as 'system balancing actions' by the trade tagging process. Particularly when we accept only a modest total volume of Bids or Offers accepted in one half-hour, these expensive Bids or Offers have a large effect on imbalance prices.

We believe that the underlying expectation, before Neta Go-Live, was that there would usually be a reasonable volume of both Bids and Offers accepted, so that the resulting Imbalance prices in each direction would reflect a reasonable average of Bid and Offer prices, and that the Trade Tagging rules would usually be able to exclude extreme price system effects. While it was accepted that both SSP and SBP would occasionally take extreme values, reflecting underlying system stresses at such times, it was not expected that short-term actions arising daily would have such a significant impact on imbalance prices

It was agreed before Go-Live, that balancing actions directly relating to frequency control, relating to the balancing service of automatic frequency response, should be excluded from imbalance price setting. Whereas balancing actions relating to the half-hourly balance of generation and demand, generally termed reserve, should be included in imbalance price setting. However, it is unclear as to whether an action of 5-15 minutes duration should be regarded as system or energy, and it remains a matter of viewpoint as to which treatment to adopt.

#### **II. PROPOSALS**

In order to address the inappropriate levels of imbalance prices, we propose two modifications to the calculation of SBP and SSP as defined in the BSC. We expect these proposals to be considered as alternatives. (However, we note that one could in fact implement both together.)

Proposal A: Tagging Short Duration BOAs

Proposal B: Averaging Imbalance Price Setting

## **IIA. PROPOSED SOLUTION A: Tagging Short Duration BOAs**

This proposes an enhanced definition of system balancing actions. Bid or Offer acceptances (known as BOAs), whose duration is less than a threshold of (say) 15 minutes, are tagged as system balancing actions, and are excluded from the imbalance price calculations.

The rationale behind this proposal is that short duration actions are likely to relate to minute-by-minute frequency control, and thus it is not appropriate to include them in imbalance prices. Of course, the attribution of short duration to frequency control is not perfect, but since BOAs can be accepted for many overlapping reasons, no attribution will be unambiguous.

The proposal enhances the current distinction between response actions and reserve actions. At present, response actions are automatic, are not recorded as BOAs, and the cost of them is reflected within the Response Imbalance; they are thus definitely system actions. Any reserve actions are Bid / Offer acceptances (BOAs), and are eligible to set imbalance prices, subject only to current trade tagging rules.

Within the main text of Section T4.4 'Determination of Energy Imbalance Prices', the proposal is simply effected by a new clause, after T4.4.4:

*T4.4.4A In respect of each Settlement Period, some of the accepted Bids and accepted Offers may be defined as Short Duration Accepted Bids and Short Duration Accepted Offers respectively in accordance with the provisions of Annex T-1, and all such Short Duration Accepted Bids and Short Duration Accepted Offers shall be disregarded for the purposes of calculation of energy imbalance prices.*

### ***Modification to the Trade Tagging Rules***

To give effect to this proposal, it is desirable to extend the Trade Tagging rules, which constitute Annex T-1 to BSC Section T, to define a 'Continuous Instruction Duration' for each BOA. The 'Continuous Instruction Duration' should be constructed by looking at all Bid or Offer acceptances for each BMU, across Bid/Offer pair ranges and across half-hours; where acceptances of non-zero MW are contiguous over adjacent minutes, the 'Continuous Instruction Duration' of all contiguous acceptances is set to the end time of the latest minus the start time of the earliest.

The rationale for this definition of 'Continuous Instruction Duration' is that we may issue sequential instructions to the same BMU, for example during conditions of minute-by-minute uncertainty on the system. The settlement system records each acceptance separately, but it is the aggregate acceptance that is meaningful

Then, individual BOAs are tagged as 'Short Duration Acceptances', if their Continuous Instruction Duration is less than a threshold level. We propose that this threshold level is initially set to 15 minutes.

We recognise that we have not yet defined precise rules, suitable for drafting Annex T-1, to give effect to this proposal. We expect such a definition to be progressed during the assessment stage of this modification.

## **IIB. PROPOSED SOLUTION B: Averaging Imbalance Price Setting**

This proposes that the BRL parameter is used as a minimum volume of balancing actions, from which the imbalance prices can be set. When there is a smaller volume of untagged actions, the imbalance price is set as a weighted average of the price defined by the current rules, and the default price that would apply if no balancing actions had been taken in that direction.

The rationale for this option is that it limits the impact that any small volume balancing action can have on the imbalance price in the cases where the assumptions behind the trade tagging methodology (i.e. that there will be at least BRL volume of balancing actions in each direction) are invalid. It does not attempt to improve the allocation of balancing actions between system and energy, but ensures that the price effects of actions of small volume, which are inappropriately included as energy actions, is mitigated.

A further argument for this option relates to the volumes of balancing actions, as against the volumes of gross imbalance. An expensive price over a small volume will only cause a modest cost within the Balancing Mechanism. But the resulting large imbalance price may be charged out to a large volume of gross imbalance, because there can easily be large volumes of gross imbalances which nearly net out, and so the gross imbalance payments are very large. The averaging approach of this proposal mitigates a modest cost of balancing giving rise to a very large cost of gross imbalances.

### ***Modification to the SBP Calculation***

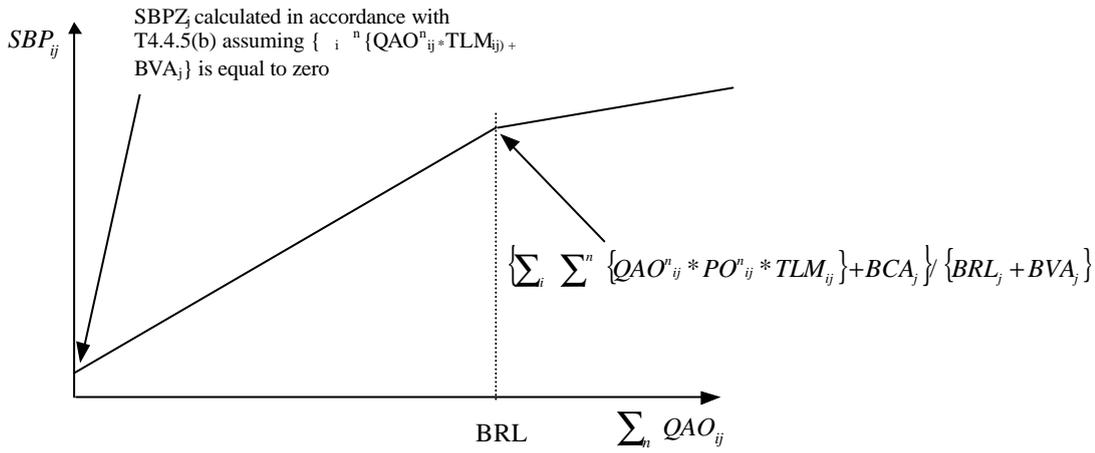
Under Section T, Paragraph 4.4 of the BSC, System Buy Price is calculated as follows:

$$SBP_j = \left\{ \sum_i \sum^n \{ QAO_{ij}^n * PO_{ij}^n * TLM_{ij} \} + BCA_j \right\} / \left\{ \sum_i \sum^n \{ QAO_{ij}^n * TLM_{ij} \} + BVA_j \right\}$$

The aggregate cost of Offer acceptances and energy contracts for a given half-hour is divided by the associated energy volume. Thus, if we accept a small volume of Offers, the price of these Offers set the imbalance price. If we accept no Offers, the imbalance price defaults to the maximum of SSP and the cheapest available Offer price, in accordance with the BSC. This current approach ensures continuity in the imbalance price as the volume of accepted Offers increases.

However, when the system is long, we may sometimes accept a small volume of highly priced Offers close to real time. Effectively a discontinuity can exist in setting imbalance prices depending on whether we accept a zero or non-zero volume of Offers. We propose the removal of this discontinuity by smoothing out potential price spikes.

The diagram below illustrates how we propose that Imbalance Prices could be set when the volume of accepted Bids exceeds the Volume of accepted Offers ( $\sum_i \sum^n QAB_{ij}^n > \sum_i \sum^n QAO_{ij}^n$ ).



For zero Offer volume acceptance, the imbalance price would continue to be set as defined in the BSC to ‘SBPZ’ (para T4.4.5(b)), namely to the maximum of SSP and the cheapest available non-arbitrated Offer. For an accepted Offer volume equal to or greater than the Balancing Reserve Level (BRL), the imbalance price would continue to be set according to the formula in the BSC. However, for Offer acceptance volumes between zero and BRL, we propose a linear extrapolation to determine the appropriate value for SBP.

Hence when  $\sum_i^n \{QAB_{ij}^n * TLM_{ij}\} > \sum_i^n \{QAO_{ij}^n * TLM_{ij}\}$  and  $\sum_i^n \{QAO_{ij}^n * TLM_{ij}\} < BRL_j$ :

$$SBP_j = \left( \frac{\sum_i \sum^n \{QAO_{ij}^n * TLM_{ij}\}}{BRL_j} \right) * \left( \frac{\left( \sum_i \sum^n \{QAO_{ij}^n * PO_{ij}^n * TLM_{ij}\} + BCA_j \right)}{\sum_i \sum^n \{QAO_{ij}^n * TLM_{ij}\} + BVA_j} \right) + \left( 1 - \frac{\sum_i \sum^n \{QAO_{ij}^n * TLM_{ij}\}}{BRL_j} \right) * SBPZ_j$$

where  $SBPZ_j$  is calculated in accordance with T4.4.5(b) (i.e. in the current case where:  $\{ \sum_i^n \{QAO_{ij}^n * TLM_{ij}\} + BVA_j \}$  is equal to zero.

### Modification to the SSP Calculation

The modifications to the SBP calculation would also be repeated in the System Sell Price (SSP) calculation.

## IV. IMPACT ASSESSMENT

For proposal A, we have performed some analysis of our concept of ‘Continuous Instruction Duration’ (CID), and applied it to one week of BM operation. Over 1500 BOAs, 80% have CID greater than 15 minutes, and so we are not tagging out a large proportion of acceptances. However, over a class of BMUs of fast dynamics, 75% of the acceptances have CID of less than 15 minutes, and so would be tagged out.

Detailed assessment of proposal A will require full replication of the Trade Tagging rules, and we have been unable to achieve this. However, our review of the prices associated with our class of BMUs of fast dynamics, leads us to a view that a threshold of 15 minutes might mitigate half the instances of ‘extreme’ System Buy Prices (say, those above 100 £/MWh). A threshold of 10 minutes might mitigate only one third of such instances.

For proposal B, there have been many half-hours where imbalance price has been set over a volume less than BRL, and it is clear that proposal B will mitigate extreme imbalance prices.

## V. OTHER ALTERNATIVES

The BSC Panel may wish to consider a number of wider alternatives to the proposal of this paper, which include:

- (a) Extending the 'P10' modification, which excludes acceptances of less than 1MWh, to a much larger level such as 50MWh. This proposal has the advantage of being implementable as soon as P10. Our analysis of the price of accepted bids and offers, against the volume, shows little relationship of price to volume of call-off, apart from the spike of prices of <1MWh call-offs. Hence we believe that this proposal would have little overall impact on imbalance prices.

There are a number of sub-options of Proposal A, which could refine the basic definition of a 'short duration' Bid / Offer acceptance.

- (b) The maximum MW of Bid or Offer accepted could be used as a criterion. For example, an acceptance of less than 200MW could be seen as fine-tuning of the system, whereas an acceptance of greater than 200MW must have a major impact on the energy balance over the whole half-hour. We have examined the spread of maximum MW over a number of Bid / Offer acceptances during one week, and conclude that there is no natural level to set such a tolerance.
- (c) A variant of the above criterion, would be to impose a rule that no more than (say) 500MWh of Bid or Offer acceptances could be tagged as 'short duration' in any half-hour. Such a rule seems to us to be counter to the objective of a clear distinction between system and energy balancing actions, and would be complicated to design and implement.
- (d) Another consideration might be only to exclude 'short duration' acceptances, when they are in the opposite direction to the system length. Thus this modification would only affect System Buy Price when the system is long, and System Sell Price when the system is short. Again, this rule seems to us to be counter to the objective of a clear distinction between system and energy balancing actions.
- (e) Another criterion might be a direct test on the dynamic parameters of each accepted Bid / Offer. For example, any BOA whose run-up and run-down rate exceeded say 25 MW/minute would be always tagged as a system action. Apart from the issue that BSC Settlement has no current use of dynamic parameter data, we believe that such a rule might encourage participants to make careful selections of dynamic parameters of 24 or 26 MW/minute, in order to influence imbalance prices.
- (f) A further criterion could be used, that any short duration acceptance should also be called at a lead-time of less than (say) five minutes. This would reflect a concept that 'unplanned' actions should be system, whereas actions planned at a greater horizon should contribute to energy imbalance prices. However, such a rule would prevent short duration actions on certain BMUs, such as OCGTs and demand-side providers of standing reserve, which have to be called at up to 20 minutes notice, being tagged as system actions.