

How Imbalance Pricing works in the GB market

Introduction

1. The GB electricity market can be described as operating in three phases.

- Forward Markets
- The Balancing Mechanism
- Imbalance Exposure

This paper briefly outlines the way in which the Forward Markets and Balancing Mechanism work by way of context, before focussing in more detail on Imbalance pricing and exposure.

Background

The British electricity market arrangements are based on the principle of bilateral trading between generators, suppliers and traders who endeavour to match their final traded electricity contractual positions against their expected generation or demand in each half hourly settlement period of the day. Generation is predominantly self dispatched with regard for contractual position and consequently the System Operator role is that of a balancer of last resort. This entails the management of any residual demand/supply disequilibrium unresolved by participant's forward contracting activity. The System Operator also has a further obligation to manage the operation of the transmission system with regard to security of supply.

Forward Markets

The forward bilateral contracts & power exchange markets for firm delivery of electricity operate from a year or more ahead down until the market closes at a time defined as Gate Closure when the System Operator takes on the role of residual balancer. The markets provide the opportunity for a seller (generator) and buyer (supplier) to enter into contracts to deliver/take delivery, on a specified date, of a given quantity of electricity at an agreed price.

Participation in these markets and the purchase of electricity to cover expected metered positions is optional and formal disclosure of price is not required. However in order for BSC participants to be able to utilise these trades to offset any imbalance exposure they must be notified to a central administration agent prior to Gate Closure which occurs one hour before the real time settlement period. Approximately 95% of all electricity necessary to meet system demand is traded in this manner.

The Balancing Mechanism

The Balancing Mechanism operates from Gate Closure through to real time and is managed by the GB System Operator. It exists to ensure that supply and demand can be continuously matched or balanced in real time.

As the market moves towards the final balancing stage it is important to be able to assess the physical position of market participants to ensure security of supply is maintained effectively and efficiently. To this end, all market participants are required to inform the System Operator of their intended physical output position. Initial Physical Notifications (IPNs) are submitted at 11.00a.m at the day ahead stage. These are continually updated until Gate Closure when they become the Final Physical Notifications (FPNs). Market participants are also required to indicate the current maximum capacity of their unit in that particular settlement period. The summation of these notifications, along with estimates of demand forecasts and other relevant information, inform the SO as to any likely subsequent activity that the SO will need to engage in to maintain the demand /supply equilibrium.

The System Operator is the instigator and sole counter party to all transactions that take place in the Balancing Mechanism. Participation, which is optional, involves BSC participants submitting offers (proposed trades to increase generation or decrease demand) and/or 'bids'

(proposed trades to decrease generation or increase demand). The prices and volumes of each of these offerings indicate the value that participants have placed on being requested to move from the Final Physical Notification (FPN) declared at Gate Closure. The instruction to move a participant from one position to another must conform to the dynamic characteristics of the BM Unit as declared by the party at gate closure. The SO is obligated to accept these bids and offers in an economic and efficient manner and compensation for participants is on a pay as bid basis.

Imbalance Pricing and Exposure

The summation of the disparity between market participants notified contractual positions and their physical delivered or taken electricity indicates the level of energy imbalance on the system. It is this imbalance that must be resolved by the SO as the residual balancer. Participants are exposed to this contractual disparity at a level determined by one of two imbalance prices derived in each settlement period.

If a participant has a long position, that is to say the difference between contractual value and metered position has contributed to a surplus of electricity flowing on to the system, they are paid for that spill at System Sell Price (SSP).

If a participant has a short position, that is to say the difference between contractual value and metered position has contributed to a deficit of electricity flowing on to the system, they are charged for that short-fall at System Buy Price (SBP).

Imbalance prices are intended to be reflective of the cost incurred by the System Operator in its role of managing system imbalance. The methodology by which each of these dual imbalance prices is calculated in each settlement period depends on the direction of market imbalance in each particular settlement period.

Where the market is long the SSP is derived from a subset of the average price of actions instructed by System Operator to resolve that imbalance, be that through the acceptance of bids in the BM or other balancing services. Under these conditions the SBP, or the reverse price as it is designated in this scenario, is derived from an on the day power market index that is designed to reflect the value of energy traded on that day.

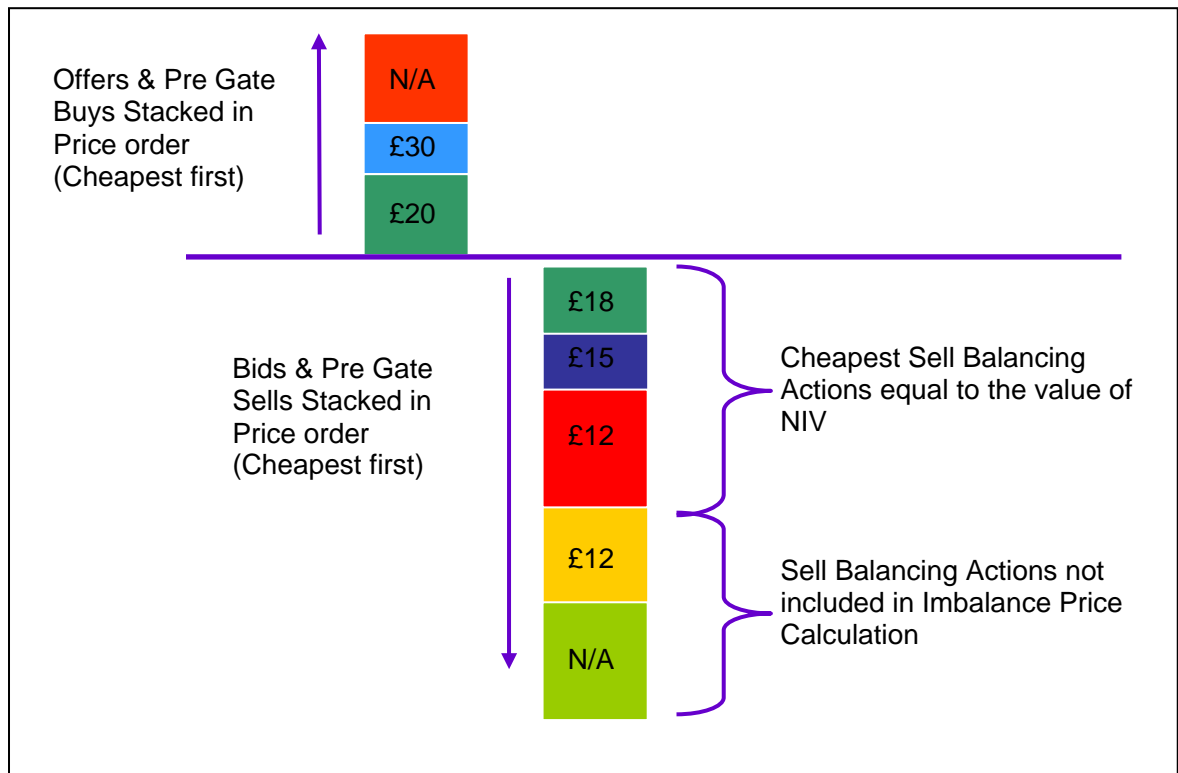
Where the market is short the SBP is derived from a subset of the average price of actions instructed by System Operator to resolve that imbalance, be that through the acceptance of offers in the BM or other balancing services. Under these conditions the SSP, or the reverse price as it is designated in this scenario, is derived from an on the day power market index that is designed to reflect the value of energy traded on that day.

For imbalance purposes, the direction on the market is determined by deriving the value of NIV (Net Imbalance Volume). This is the net MWh value of all actions taken by the System Operator in any settlement period and is the maximum volume of actions that can be utilised to derive the main imbalance price in each period.

Taking the example of a settlement period where NIV is long the following diagram provides a general description of the principles to derive SSP.

1. System Operator actions taken outside the BM are explicitly tagged as being used to resolve energy imbalance or for system reasons. Those for system reasons are deemed un-priced for the purposes of the price formula
2. All System Operator actions are then stacked in price order with those pre determined as system actions placed at the top of the respective buy and sell stacks.
3. The Value of NIV is derived by summing all buy and sell actions (All sell actions have a negative MWh volume)
4. The volume weighted average of the cheapest actions that meet the value of NIV are then calculated

5. If the market is long a value of SPA is then added on to this calculated price. SPA represents the value of sell option costs incurred by the system operator in it's management of energy imbalance.
6. If the market is short a value of BPA is then added on to this calculated price. BPA represents the value of buy option costs incurred by the system operator in it's management of energy imbalance.
7. The lack of a utilised procured volume associated with an option cost prohibits such a cost from being included in the NIV stack portion of the price mechanism



1. When the market is long SBP would be derived from a price index of on the day power exchange trades that covered the settlement period in question. The current Market Index Data Provider (MIDP) for this value is UKPX.
2. When the market is short SBP would be derived from a price index of on the day power exchange trades that covered the settlement period in question

BSC participants have no obligation to balance their contractual positions against expected demand or generation in any half-hour. It is the relative desire to avoid exposure to this imbalance at the expected imbalance price that drives the incentive to balance contractual positions and as such influences the behaviour of the market in relation to market imbalance.