ISG176-SPAR
REPORTING ON JANUARY 2016

ISSUE 3 – PUBLISHED 16 FEBURARY 2016

SYSTEM PRICE ANALYSIS REPORT

The System Prices Analysis Report (SPAR) provides a monthly update on price calculations. It is published with the Imbalance Settlement Group (ISG) documentation a week ahead of the ISG meeting.

This report provides data and analysis specific to System Prices and the Balancing Mechanism[1]. It demonstrates out-turn prices and the data used to derive the prices. The data is a combination of II and SF Settlement Runs.

In addition to the SPAR, a post-implementation review will be performed for changes under Modification P305 'Electricity Balancing Significant Code Review Developments'. This will be published in spring 2016.

1 SYSTEM PRICES AND LENGTH

This report covers the month of **January 2016**. Where available, data uses the latest Settlement Run (in most cases 'II' or 'SF').

In this report we distinguish between a 'long' and a 'short' market when analysing System Prices because the price calculation differs between two scenarios.

When the market is long, System Prices will be based predominantly on the System Operator's 'sell' actions such as Accepted Bids. When the market is short, System Prices will instead be based predominantly on the System Operator's 'buy' actions. This tends to result in prices 'flipping' between £40.00/MWh and £60.00/MWh when the System is short, and between around £20.00/MWh and £40.00/MWh when the System is long, reflecting the underlying value of Buy and Sell actions respectively.

	System Price (Long)				
Month	**Min**	**Max**	**Median**	**Mean**	**Std Dev**
January 2016	-35.00	43.29	28.14	27.06	6.90

	System Price (Short)				
Month	**Min**	**Max**	**Median**	**Mean**	**Std Dev**
January 2016	33.17	225.00	47.30	57.25	27.38

1.1 System Price summary by month (£/MWh)

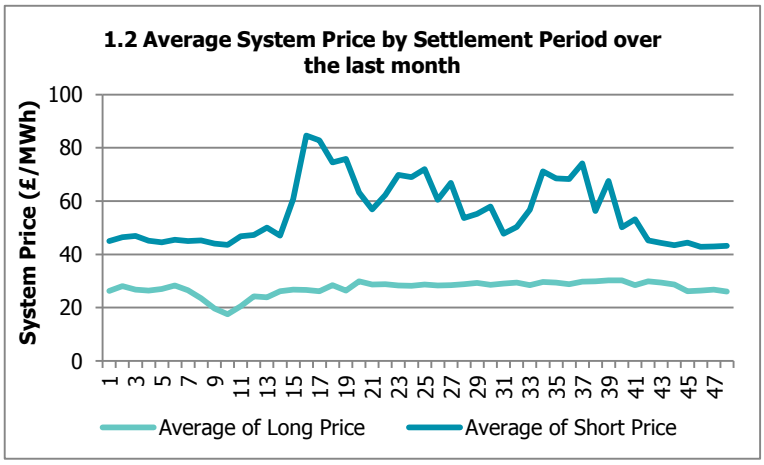
The lowest price in January was -£35.00/MWh, and occurred when the System was long at Settlement Period 19 on 3 January, and from Settlement Periods 8 to 11 on 26 January. These prices were all driven by negatively-priced Bids from coal plants. The highest price was £225.00/MWh and occurred when the system was short at Settlement Period 39 on 19 January 2016. The price was set by two Offers from one CCGT plant, priced at £225.00/MWh.

The standard deviation is higher for System Prices when the System is short. This reflects the price curve of Offers (and other Buy Actions), which tends to be steeper than that for Bids (and other Sell actions).

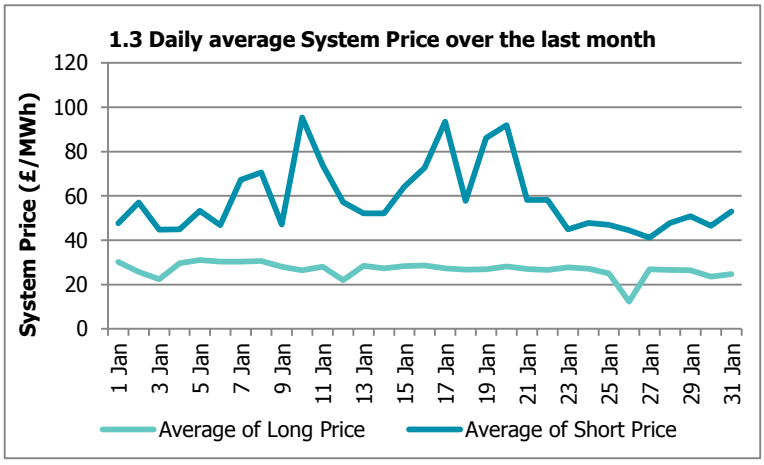
[1] For further detail of the imbalance price calculation, see our imbalance pricing guidance: https://www.elexon.co.uk/wp-content/uploads/2015/11/Imbalance_pricing_guidance_v9.0.pdfv

Graph 1.2 shows the variation of System Prices across the day. Prices when the market is long tend to be at their lowest between Settlement Periods 7 and 12, likely due to the predictably low demand pattern for this time of day. There is no clear peak in Long Prices.

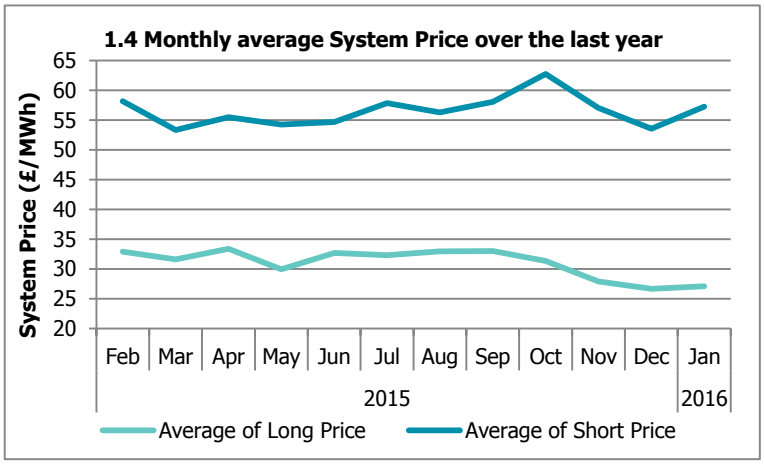
There are several obvious peaks in average prices when the market was short. The greatest peak this month was between Settlement Periods 16 to 19, during which time prices exceeded £100.00/MWh in 11 Settlement Periods. Accepted offers from four CCGTs made up 36% of priced volumes during these Settlement Periods.



Graph 1.3 shows daily average System Prices over the last month. The lowest daily average when the system was long was £12.33/MWh on 26 January. The highest daily average when the system was short was £95.39/MWh on 10 January.



Graph 1.4 shows the monthly average difference between System Prices when the system is long compared to when the system is short over the last year. For comparison, this represents the 'Main Price' rather than the 'Reverse Price' for Settlement Periods before the implementation of P305. On this average basis, System Prices have been relatively stable throughout the last year, with highest monthly average price when the system was short in October 2015, and the lowest monthly average price when the system was long in December 2015.



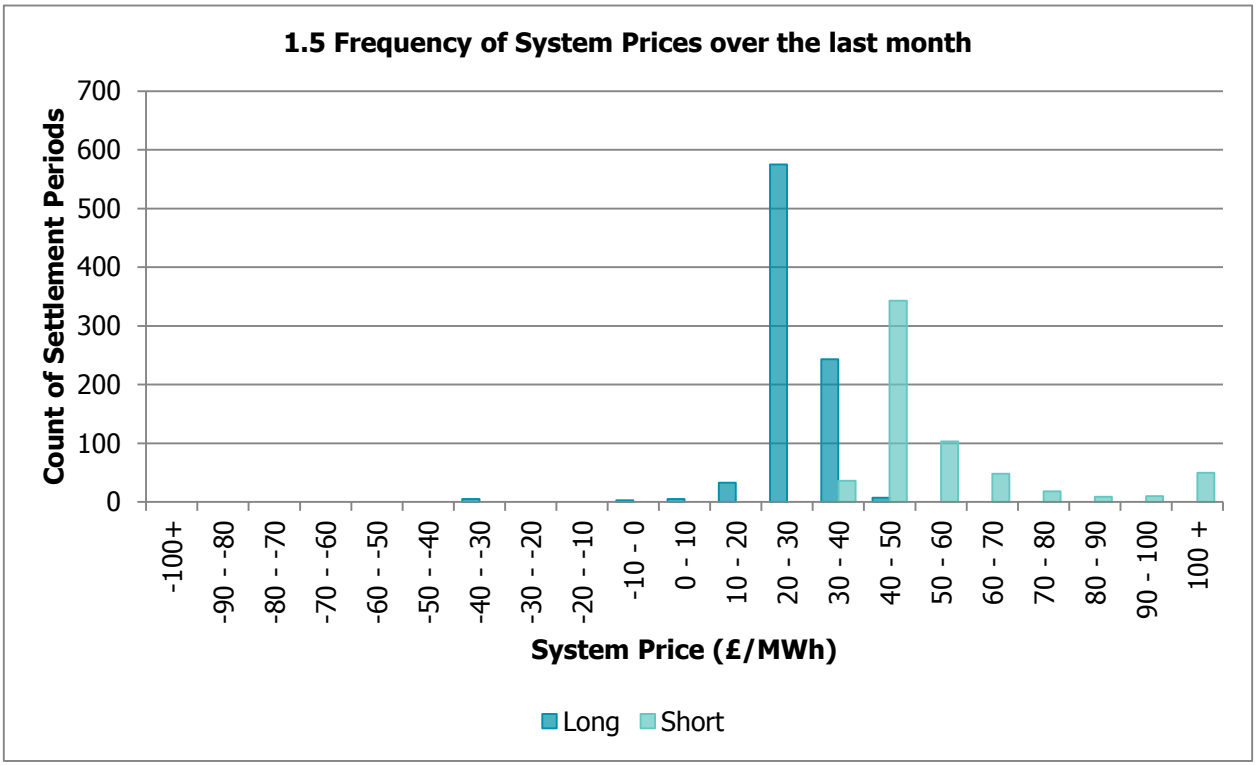
Graph 1.5 shows the distribution of System Prices across Settlement Periods in the last month when the market was long and short.

Overall, system Prices were between £20.00/MWh and £50.00/MWh in 81% of Settlement Periods. When the System was long 94% of prices were between £20/MWh and £40/MWh, whereas when the System was short 72% prices were between £40/MWh and £60/MWh. This distinction reflects the different kind of balancing actions in the priced volume depending on the system length. Prices did not rise above £50/MWh when the system was long.

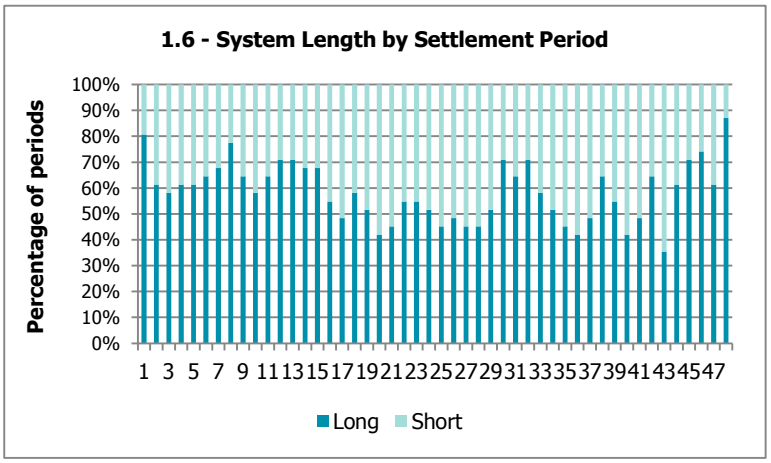
There were 50 Settlement Periods with System Prices above £100/MWh in January (3.36% of all Settlement Periods). The highest price was £225/MWh and occurred on 19 January 2016 at Settlement Period 39. The price was set by two actions from one gas CCGT plant, both priced at £225/MWh.

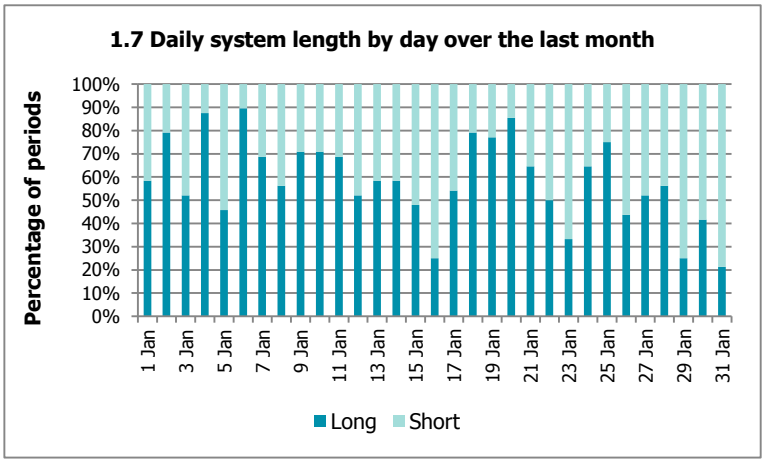
There were two incidents of £0/MWh prices at Settlement Periods 45 and 46 on 19 January 2016. These were as a result of two Balancing Service Adjustment Actions (BSAAs) priced at £0.00/MWh, of 1445.3MWh and 1430.63MWh respectively. However, following further investigation, National Grid has confirmed that the volumes were erroneous. The volumes reflect SO-SO trades with the French TSO and should be 23.86MWh and 23.53MWh respectively. The data has been resubmitted, and will be corrected for the R1 Settlement Run. Based on the data available, we estimate the imbalance price will be £27.53/MWh in both of these Settlement Periods.

There were 8 negative prices in January. Five of these were -£35/MWh, all of which were set by negatively-priced bids from coal plant in the priced volume.



Graph 1.6 shows system length by Settlement Period, and **graph 1.7** shows system length by day in January.





2 PARAMETERS

In this section we consider a number of different parameters on the price. We consider:

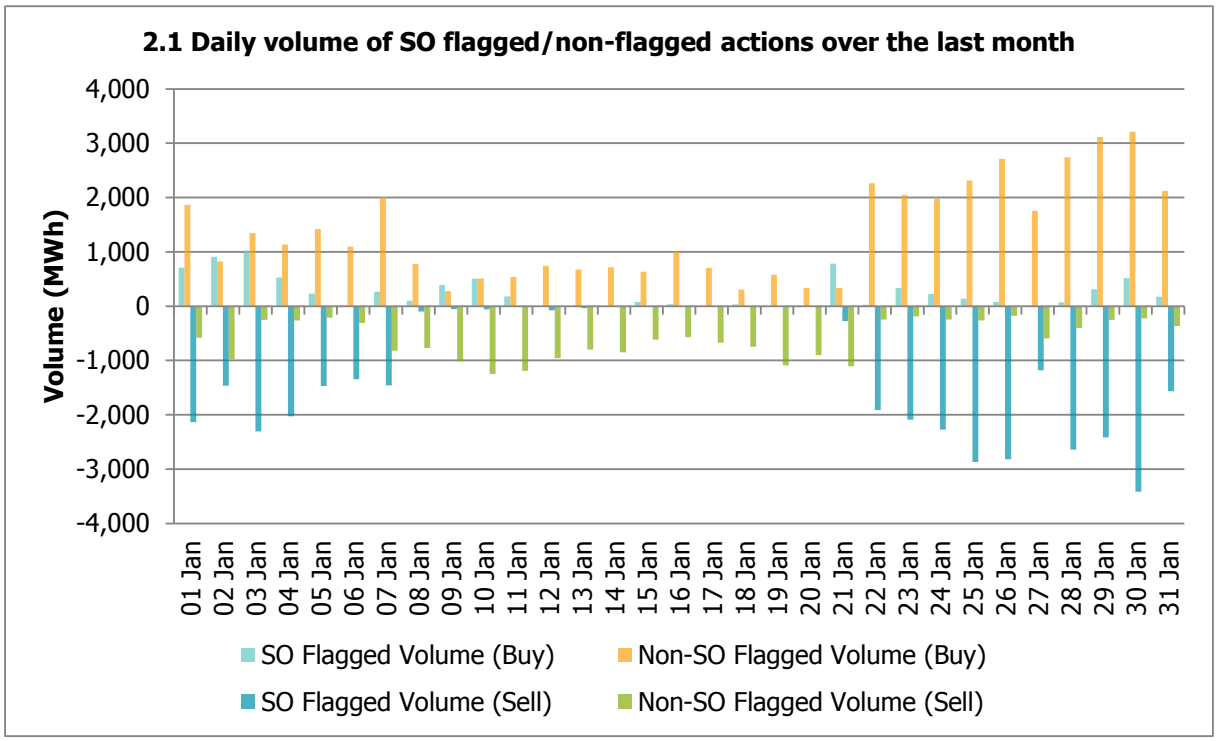
- The impact of flagging balancing actions;
- The impact of NIV tagging;
- The impact of PAR tagging;
- The impact of the Replacement Price; and
- How these mechanisms affect which balancing actions feed into the price.

Flagging

The imbalance price calculation aims to distinguish between 'energy' and 'system' balancing actions. Energy balancing actions are those which are related to the overall energy imbalance on the system. It is these actions which the imbalance price should reflect. System balancing actions are actions which relate to non-energy, system management actions (e.g. locational constraints).

Some actions are 'flagged'. This means that they have been identified as potentially being 'system related', but rather than removing them completely from the price calculation (i.e. tagging them) they may be re-priced, depending on their position in relation to the rest of the stack (this process is called Classification). Actions are flagged by the System Operator when they were taken to resolve a locational constraint on the transmission network (SO-flagging), or when they were taken to correct short-term increases or decreases in generation/demand (CADL Flagging).

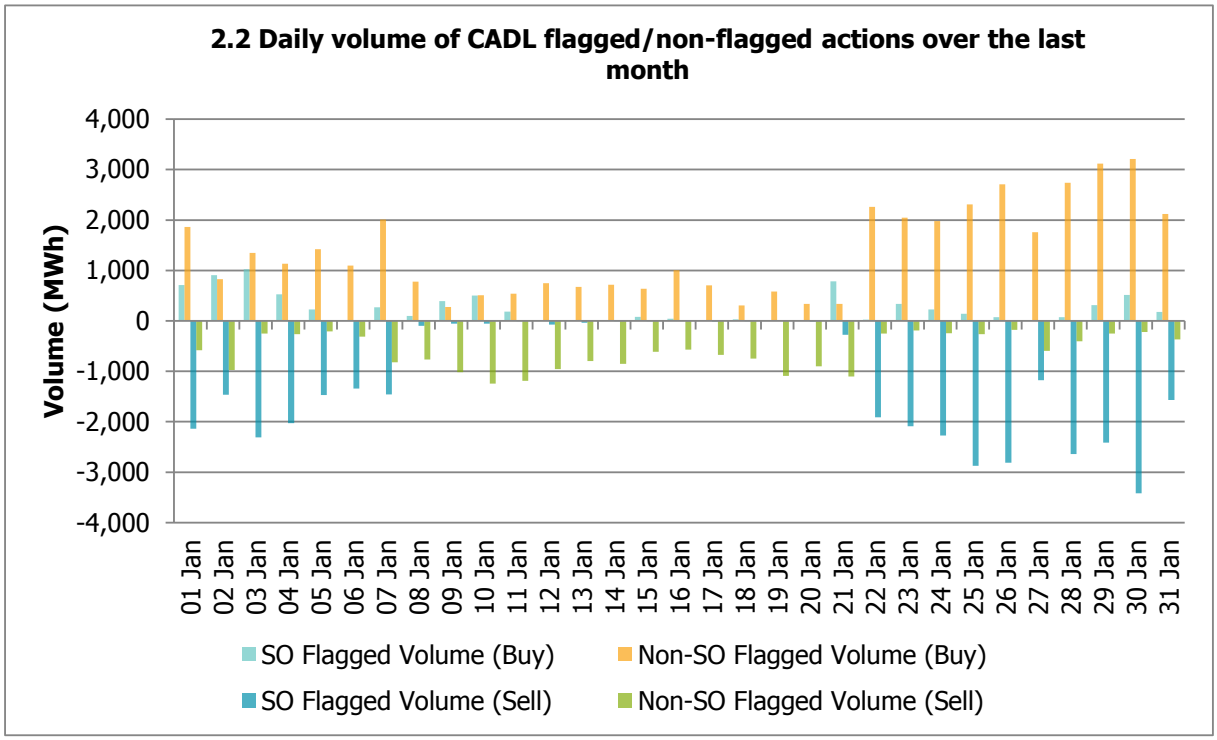
Graph 2.1 shows the volumes of buy and sell actions that have been flagged by the SO as being constraint related across the month, compared with volumes that were not SO-flagged.



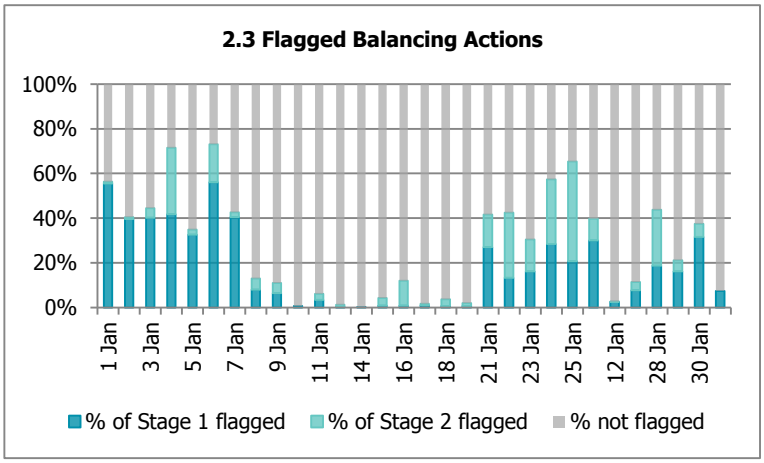
65.6% of the total volume of sell actions were SO-flagged in January, with 49% of these from coal plant, and 31% from wind plant. The average price of an SO-flagged sell action was -£57.68/MWh, and the most expensive flagged sell action was -£155.00/MWh.

15.4% of the total volume of buy actions were SO-flagged in January. 78% of flagged buy actions came from CCGTs. The average price of an SO-flagged buy actions was £44.85/MWh, and the most expensive flagged buy action was £500.

Graph 2.2 shows volumes of buy and sell actions which have been Continuous Acceptance Duration Limit (CADL) flagged. Any actions which are less than 15 minutes total duration (regardless of whether these span across different Settlement Periods) are CADL flagged.

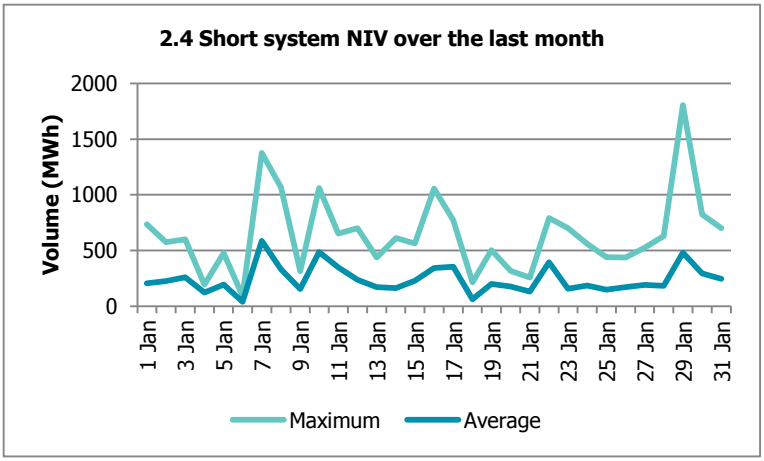


SO-flagged and CADL-flagged actions are known as 'first stage flagged'. First stage flagged actions may become 'second stage flagged' depending on their price in relation to other un-flagged actions. If a first stage flagged balancing action has a more expensive price than the most expensive first stage un-flagged balancing action it becomes second stage flagged. This means that it is considered a system balancing action and becomes unpriced. **Graph 2.3** shows first and second stage flagged actions as a proportion of all actions taken on the system. Note these are all balancing actions that were taken – only a proportion of these will feed through to the final price calculation.

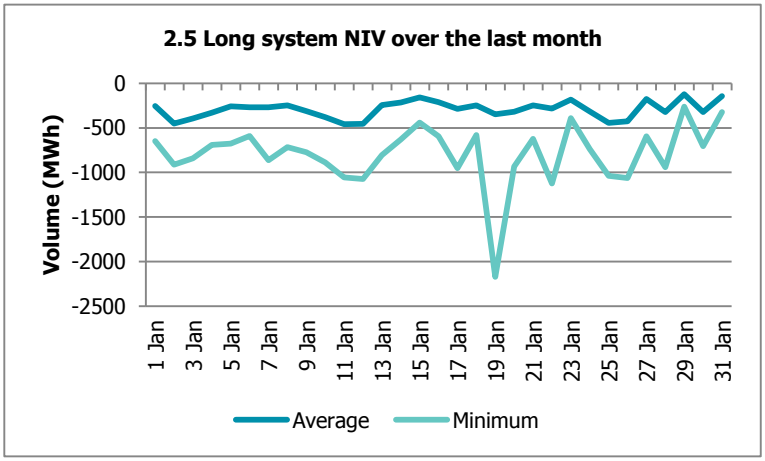


NIV and NIV tagging

The Net Imbalance Volume (NIV) represents the direction of imbalance of the System – ie whether the system is long or short overall. **Graph 2.4** shows the greatest and average NIV when the system was short and **graph 2.5** shows greatest and average NIVs when the system was short in January (short NIVs are depicted as positive volumes and long NIVs are depicted as negative volumes).



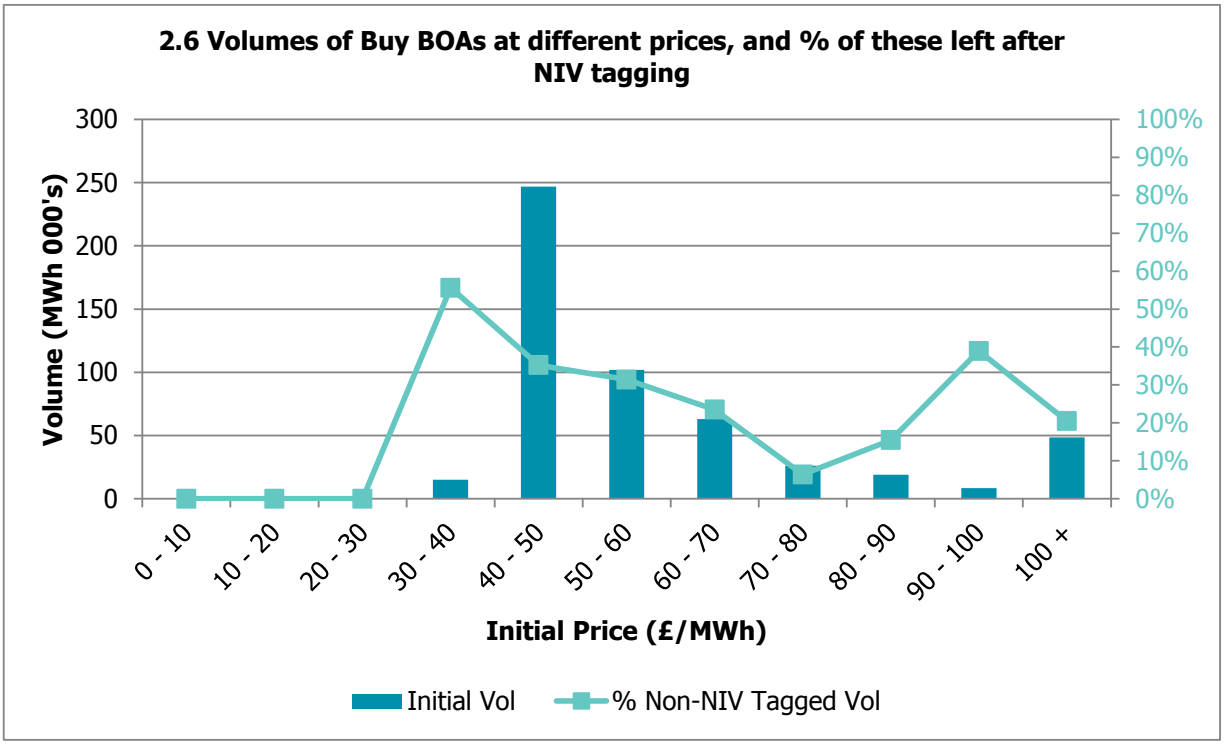
The lowest NIV was at Settlement Period 46 on 19 January. This was largely made up of a 1,430MWh BSAA action priced at £0.00/MWh. National Grid has confirmed that this volume is erroneous and the volume should be 23.53MWh. It will be corrected in time for the R1 Settlement run.



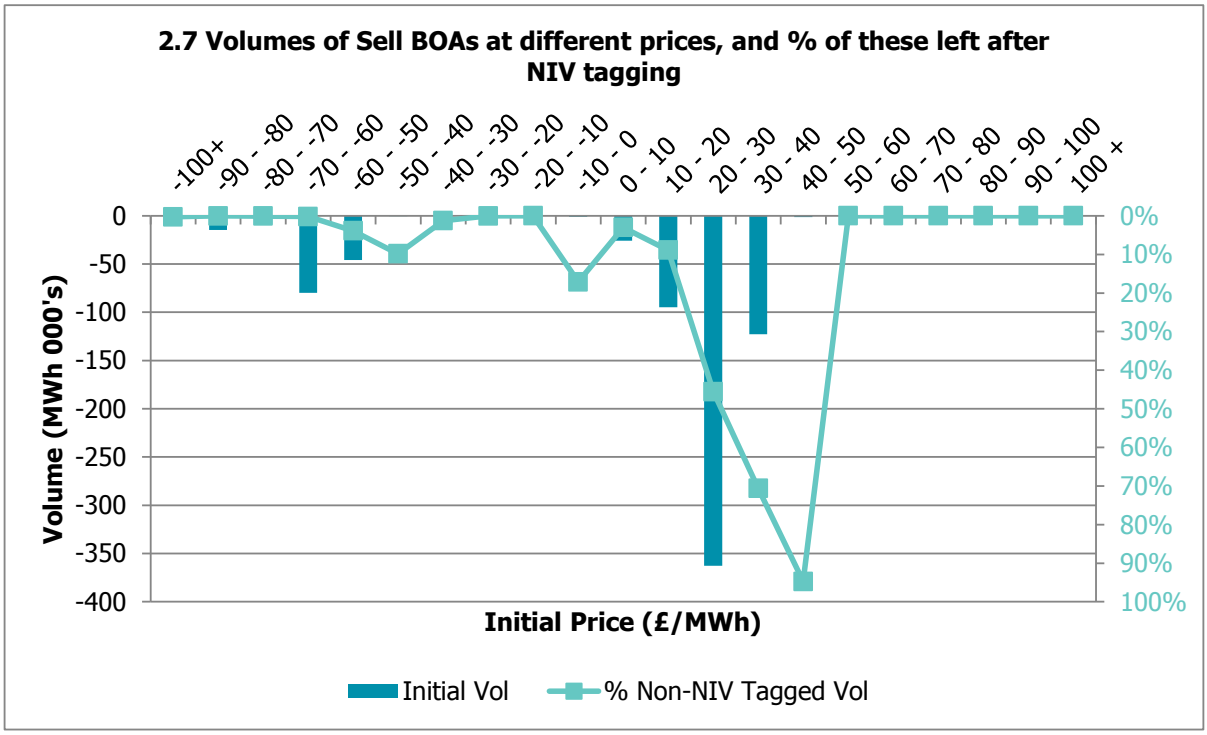
In almost all Settlement Periods the System Operator will need to take balancing actions in both directions (buys and sells) to balance the system. However for the purposes of calculating an imbalance price there can only be one imbalance in one direction (the Net Imbalance). 'NIV tagging' is the process which subtracts the smaller stack of balancing actions from the larger one to determine the Net Imbalance. It is from these remaining actions that the price is derived.

NIV tagging has a significant impact in determining which actions feed through to prices. 50% of actions were NIV tagged in January. Because the most expensive actions are NIV tagged first, NIV tagging has a dampening effect on prices when there are actions in both directions.

Graph 2.6 illustrates the impact of NIV tagging in determining which buy actions will be left in the price stack when the system was short. It shows the prices of buy actions, and which proportion of these will be left in the price calculation after the NIV-tagging step. These illustrate that a higher proportion of more expensive actions are excluded from the price stack as a result of NIV tagging.



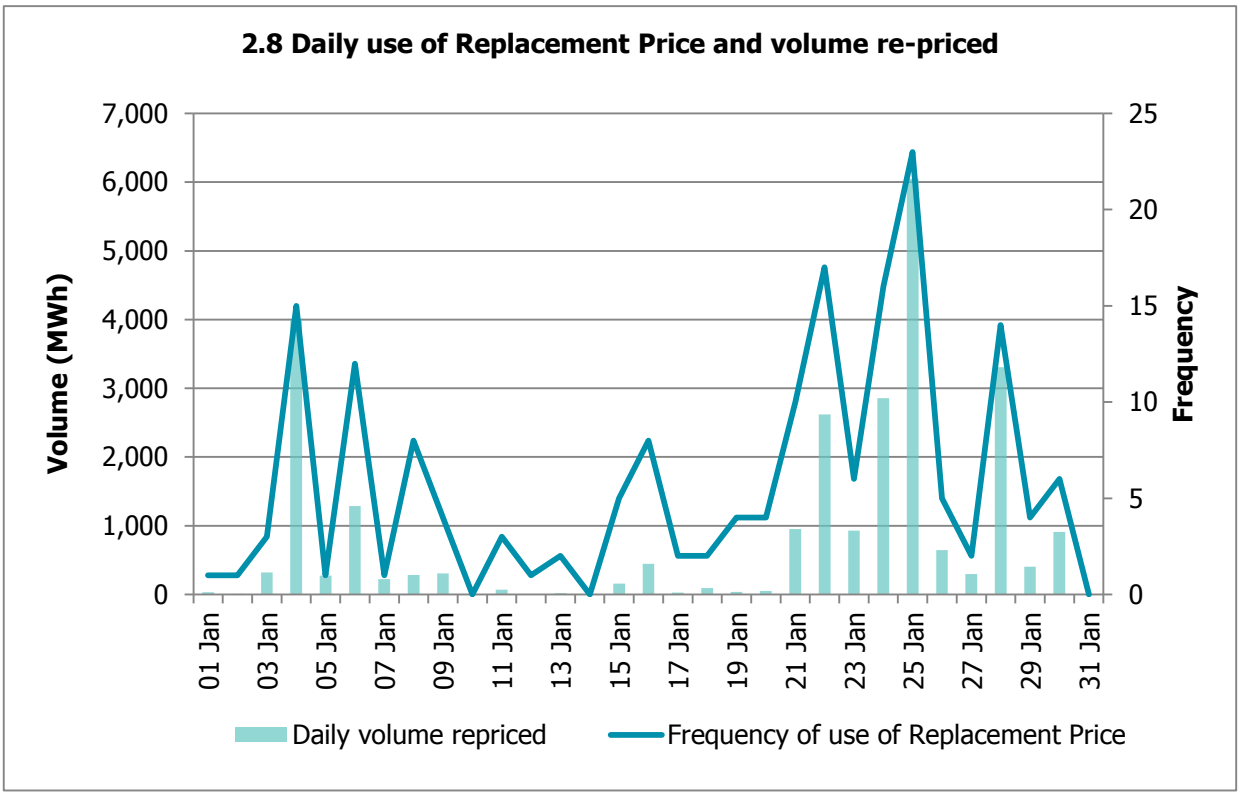
Graphs 2.7 illustrates the impact of NIV tagging in determining which sell actions will be left in the price stack when the system was long.



The Replacement Price

If there are 'second stage' flagged action volumes in the NIV these become unpriced. These actions can be considered to be 'out of merit' and therefore require a Replacement Price to bring their prices in line with the rest of the actions in the merit order (for the purposes of calculating the imbalance price). The Replacement Price is currently based on the most expensive 1MWh of un-flagged actions.

Graph 2.8 shows how frequently the Replacement Price was used to re-price actions left in the NIV, and what volumes these applied to.



The Replacement Price will impact the imbalance price if it is left in the PAR volume – the final 50MWh of actions which are averaged to determine the imbalance price. About 25% of the actions re-priced using the Replacement Price were also left in the PAR in January.

Of those actions left in the PAR, the average Replacement Price was £18.85/MWh when the system was long, and £77.35/MWh when the system was short.

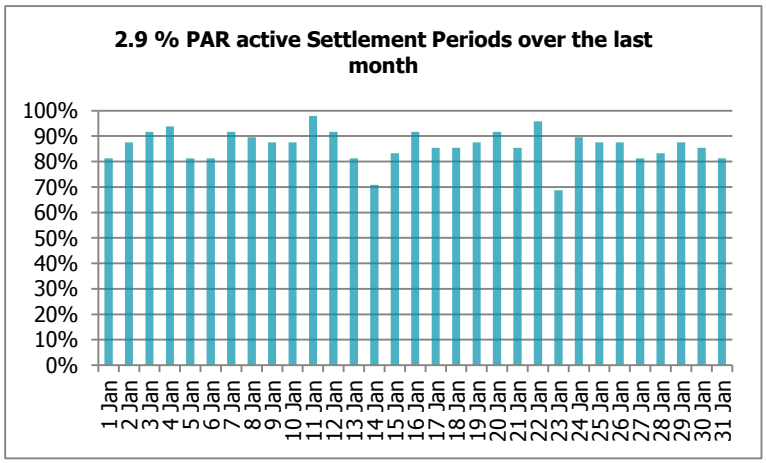
When the system was long, the most expensive action re-priced was -£150.00/MWh. This was a Bid from a pumped storage unit, and was re-priced with a Replacement Price of £24.00/MWh for the purposes of calculating the imbalance price.

When the system was short, the most expensive re-priced actions were £200.00/MWh. The Replacement Price was less than the initial price of the re-priced actions in all Settlement Periods.

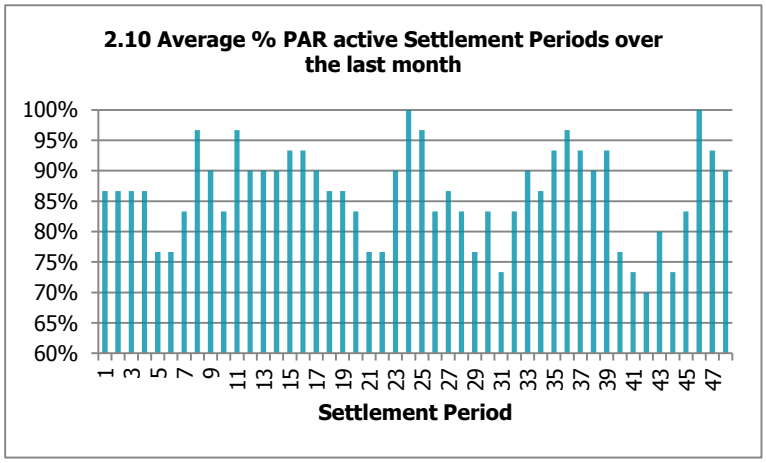
PAR tagging

PAR is the final step of the Imbalance Price calculation. It takes a volume weighted average of the most expensive 50MWh of actions left in the stack. While PAR is currently set to 50MWh, the PAR volume is due to decrease to 1MWh on 1 November 2018.

The impact of PAR tagging across the month can be seen in **graph 2.9**. When PAR tagging is active, this means that there were more than 50MWh of actions left in the NIV following the previous steps of imbalance price calculation.



Graph 2.10 shows the proportion of Settlement Periods over the last month when PAR tagging was active.

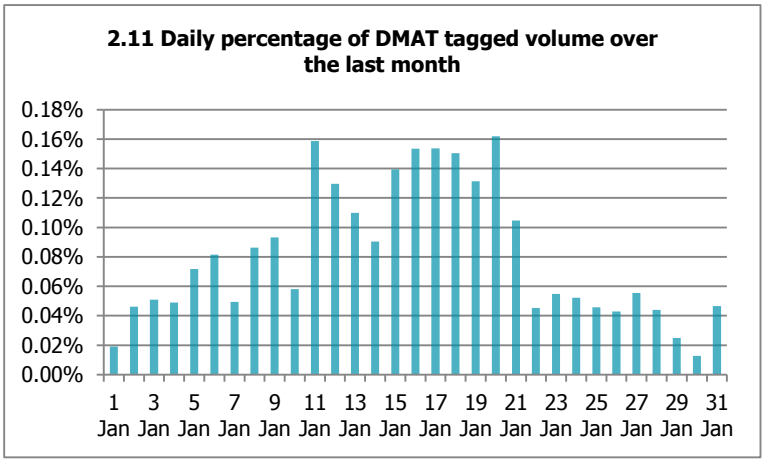


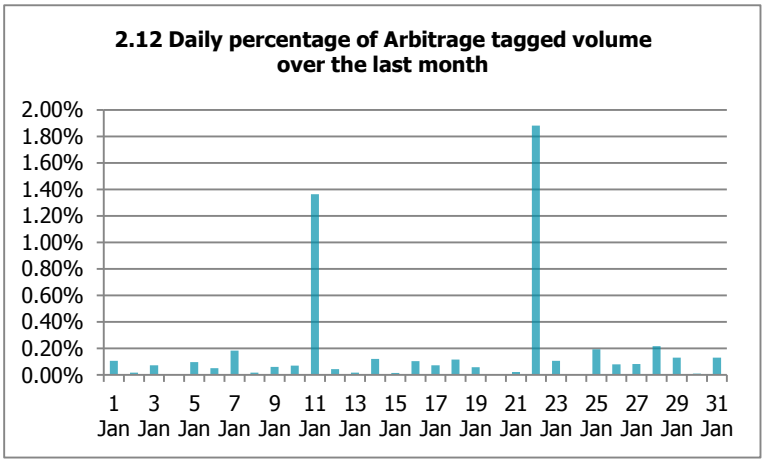
DMAT and Arbitrage Tagged Volumes

Some actions are always removed from the price calculation (before NIV tagging). These are actions which are less than 1MWh (De Minimis Acceptance Threshold (DMAT) tagging) and buy actions which are either the same price or lower than the price of sell actions (Arbitrage tagging).

Graph 2.11 shows the volumes of actions which were removed due to DMAT tagging.

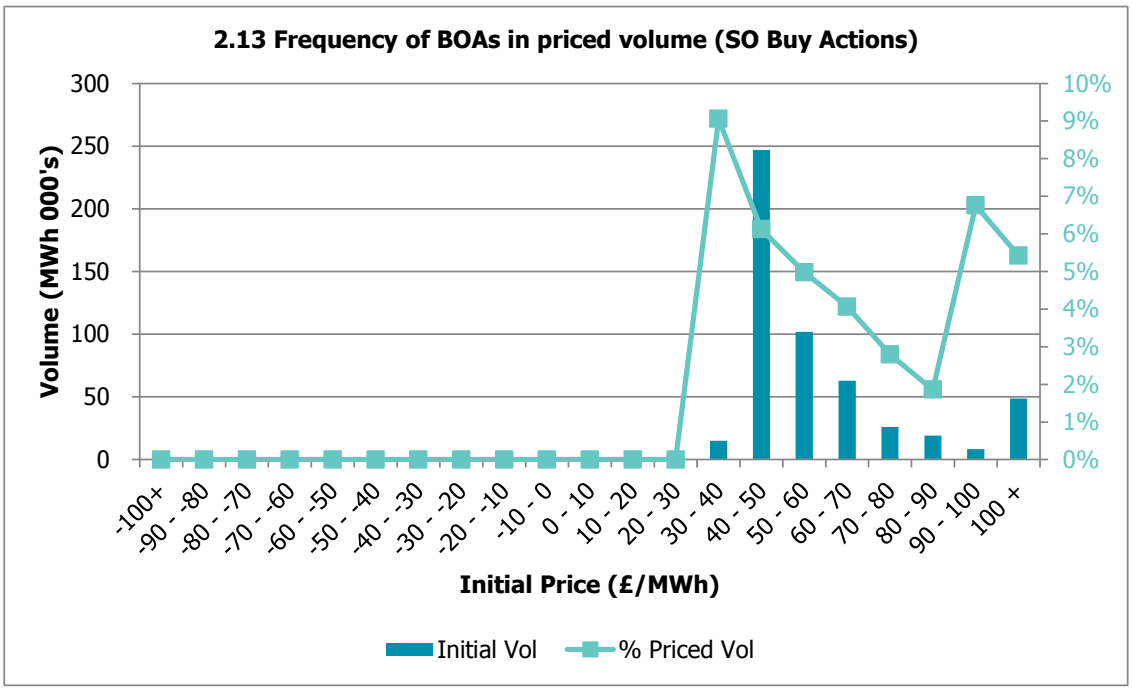
Graph 2.12 shows the volumes of actions that were removed to Arbitrage tagging.



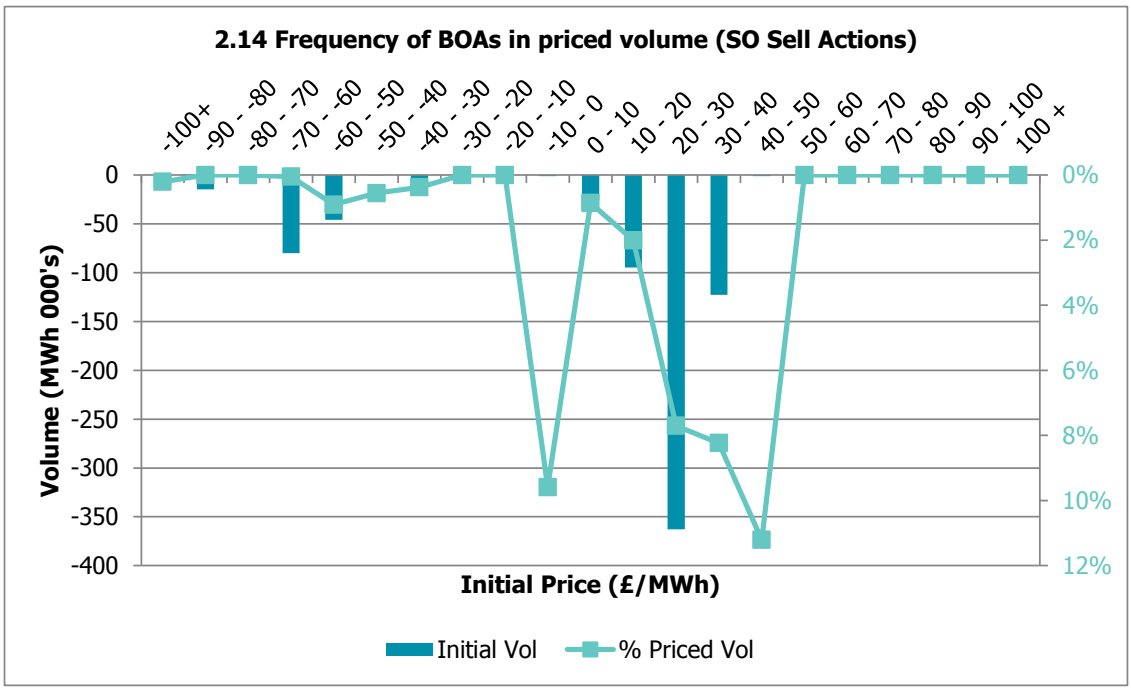


Impact of pricing rules on balancing actions reflected in the price

Next we consider the impact of these pricing rules on which actions feed through to the imbalance price calculation. Actions may not feed through to the imbalance price because of the impact of price calculation rules such as NIV and PAR tagging, flagging and replacement price. **Graph 2.13** shows buy actions as volumes (on the left axis) and what proportion of these were reflected in the imbalance price (on the right axis) when the system was short.

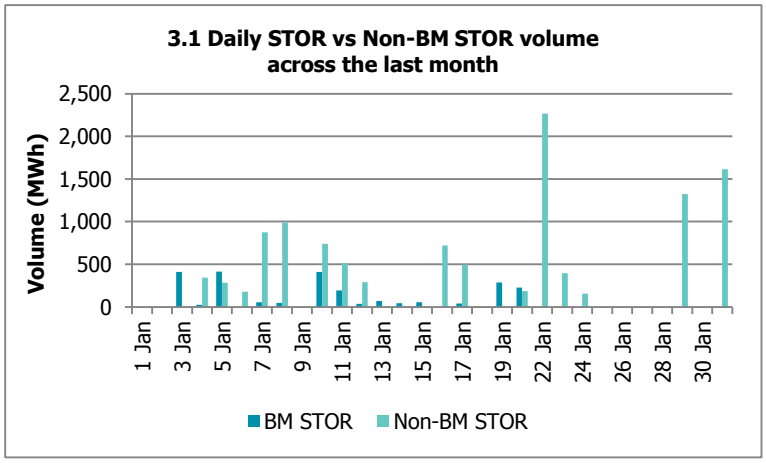


Graph 2.14 shows sell actions as volumes (on the left axis) and what proportion of these were reflected in the imbalance price (on the right axis) when the system was long.



3 BALANCING SERVICES

This section deals with the balancing services that the System Operator takes outside the Balancing Mechanism that can have an impact on the price.

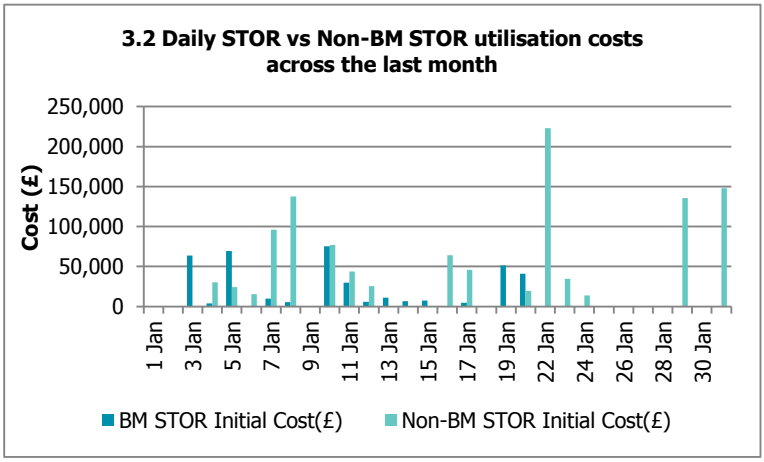


In addition to Bids and Offers available in the Balancing Mechanism, the SO can enter into contracts with providers of balancing capacity to deliver when called upon. These additional sources of power are referred to as reserve and most of the reserve that the SO procures is called Short Term Operating Reserve (STOR).

Under STOR contracts, availability payments are made to the balancing service provider in return for capacity being made available to the SO during specific times (STOR Availability Windows). When STOR is called upon, the SO pays for it at a pre-agreed price (its Utilisation Price). Some STOR is dispatched in the Balancing Mechanism (BM STOR) while some is dispatched separately (Non-BM STOR).

Graph 3.1 sets out volumes of Short Term Operation Reserve (STOR) that were called upon during the month – split into volumes dispatched via the Balancing Mechanism (BM STOR) and volumes dispatched outside the Balancing Mechanism (non-BM STOR). **Graph 3.2** shows the utilisation costs of this capacity[2].

Due to ongoing data issues, we cannot report on De-Rated Margin (DRM) or the Reserve Scarcity Price (RSP) this month. See ELEXON circular EL02381 for further detail.



[2] Due to issues with National Grid's reporting of non-BM STOR, volumes and prices of non-BM STOR are being aggregated into one volume and price per Settlement Period that non-BM STOR is used.

4 P305 - SPECIFIC ANALYSIS

This section compares live prices with two different pricing scenarios. First we consider what prices would look like with the **pre-P305 price calculation** to highlight the impact of P305. Before the implementation of P305, the price calculation had:

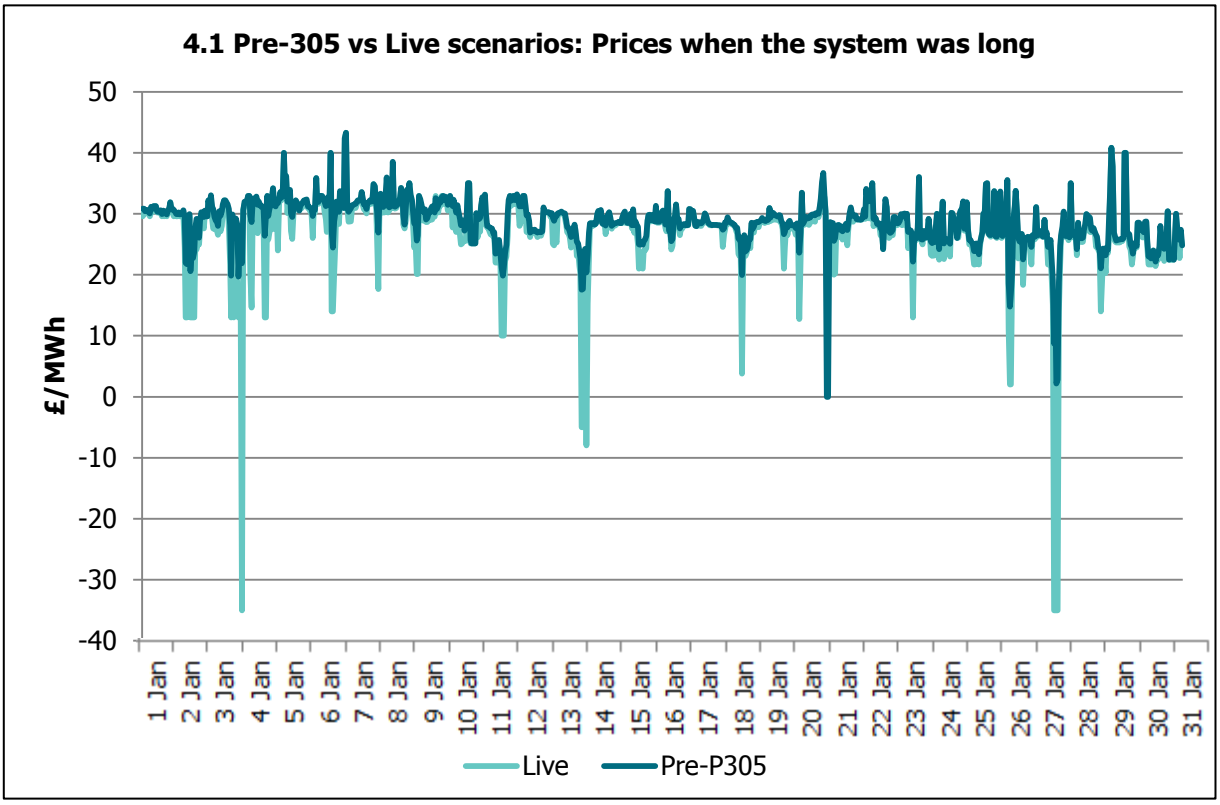
- A PAR of 500MWh, and an RPAR of 100MWh;
- No non-BM STOR volumes or prices included in the price stack;
- No RSP, and instead a Buy Price Adjuster (BPA) that recovers STOR availability fees; and
- No Demand Control, Demand Side Balancing Reserve (DSBR), or Supplementary Balancing Reserve (SBR) actions priced at VoLL.

We also consider the **November 2018 Scenario**, which captures the effect of changes to the imbalance price parameters that are due to come in on 1 November 2018. These are:

- A reduction in the PAR value to 1MWh (RPAR will remain at 1MWh);
- The introduction of a 'dynamic' LOLP function; and
- An increase in the VoLL to £6,000MWh, which will apply to all instances of VoLL in arrangements, including the RSP function.

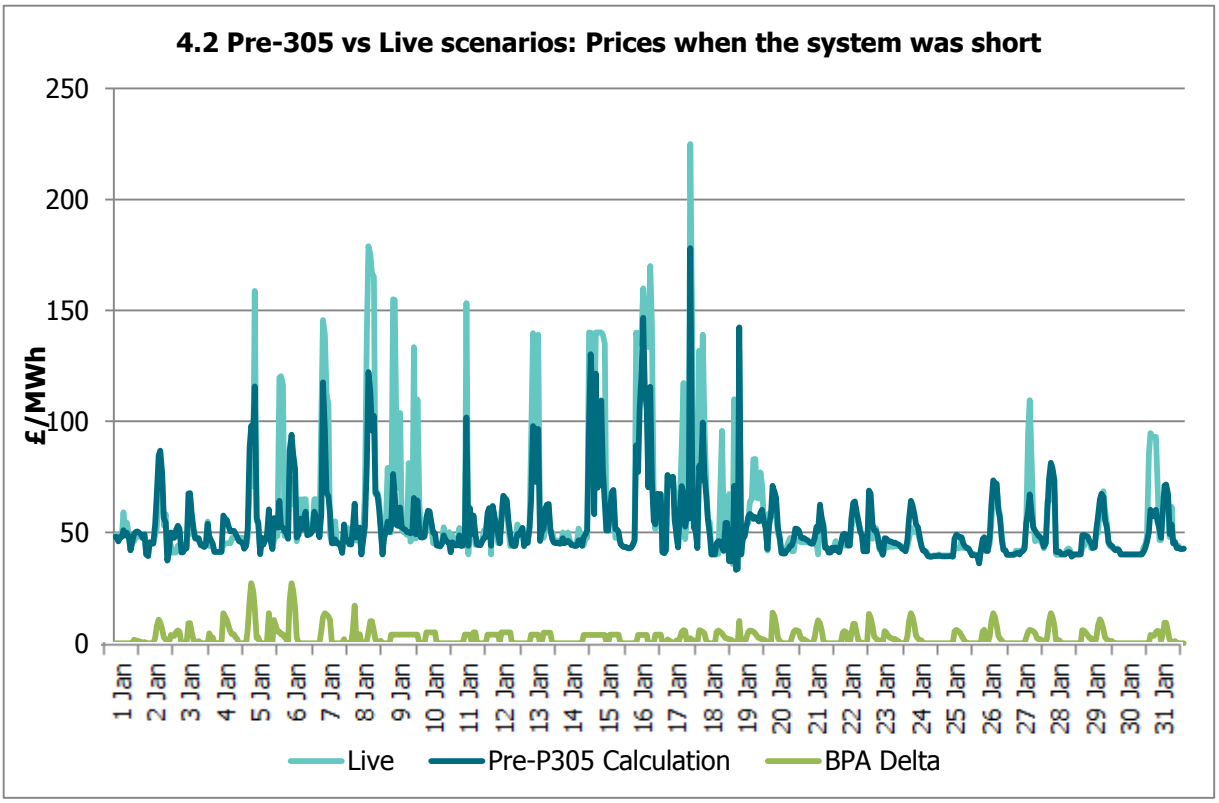
Pre-P305 Price Calculation

Graph 4.1 compares live System Prices when the system was long with prices re-calculated using the pre-305 pricing scenario (for comparison we use the Main Price calculation). On average, live prices were £1.54/MWh lower when the system was long compared to the pre-305 calculation. This is expected, in particular because of the reduction of PAR from 500MWh to 50MWh to make prices 'more marginal'.



When the system was long, prices were different in 80% of Settlement Periods, and live prices were either unchanged or lower when compared to the pre-P305 price scenario. 3% of Settlement Periods had changes in price that were greater than £5/MWh. The biggest 'shift' in prices was £56.90/MWh. This happened at Settlement Period 19 on 3 January when the price would have been £21.90/MWh under the old price calculation but was -£35.00/MWh under the live scenario. This was driven by the PAR value – under the pre-305 price scenario the larger PAR value meant that a 250MWh action from a coal BMU priced at £30.19/MWh was included in the price calculation. The smaller PAR in the live price scenario excluded this action, and the price was instead made up of negatively-priced offers from wind and coal units.

Graph 4.2 compares live System Prices when the system was short with prices re-calculated using the pre-305 pricing scenario (using the Main Price calculation). Prices were an average of £4.09/MWh higher when the system was short.



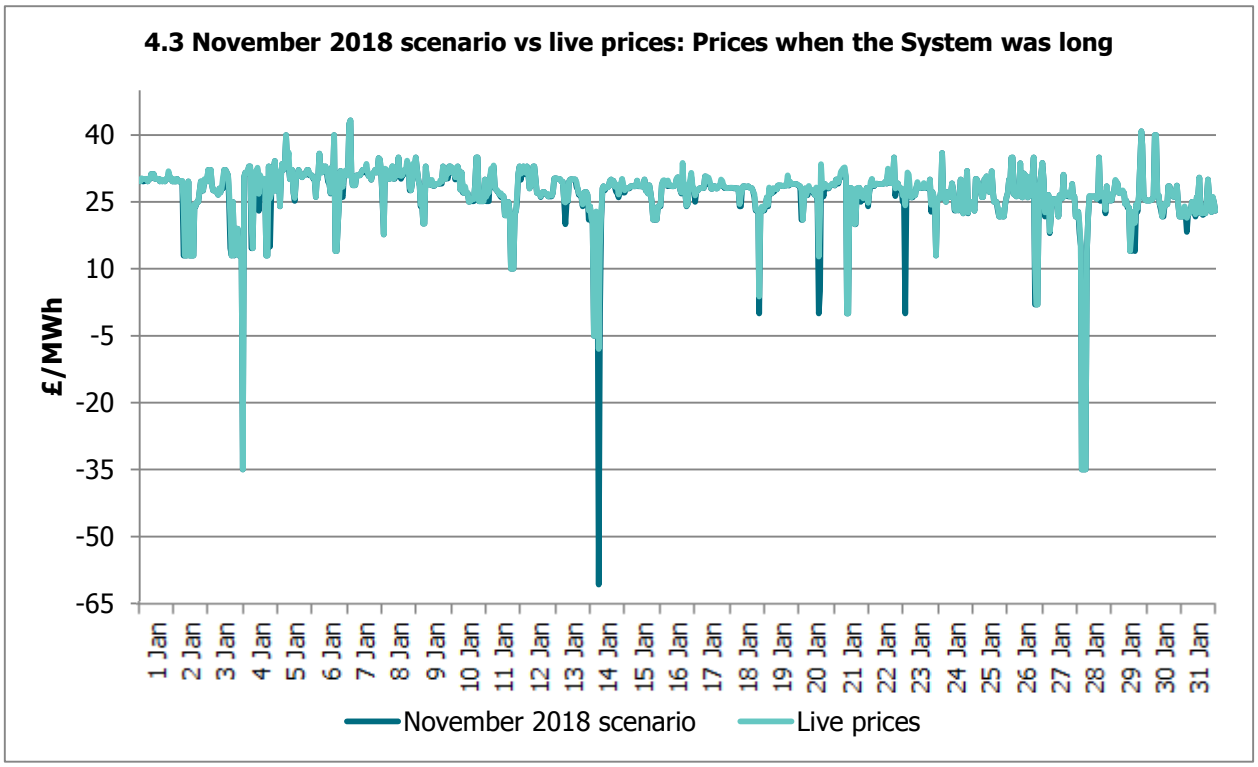
Despite the P305 changes to the price calculation to make prices 'more marginal,' 35% of live prices when the system was short were lower than pre-305 prices. These differences were driven by the removal of the portion of the Buy Price Adjuster (BPA) that was used to recover STOR availability fees – shown as 'BPA Delta' in graph 4.2. The proportion of the BPA related to STOR availability fees was removed when the RSP was introduced with P305. As a result, the magnitude and frequency of BPAs has decreased – BPAs applied to 5.5% of short periods in the live price scenario, whereas they would have applied to 54% of short periods in the pre-305 price scenario.

November 2018 Scenario

The average price differences across the month are relatively small under the November 2018 scenario – prices were £0.42/MWh lower when the system was long and £1.17/MWh higher when the system was short. There was no change in prices in 62% of Settlement Periods. When the system was long, prices were always the same or lower, and when the system was short prices were always the same or higher under the November 2018 scenario.

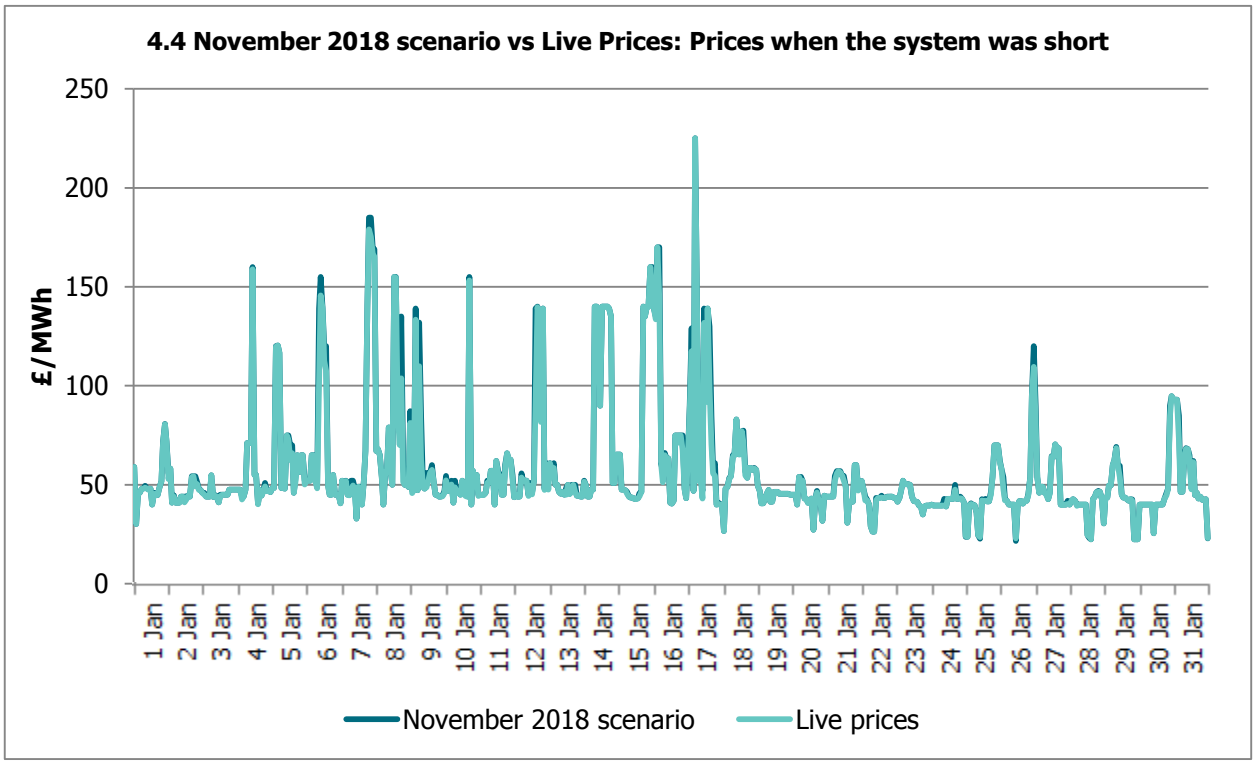
Graph 4.3 compares live System Prices with prices re-calculated using the November 2018 scenario when the system was long. Of those Settlement Periods that did change price under the November 2018 scenario the majority of these (63%) were when the system was long. However, the magnitude of the changes seen when the system was long was less than those when the system was short – price changes were less than £1/MWh in 85.3% of Settlement Periods when the system was long and 52% when the system was short.

4% of price changes were greater than £5/MWh when the system was long, with some notable shifts in price. The biggest shift in price was £52.80. This happened at Settlement Period 13 on 12 January when the price would have been -£60.75 under the November 2018 scenario, whereas the live system was price -£7.95.



Graph 4.4 compares live System Prices with prices re-calculated using the November 2018 scenario when the system was short. Prices would have been higher in 14% of Settlement Periods under the November 2018 scenario. Of those prices that did change, 18% of these changed by more than £5/MWh under the November 2018 scenario, and 9% by more than £10.00/MWh. The biggest shift in price was £47.98 at Settlement Period 15 on 15 January. The price would have been £139.00/MWh under the November 2018 scenario, whereas the live price was £91.02/MWh.

There were no Demand Control, DSBR or SBR actions taken during the month. Under the November 2018 scenario these actions would be priced at a VoLL of £6,000.00/MWh (rather than £3000.00/MWh).



5 GLOSSARY

Term	Abbrev.	Definition
Bid		A proposed volume band and price within which the registrant of a BM Unit is willing to reduce generation or increase consumption (i.e. a rate below their FPN).
Bid/Offer Acceptance	**BOA**	A Bid or Offer within a given Settlement Period that was Accepted by the SO. BOAs are used in the imbalance price calculation process e.g. to calculate NIV or the System Price.
Offer		A proposed volume band and price within which the registrant of a BM Unit is willing to increase generation or reduce consumption (i.e. a rate above their FPN).
System Price		A price (in £/MWh) calculated by BSC Central Systems that is applied to imbalance volumes of BSC Parties. It is a core component of the balancing and settlement of electricity in GB and is calculated for every Settlement Period. It is subject to change via Standard Settlement Runs.
Replacement Price		A price (in £/MWh) calculated by BSC Central Systems that is applied to volumes that are not priced during the imbalance pricing process (detailed in BSC Section T) It is calculated for every Settlement Period, and is subject to change via Standard Settlement Runs.
Utilisation Price		The price (in £/MWh) sent by the SO in respect of the utilisation of a STOR Action which: (i) in relation to a BM STOR Action shall be the Offer Price; and (ii) in relation to a Non-BM STOR Action shall be the Balancing Services Adjustment Cost.
Market Price		The Market Price reflects the price of wholesale electricity in the short-term market (in £/MWh). You can find an explanation of how it is calculated and used in the Market Index Definition Statement (MIDS).
Reserve Scarcity Price	**RSP**	Both accepted BM and non-BM STOR Actions are included in the calculation of System Prices as individual actions, with a price which is the greater of the Utilisation Price for that action or the RSP. The RSP function is based on the prevailing system scarcity, and is calculated as the product of two following values: · the Loss of Lost Load (LoLP), which will be calculated by the SO at Gate Closure for each Settlement Period; and · the Value of Lost Load (VoLL), a defined parameter currently set to £3,000/MWh.
Replacement Price Average Reference	**RPAR**	The RPAR volume is a set volume of the most expensive priced actions remaining at the end of the System Price calculation, and is currently 1MWh. The volume-weighted average of these actions, known as the Replacement Price, is used to provide a price for any remaining unpriced actions prior to PAR Tagging.
Long		In reference to market length, this means that the volume of Accepted Bids exceeds that of Accepted Offers
Short		In reference to market length, this means that the volume of Accepted Offers exceeds that of Accepted Bid
Net Imbalance Volume	**NIV**	The imbalance volume (in MWh) of the total system for a given Settlement Period. It is derived by netting Buy and Sell Actions in the Balancing Mechanism. Where NIV is positive, this means that the system is short and would normally result in the SO accepting Offers to increase generation/decrease consumption. Where NIV is negative, the system is long and the SO would normally accept Bids to reduce generation/increase consumption. It is subject to change via Standard Settlement Runs.