ISG207-SPAR

REPORTING ON JUNE 2018

ISSUE 32 – PUBLISHED 17 JULY 2018

SYSTEM PRICE ANALYSIS REPORT

The System Prices Analysis Report (SPAR) provides a monthly update on price calculations. It is published by the ELEXON Market Analysis Team to the Imbalance Settlement Group (ISG) and on the ELEXON Website ahead of the monthly 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.

The System Price Analysis Dashboard is available on the ELEXON website, and allows customers to model and compare System Prices under post 1 November 2018 scenario.

This month's SPAR contains an appendix on increased occurrence of the Replacement Price setting the System Price.

1 SYSTEM PRICES AND LENGTH

This report covers the month of June. 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 are based predominantly on the System Operator's 'sell' actions such as accepted Bids. When the market is short, System Prices are based predominantly on the System Operator's 'buy' actions. **Table 1.1** gives a summary of System Prices for June 2018, with values shown in £/MWh.

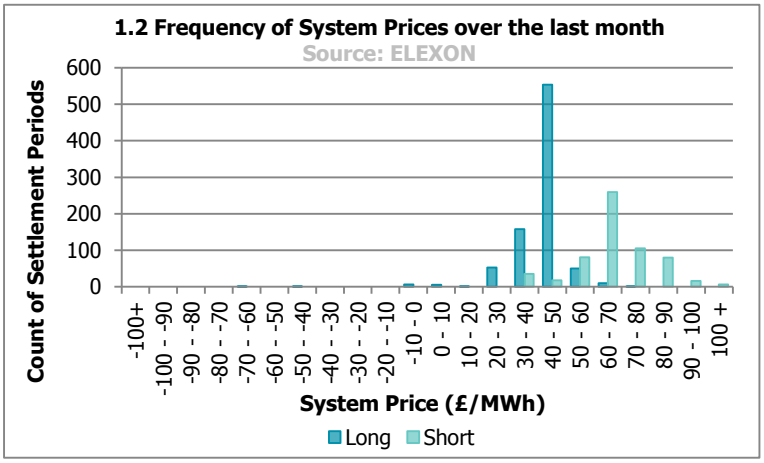
	System Price (Long)				
Month	**Min**	**Max**	**Median**	**Mean**	**Std Dev**
June 2018	-61.47	71.45	42.42	41.00	9.64

	System Price (Short)				
Month	**Min**	**Max**	**Median**	**Mean**	**Std Dev**
June 2018	37.35	148.50	66.11	67.41	13.73

1.1 System Price summary by month (£/MWh)

Graph 1.2 shows the distribution of System Prices across Settlement Periods in June 2018 when the market was long and short.

62% of System Prices were between £30/MWh and £60/MWh, regardless of system length. When the system was long, 85% of prices were between £30/MWh and £50/MWh. When the system was short, 61% of prices were between £60/MWh and £80/MWh and 1% of prices were over £100/MWh.



[1] For further detail of the Imbalance Price calculation, see our imbalance pricing guidance: https://www.elexon.co.uk/reference/credit-pricing/imbalance-pricing/

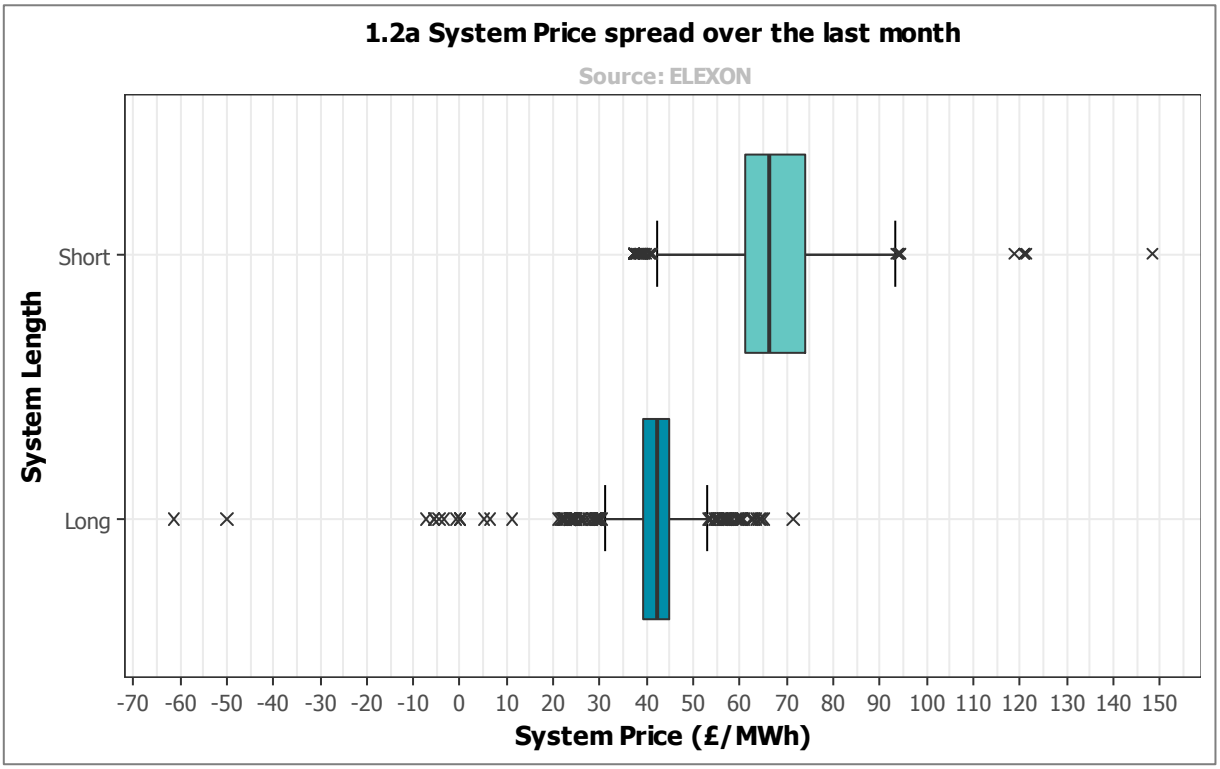
SYSTEM PRICE ANALYSIS REPORT

System Prices exceeded £100/MWh a total of six times (over two Settlement Days) in June 2018, compared to 37 times in May. The highest System Price of the month, £148.50/MWh, occurred in Settlement Period 34 on 4 June 2018. The price was set by an Offer from a Gas BMU priced at £148.50/MWh.

The lowest System Price of the month, -£61.47/MWh, occurred during Settlement Period 7 on 14 June. This price was set by a weighted average of negatively priced Bids from three Wind BMUs priced at -£63.51/MWh, and a Bid from a Biomass BMU priced at -£50/MWh.

Graph 1.2a displays the spread of System Prices in June 2018 as a box plot diagram, split between a short and long system. The middle line in each box represents the median System Price of the month, which is £66.11/MWh for short Settlement Periods and £42.42/MWh for long Settlement Periods. Each box edge represents the lower and upper quartiles (25th and 75th percentile respectively), with the Interquartile Range (difference between the Upper and Lower quartiles) being £13/MWh for short System Prices and £5.53/MWh for long System Prices.

Outliers are shown on the graph as crosses, and have been defined as being greater than 1.5 x the Interquartile Range away from the Upper and Lower quartiles. Under this definition, 112 of 600 short System Prices (19%) for June were outliers. The two lowest long System Prices of the month, -£61.47/MWh and -£50/MWh, are much lower than other long System Prices in June.



SYSTEM PRICE ANALYSIS REPORT

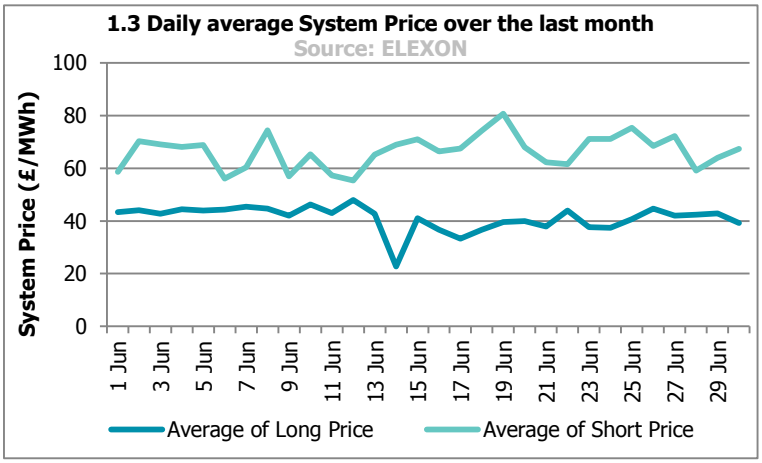
Graph 1.3 shows daily average System Prices over the last month. In June, the average System Price was £41.00/MWh when the system was long, and £67.41MWh when the system was short.

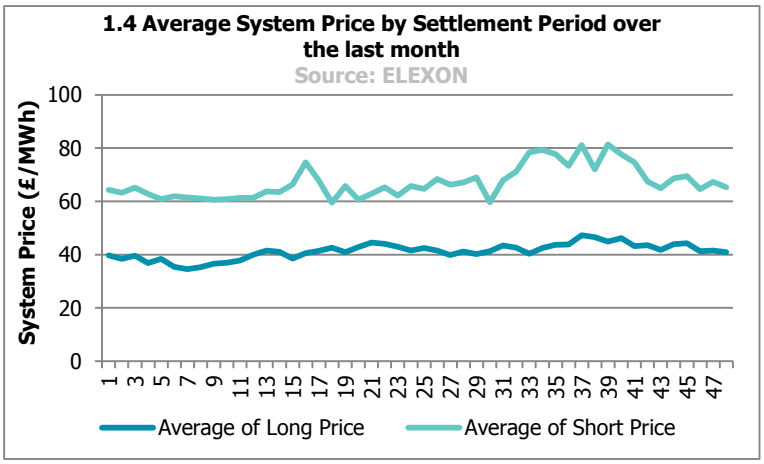
The highest daily average price when the system was short was £80.69/MWh, and occurred on 19 June. The system was short for 31 Settlement Periods on this day.

The lowest daily average price when the system was long was £22.71/MWh on 14 June 2018. The system was long in 26 Settlement Periods on this day.

Graph 1.4 shows the variation of System Prices across the day. Short prices were highest in Settlement Period 39, with long prices lowest in Settlement Period 7. The lowest average System Prices, regardless of market length, occurred during Settlement Period 10, when the System Price was £40.09/MWh.

Average long Settlement Period System Prices ranged between £34.60/MWh and £47.22/MWh. Average short Settlement Period prices varied more, from £59.31/MWh to £81.32/MWh.



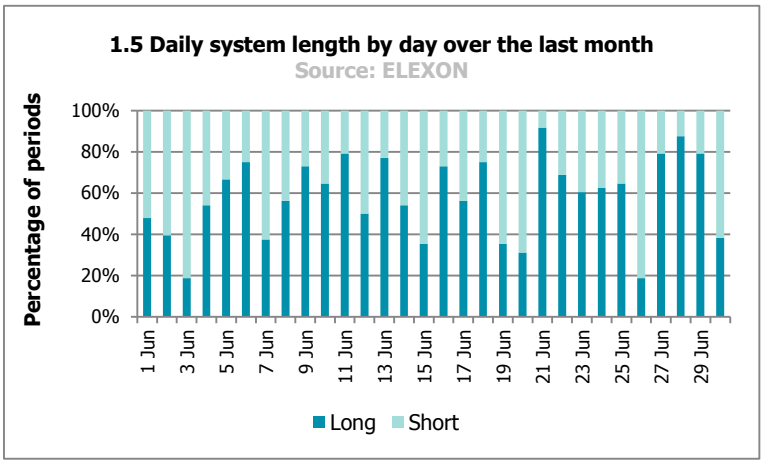


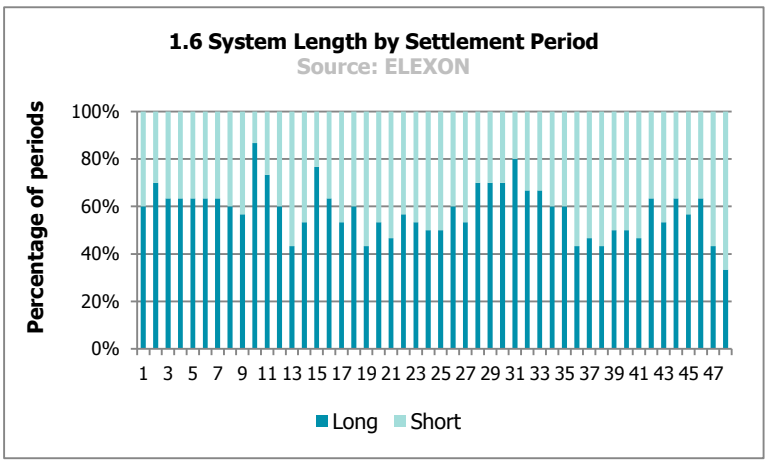
Graph 1.5 shows system length by day, and **Graph 1.6** shows system length by Settlement Period for June. The system was long for 58% of Settlement Periods in June, compared to 62% in May.

On 3 June and 26 June, the system was short for 81% of Settlement Periods. On 3 June, the average NIV when the system was short was 236MWh, while the average System Price in a short Settlement Period was £69.06/MWh. On 26 June, the average NIV when the system was short was 114MWh, while the average System Price in a short Settlement Period was £68.48/MWh.

On 21 June, the system was long in 92% of Settlement Periods.

Settlement Period 48 was short for 67% of the month, whilst Settlement Period 10 was short for 13% of the month.





2 PARAMETERS

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

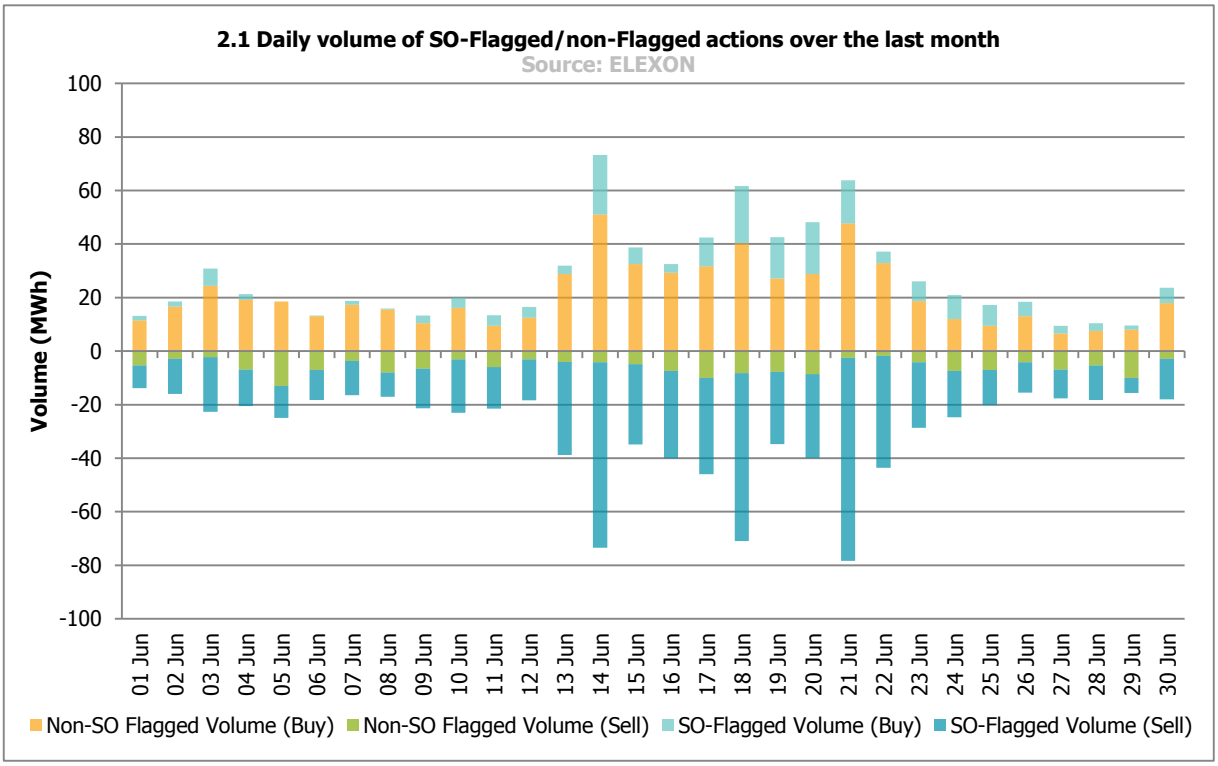
- The impact of Flagging balancing actions;
- The impact of NIV Tagging;
- The impact of PAR Tagging;
- The impact of the Replacement Price; and
- How these mechanisms affect which balancing actions feed into the price.

Flagging

The Imbalance Price calculation aims to distinguish between 'energy' and 'system' balancing actions. Energy balancing actions are those related to the overall energy imbalance on the system (the 'Net Imbalance Volume'). It is these 'energy' balancing actions which the Imbalance Price should reflect. System balancing actions 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 (a process called Classification). The System Operator flags actions when they are taken to resolve a locational constraint on the transmission network (SO-Flagging), or 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 in June 2018 as being constraint related. On 21 June, 97% of sell volume was SO-Flagged.



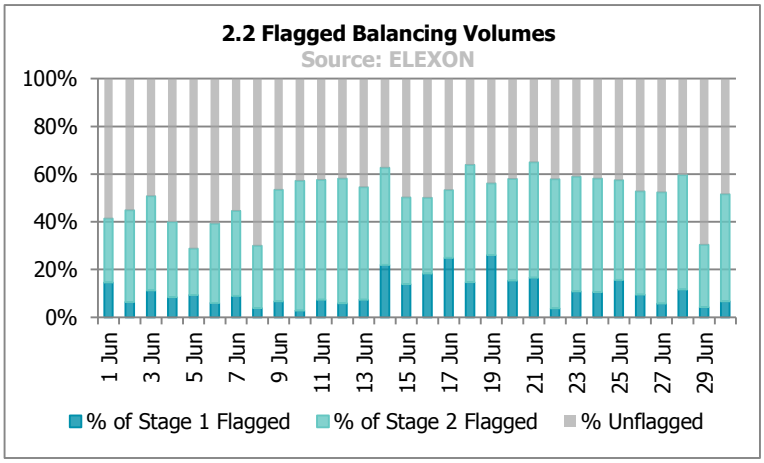
80% of sell balancing actions taken in June had an SO-Flag compared with 51% in May. 47% of SO-Flagged sell actions came from CCGT BMUs, 31% from Balancing Services Adjustment Actions (BSAAs) and 18% from Wind BMUs. The average initial price (i.e. before any re-pricing) of a SO-flagged sell action was -£18.86/MWh.

23% of buy balancing actions taken in June had an SO-Flag, compared to 18% in May. 70% of SO-Flagged buy actions came from BSAAs and 21% from CCGT BMUs. The average initial price of a SO-Flagged buy action was £85.63/MWh.

Any actions with a total duration of less than 15 minutes are CADL Flagged. 1% of buy actions and less than 1% of sell actions were CADL Flagged in June. The majority of CADL Flagged buy actions (89%) came from Pumped Storage BMUs. 63% of CADL Flagged sell actions came from CCGT BMUs, with Pumped Storage BMUs accounting for a further 36%.

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 Unflagged actions. If a First-Stage Flagged balancing action has a more expensive price than the most expensive First-Stage Unflagged balancing action, it becomes Second-Stage Flagged. This means it is considered a system balancing action and becomes unpriced.

Graph 2.2 shows First and Second-Stage Flagged action volumes as a proportion of all actions taken on the system. Note these are all the accepted balancing actions – only a proportion of these will feed through to the final price calculation.



The Replacement Price

Any Second-Stage Flagged action volumes left in the NIV will be repriced using the Replacement Price. In total, 81% of sell actions in June were Flagged. Of these, 19% were assigned a Replacement Price.

The Replacement Price is either based on the Replacement Price Average Reference (RPAR currently based on the most expensive 1MWh of Unflagged actions) or if no Unflagged actions remain after NIV Tagging, the Market Index Price (MIP). In June, 364 Settlement Periods had a Replacement Price based on the RPAR and 141 Settlement Periods had a Replacement Price based on the MIP. However the majority of Settlement Periods (65%) did not have a Replacement Price.

Sell actions will typically have their prices revised upwards by the Replacement Price for the purposes of calculating the System Price. In June, the average original price of a Second-Stage Flagged repriced sell action was £33.78/MWh and the average Replacement Price for sell actions (when the System was long) was £43.98/MWh.

25% of buy actions were Flagged; of these 2% had the Replacement Price applied. Buy actions will typically have their prices revised downwards by the Replacement Price. The average original price of a buy action with the Replacement Price applied was £68.29/MWh, and the average Replacement Price was £65.85/MWh.

If there are no Unflagged actions remaining in the NIV, the Replacement Price will default to the Market Index Price. This occurred in 141 long Settlement Periods in June, compared to 43 long Settlement Periods last month. This is discussed in more detail in the appendix.

NIV and NIV Tagging

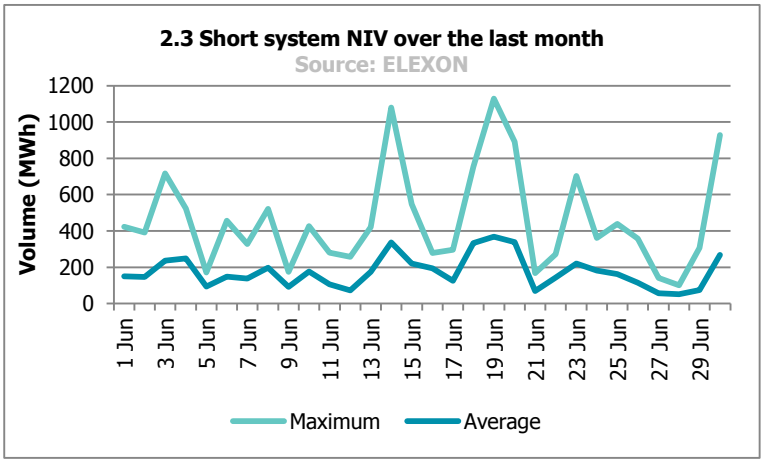
The Net Imbalance Volume (NIV) represents the direction of imbalance of the system – i.e. whether the system is long or short overall. **Graph 2.3** shows the greatest and average NIV when the system was short, and **Graph 2.4** shows the greatest and average NIVs when the system was long. Note short NIVs are depicted as positive volumes and long NIVs are depicted as negative volumes.

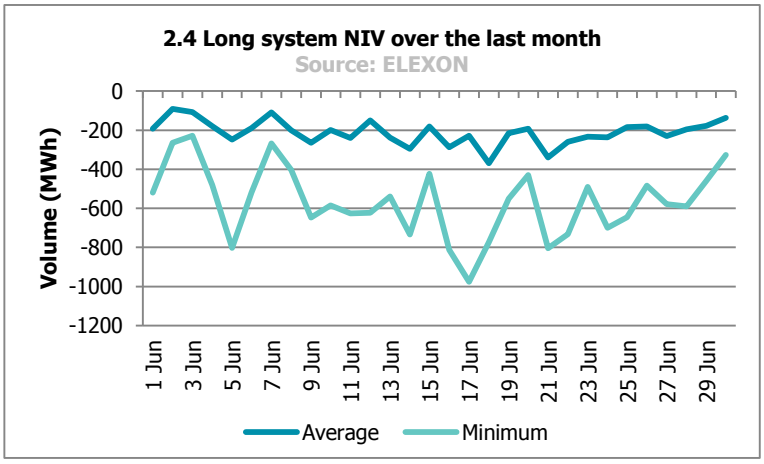
In almost all Settlement Periods, the System Operator will need to take balancing actions in both directions (buys and sells) to balance the system. However, for the purposes of calculating an Imbalance Price there can only be one imbalance in one direction (the Net Imbalance). 'NIV Tagging' is the process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

NIV Tagging has a significant impact in determining which actions feed through to prices. In June, 80% of volume was removed due to NIV tagging. The most expensive actions are NIV Tagged first; hence NIV Tagging has a dampening effect on prices when there are balancing actions in both directions.

The maximum short system NIV of the month (1128MWh) was seen on 19 June in Settlement Period 47. The System Price was £91.00/MWh in this Settlement Period.

The minimum long system NIV of the month was -975MWh, on 17 June 2018 during Settlement Period 2 when the System Price was £21.66/MWh.

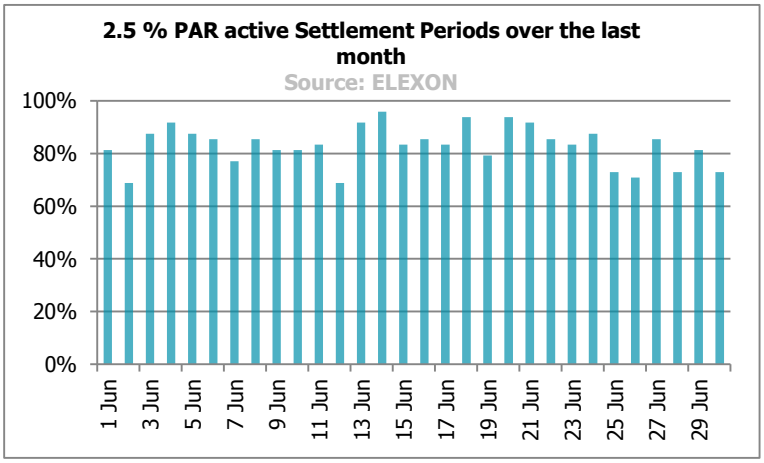




PAR Tagging

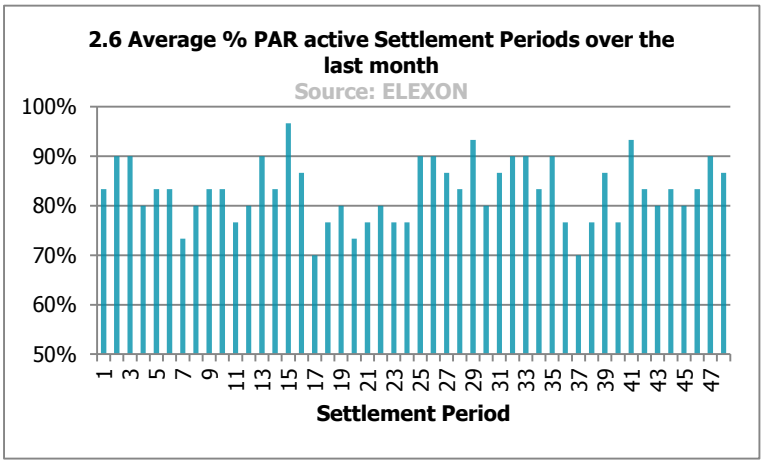
PAR is the final step of the Imbalance Price calculation. It takes a volume weighted average of the most expensive 50MWh of actions left in the stack. PAR is currently set to 50MWh, but is due to decrease to 1MWh on 1 November 2018.

Graph 2.5 shows the impact of PAR Tagging across the month. PAR Tagging is active when there are more than 50MWh of actions left in the NIV following the previous steps of Imbalance Price calculation. Only the most expensive 50MWh are used in the calculation, so any volumes greater than 50MWh are 'PAR Tagged' and removed from the Imbalance Price calculation stack. PAR was active for 83% of Settlement Periods in June.



Graph 2.6 shows the proportion of Settlement Periods over the last month when PAR Tagging was active. Settlement Periods 17 and 37 had the lowest active PAR Tagging in June 2018 with 70%, representing the NIV being smaller in this period or the system being more balanced as a whole prior to System Operator balancing activity.

No Settlement Periods had PAR Tagging active every day during June.



DMAT and Arbitrage Tagged Volumes

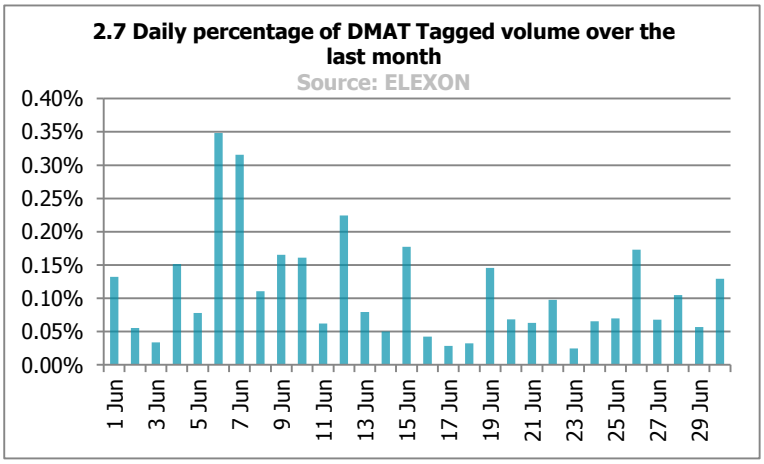
Some actions are always removed from the price calculation (before NIV Tagging). These are actions which are less than 1MWh (De Minimis Acceptance Threshold (DMAT) Tagging) or buy actions which are either the same price or lower than the price of sell actions (Arbitrage Tagging).

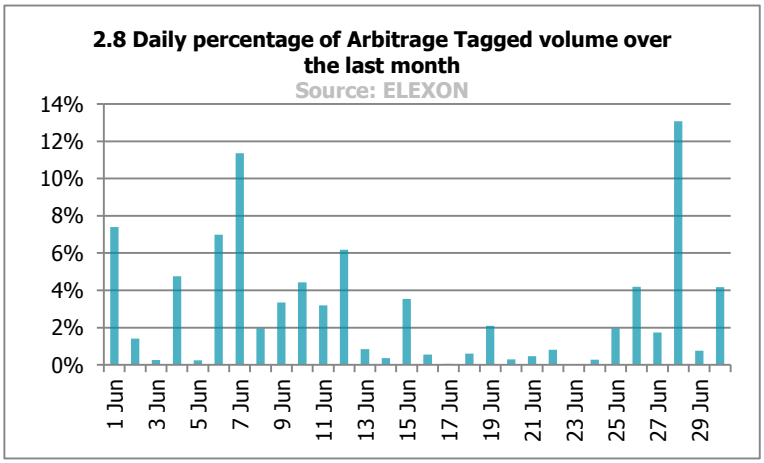
Graph 2.7 shows the volumes of actions removed due to DMAT Tagging. 0.09% of total buy and sell volume was removed by DMAT Tagging in June. 56% of DMAT Tagged volume came from Balancing Services Adjustment Actions (BSAAs), whilst 28% came from CCGT BMUs.

Graph 2.8 shows the volumes of actions that were removed due to Arbitrage Tagging. 51% of Arbitrage Tagged volume was from BSAAs, with 40% from CCGT BMUs.

In June, the average initial price of an Arbitrage Tagged buy action was £38.10/MWh, and for a sell action was £41.85/MWh. The maximum price of an Arbitrage Tagged sell action was £270.19/MWh, and the lowest priced Arbitrage Tagged buy action was £0/MWh.

On 28 June 2018, 3,755MWh of actions were Arbitrage Tagged, representing 13.07% of daily volume. The average price of an Arbitrage Tagged buy action was £34.95/MWh, and for a sell action was £37.46/MWh.





3 BALANCING SERVICES

Short Term Operating Reserve (STOR) costs and volumes

This section covers the balancing services that the System Operator (SO) takes outside the Balancing Mechanism that can affect 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).

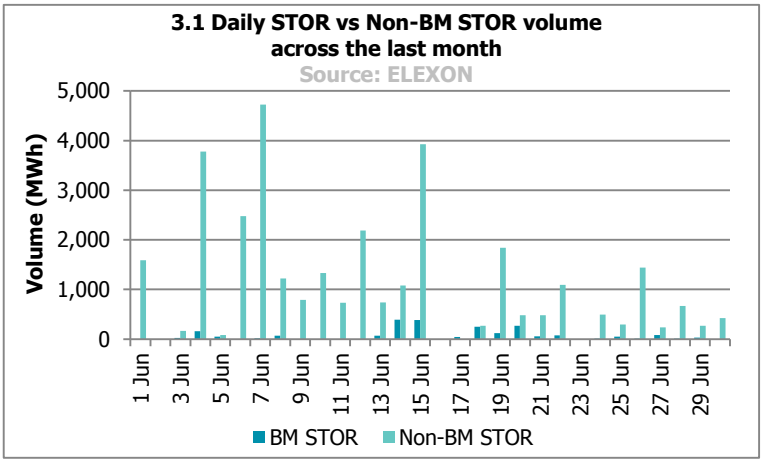
Under STOR contracts, availability payments are made to the balancing service provider in return for capacity being made available to the SO during specific times (STOR Availability Windows). When STOR is called upon, the SO pays for it at a pre-agreed price (its Utilisation Price). Some STOR is dispatched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

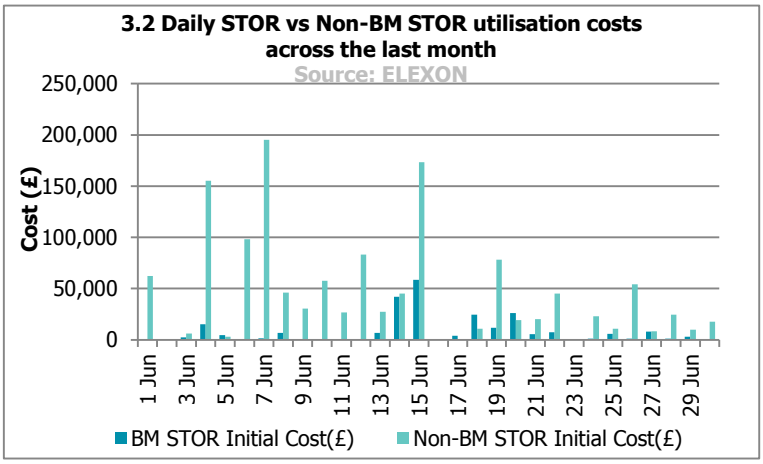
Graph 3.1 gives STOR volumes that were called upon during the month – split into BM STOR and non-BM STOR. **Graph 3.2** shows the utilisation costs of this capacity. 94% of the total STOR utilised in June came from outside of the Balancing Mechanism.

The average Utilisation Price for STOR capacity in June was £44.87/MWh (£110.03/MWh for BM STOR and £40.60/MWh for non-BM STOR).

On 15 June, 318MWh of BM STOR volume was called at an utilisation cost of £58,600. This represented 18% of the total BM STOR volume in June. On the same day, 3,922MWh of Non-BM STOR was called upon at an utilisation cost of £173,455.

In total, 4,303MWh of BM and non-BM STOR volume was called on 15 June, at a combined utilisation costs of £232,055.





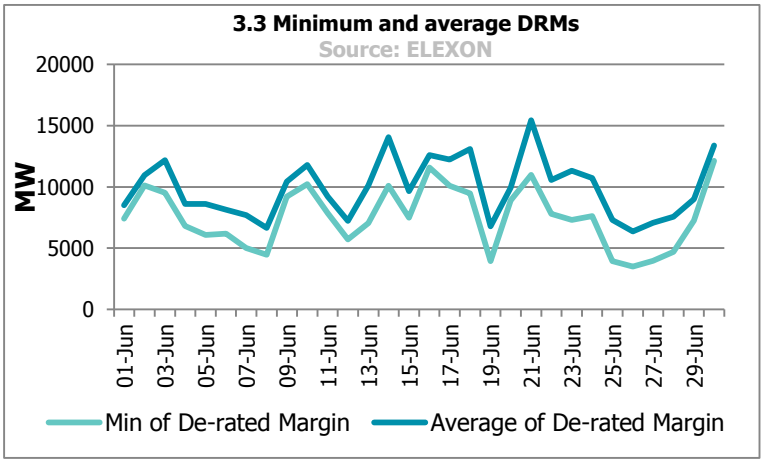
De-Rated Margin, Loss of Load Probability and the Reserve Scarcity Price

There are times when the Utilisation Prices of STOR plants are uplifted using the **Reserve Scarcity Price (RSVP)** in order to calculate System Prices. The RSVP is designed to respond to capacity margins, so rises as the system gets tighter (the gap between available and required generation narrows). It is a function of **De-Rated Margin (DRM)** at Gate Closure, the likelihood that this will be insufficient to meet demand (the **Loss of Load Probability**, LoLP) and the **Value of Lost Load** (VoLL, currently set at £3,000/MWh).

Graph 3.3 shows the daily minimum and average Gate Closure DRMs for June 2018.

The System Operator has determined a relationship between each DRM and the LoLP[2], which will determine the RSVP. The minimum DRM in June was 3,499MW on 26 June in Settlement Period 38 (compared to 4,433MW in May).

The RSVP re-prices STOR actions in the Imbalance Price calculation if it is higher than the original Utilisation Price. No STOR actions were re-priced using the RSVP in June (see **Table 3.4**).



3.4 Top 5 LoLPs and RSVPs

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
26/06/2018	38	3,498.85	0.0000	**0.00**	No	Short	90.52
26/06/2018	37	3,727.34	0.0000	**0.00**	No	Short	90.95
19/06/2018	37	3,942.94	0.0000	**0.00**	No	Short	121.00
25/06/2018	38	3,948.44	0.0000	**0.00**	No	Short	92.65
27/06/2018	38	3,959.39	0.0000	**0.00**	No	Short	78.02

[2] The System Operators methodology for LoLP is set out in the LoLP Methodology statement: https://www.elexon.co.uk/wp-content/uploads/2015/10/Loss_of_Load_Probability_Calculation_Statement_v1.0.pdf

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 RSVP, 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:

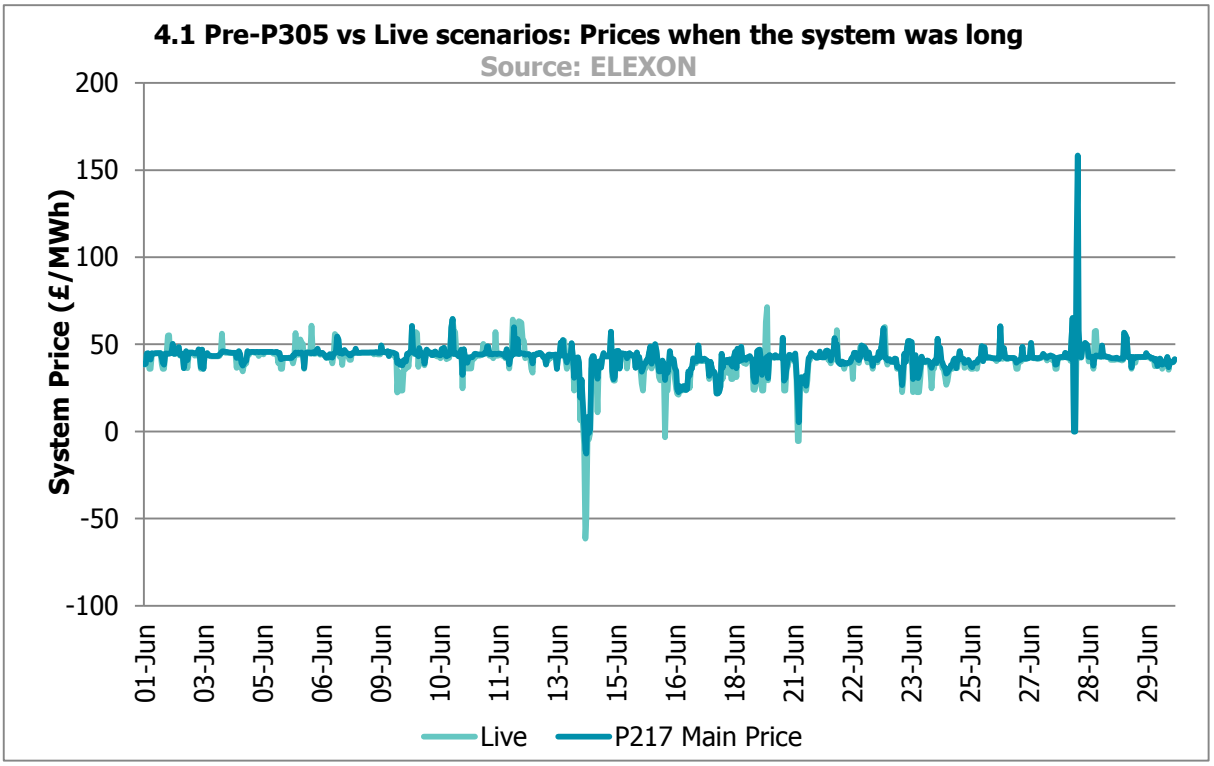
- A reduction in the PAR value to 1MWh (RPAR will remain at 1MWh);
- The introduction of a 'dynamic' LoLP function[3]; and
- An increase in the VoLL to £6,000MWh, which will apply to all instances of VoLL in arrangements, including the RSVP function.

[3] From 1 May 2018 the Transmission Company will calculate Indicative LoLP values using the Dynamic Method, whilst it continues to calculate Final LoLP values using the Static Method. Indicative LoLP values using the Dynamic Method will be published on the ELEXON Portal.

Pre-P305 Price Calculation

Graph 4.1 compares live System Prices when the system was long with prices re-calculated using the pre-P305 pricing scenario 'P217' (for comparison we use the Main Price calculation). On average, live prices were £1.17/MWh lower when the system was long compared to the pre-P305 calculation. This is expected as the reduction of PAR from 500MWh to 50MWh aims to make prices 'more marginal', by reducing the dampening effect of a large PAR.

When the system was long, prices were different in 74% of Settlement Periods; in 91% of these periods, the change was less than £1/MWh. The biggest price change occurred on the 28 June 2018 in Settlement Period 21, where the live price was £116.10/MWh lower than the System Price would have been under the P217 Scenario. This difference was due to the reduction in PAR.

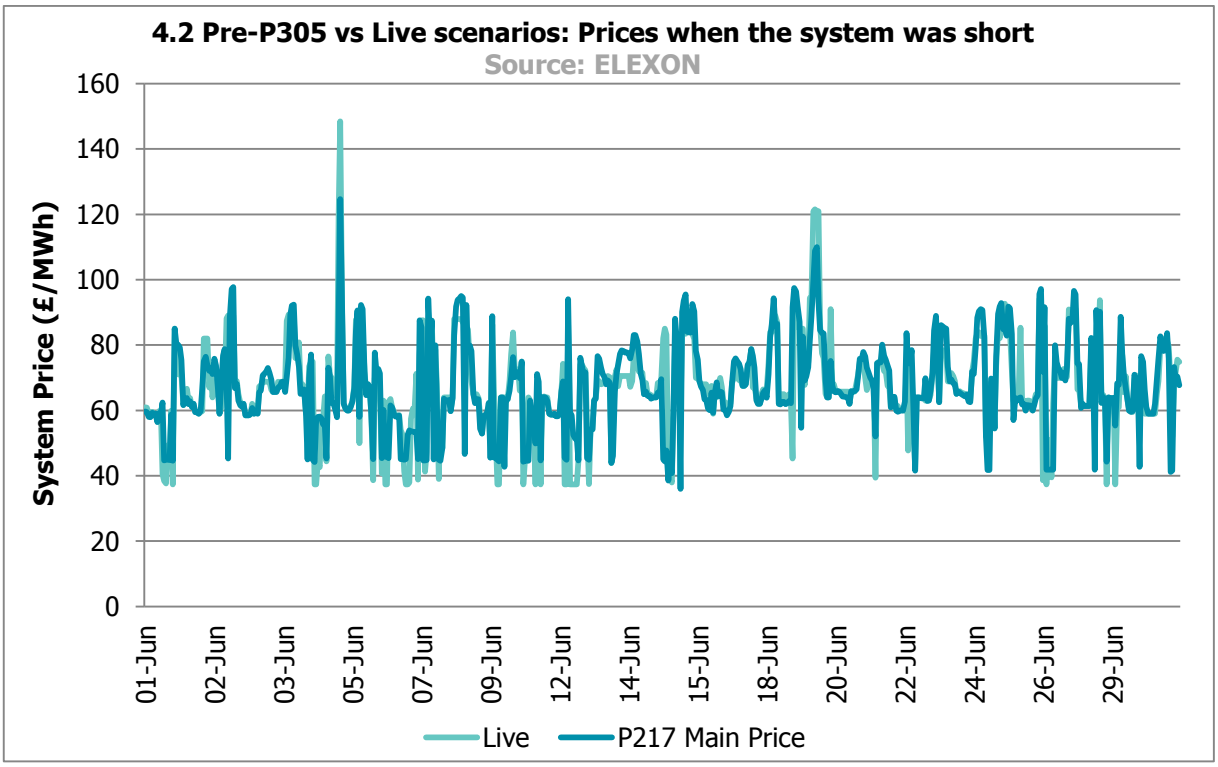


Graph 4.2 compares live System Prices when the system was short with prices re-calculated using the pre-P305 pricing scenario 'P217' (using the Main Price calculation).

Live prices were on average £0.09/MWh lower when the system was short. In June, 46% of Settlement Periods had live System Prices higher than the Pre-P305 scenario, 38% lower and 16% with no change.

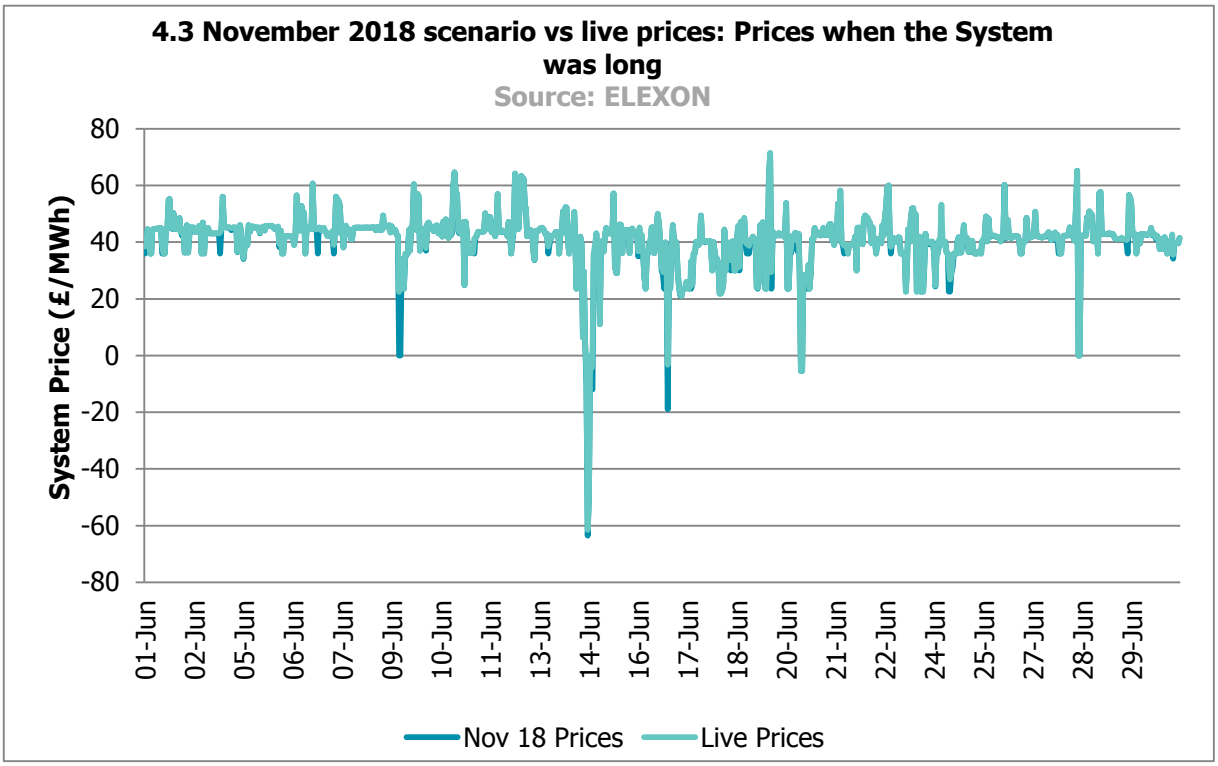
The biggest difference in prices when the system was short was £43.68/MWh (2 June 2018 during Settlement Period 38), as a result of the inclusion of non-BM STOR in the pricing calculation. In the P217 scenario, the Main Price would have been £45.32/MWh and the system long compared to the live scenario System Price of £89.00/MWh and the system short.

The inclusion of non-BM STOR volumes in the pricing stack changed the system length from long to short in 88 Settlement Periods.



November 2018 Price Calculation

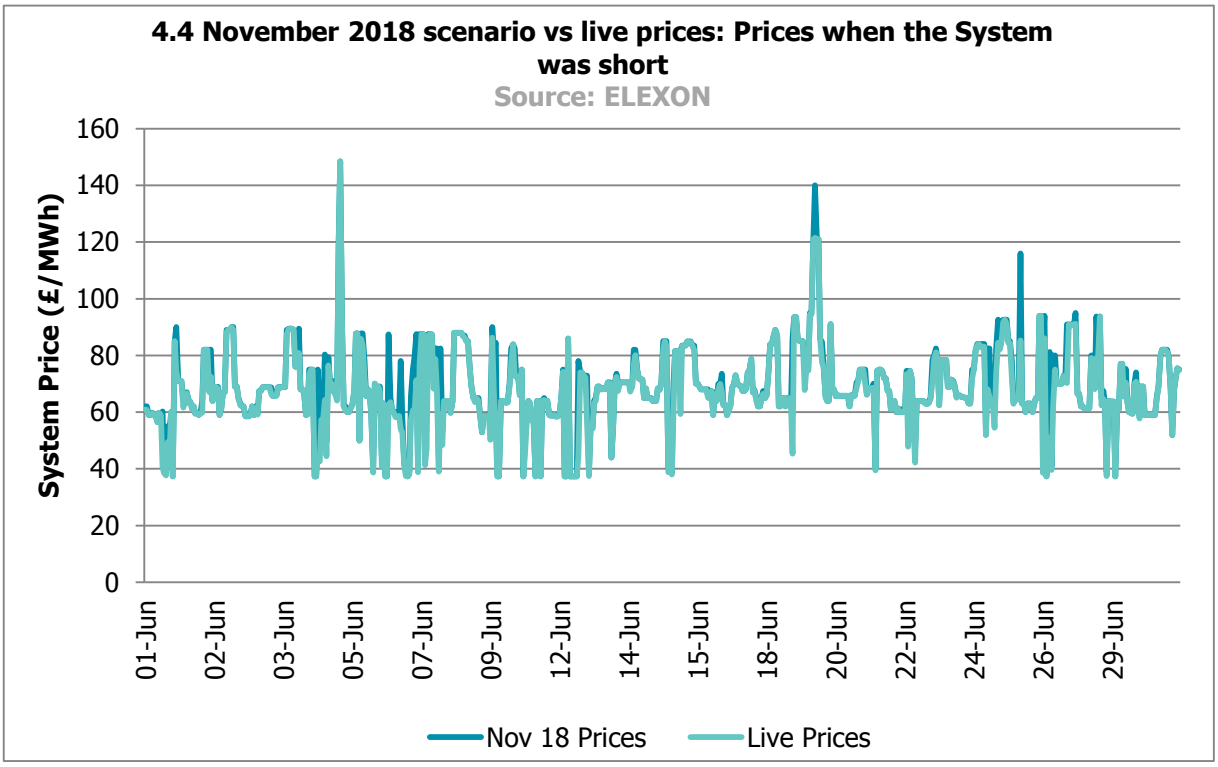
Under the November 2018 scenario, when the system is long prices would be the same or lower, and when the system is short prices would be the same or higher. **Graph 4.3** compares live System Prices with prices recalculated using the November 2018 scenario when the system was long.



The average price differences across the month are relatively small under the November 2018 scenario. Prices were different in 35% of Settlement Periods, with 14% of these changes greater than £1/MWh. System Prices would be £0.38/MWh lower when the system was long, and £1.87/MWh higher when the system was short. When the system was long and System Prices changed, price changes were less than £1/MWh in 70% of Settlement Periods and greater than £5/MWh in 7% of Settlement Periods. The biggest shift in price was -£34.15/MWh (Settlement Period 27 on 9 June 2018), when the price would have been £0/MWh under the November 2018 scenario compared to the current live System Price of £34.15/MWh.

Graph 4.4 compares live System Prices with prices re-calculated using the November 2018 scenario when the system was short. Prices would be higher in 39% of short Settlement Periods under the November 2018 scenario; 26% changed by more than £5/MWh and 15% by more than £10/MWh. The biggest difference in price was £45.40/MWh (Settlement Period 18 on 26 June); the price would have been £84/MWh under the November 2018 scenario, compared to the current live System Price of £38.60/MWh.

Under the November 2018 scenario, there would be seven Settlement Periods in June 2018 with prices greater than £100/MWh, compared to six periods under the current live scenario.



There were no Demand Control actions taken during June 2018. Under the November 2018 scenario, these action types would be priced at a VoLL of £6,000/MWh rather than the current £3,000/MWh. Although this scenario does not capture the impact that a move to a dynamic LoLP methodology will have, the impact of the change in VoLL on the RSVPs can be seen in **Table 4.5**. The RSVP would have re-priced no STOR actions in June.

4.5 Reserve Scarcity Prices with VoLL of £6,000

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
26/06/2018	38	3,498.85	0.0000	**0.00**	No	Short	90.52
26/06/2018	37	3,727.34	0.0000	**0.00**	No	Short	90.95
19/06/2018	37	3,942.94	0.0000	**0.00**	No	Short	121.00
25/06/2018	38	3,948.44	0.0000	**0.00**	No	Short	92.65
27/06/2018	38	3,959.39	0.0000	**0.00**	No	Short	78.02

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 Index Price	**MIP**	The Market Index 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	**RSVP**	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 RSVP. The RSVP function is based on the prevailing system scarcity, and is calculated as the product of two following values: · the Loss of Load Probability (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 between Standard Settlement Runs.

SYSTEM PRICE ANALYSIS REPORT

APPENDIX 1 – INCREASE IN THE REPLACMENT PRICE SETTING THE IMBALANCE PRICE

This month our Business Intelligence Analyst, Emma Tribe, looks at how often the Replacement Price is calculated using the Market Index Price (MIP). Where there are no priced actions, the Replacement Price sets the Imbalance Price. This analysis has also been presented to the ISG in an information paper.

emma.tribe@elexon.co.uk

When is the Replacement Price used?

The Replacement Price was used to set the Imbalance Price in 21% of long Settlement Periods, and 5% of short Settlement Periods, between November 2015 and June 2018. However in recent months this has risen, reaching 58% of long Settlement Periods in June 2018.

Graph 1 shows the percentage of long Settlement Periods where the Replacement Price set the Imbalance Price, and the percentage of flagged sell balancing volume.

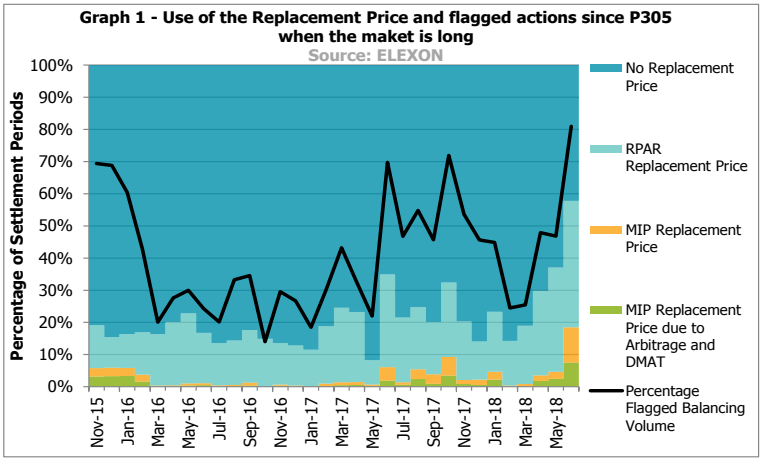
In June, the MIP set the Imbalance Price in 18% of long Settlement Periods, compared to an average 3% of long Settlement Periods since the introduction of P305.

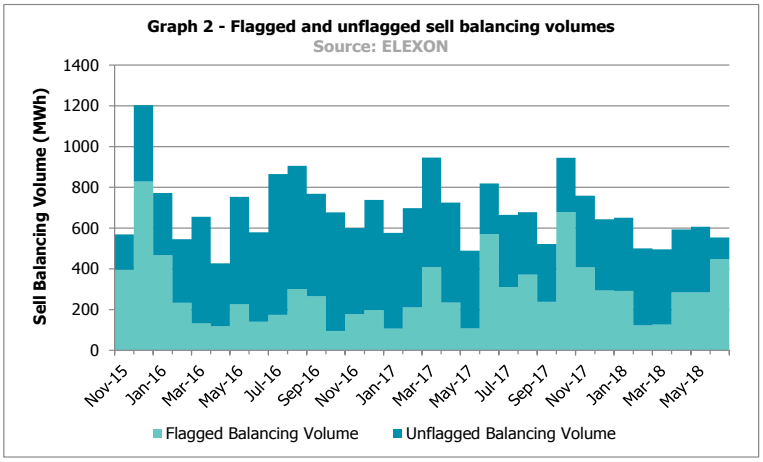
In addition, 82% of sell balancing volume was SO or CADL Flagged in June, compared to an average of 42% between November 2018 and June 2018. Although the percentage of flagged balancing volume has been high before, peaking at 72% in October, it has never reached current levels.

The MIP has set the Replacement Price in 8% of long Settlement Periods in June, due to Arbitrage or De Minimis Acceptance Threshold (DMAT) Tagging. This happens when DMAT and Arbitrage Tagging remove unflagged actions from the calculation before classification.

Graph 2 shows the volume of flagged actions since November 2018 to date.

Whilst the volume of flagged actions is stable over time, the proportion of flagged actions seen in June 2018 is higher due to less unflagged balancing actions.





Graph 3 uses the same data as graph 1, but plots the percentage of flagged sell balancing actions on the x-axis.

This graph plots the percentage of flagged sell balancing volume, when the market is long, against the use of the Replacement Price for June 2018.

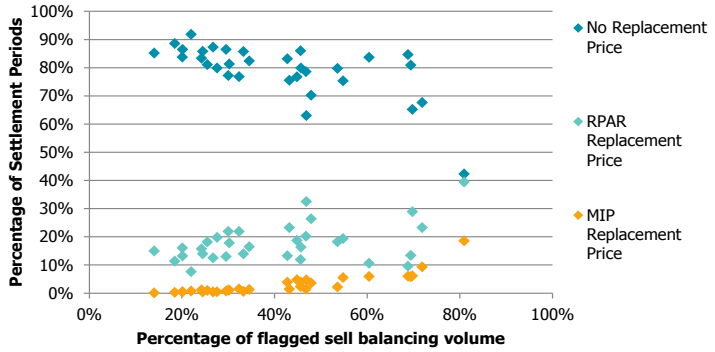
The frequency with which the RPAR and MIP Replacement Prices are used increases with the percentage of flagged sell volume. If all sell balancing volumes are flagged, the MIP will set the Replacement Price, and consequently the Imbalance Price in all Settlement Periods.

Graph 4 shows the percentage of Arbitrage Tagged volume in June 2018 was 1.72%, with Arbitrage Tagging occurring in 312 Settlement Periods.

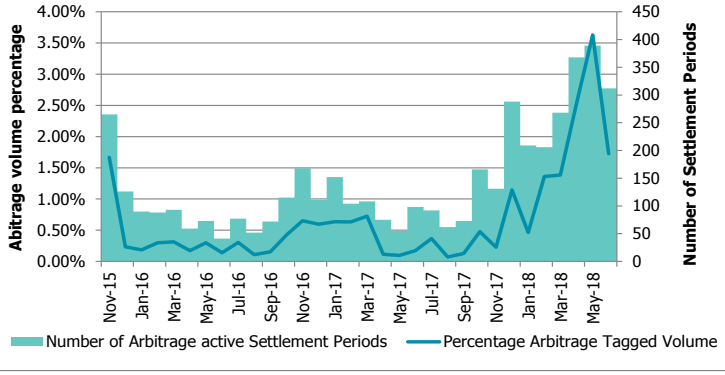
In June 2018, the percentage and number of arbitrage active Settlement Periods is higher than the average (0.67% and 143 Settlement Periods). However, more Arbitrage Tagging occurred in April and May 2018.

While Arbitrage Tagged volumes are a factor in the increase in the use of the MIP, the higher proportion of flagged sell balancing volumes is the key driver of the increase.

Graph 3 - Percentage of long Settlement Periods where Replacement Price is used in a month compared to percentage of flagged sell volume
Source: ELEXON



Graph 4 - Percentage of actions that are Arbitrage Tagged and number of arbitrage active Settlement Periods
Source: ELEXON



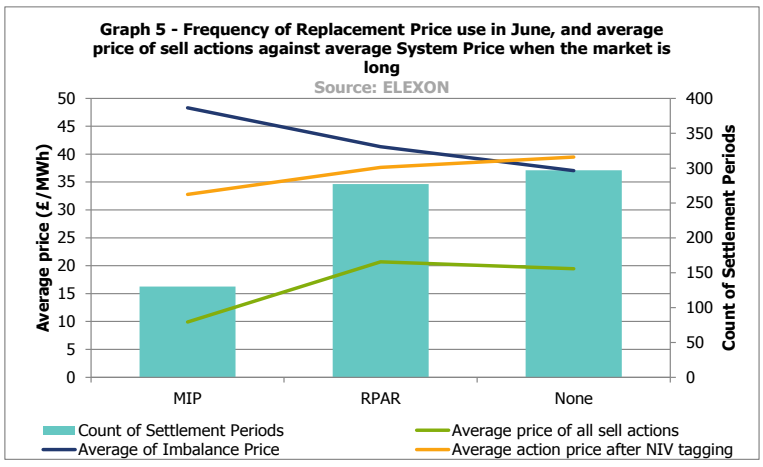
What impact is this having on the Imbalance Price?

The Replacement Price is applied to Stage 2 Flagged actions after Net Imbalance Volume (NIV) Tagging, but before Price Average Reference (PAR) Tagging.

Graph 5 shows, for when the market is long: the average of the Energy Imbalance Price, the average price of sell actions, and the average price of actions after NIV Tagging.

The average price of all actions is less than the average Energy Imbalance Price, as NIV Tagging removes the most expensive actions first. Where the MIP has set the price, the greatest difference is £38.40/MWh; where no replacement price was used, the greatest difference was £17.59/MWh.

Graph 5 - Frequency of Replacement Price use in June, and average price of sell actions against average System Price when the market is long
Source: ELEXON

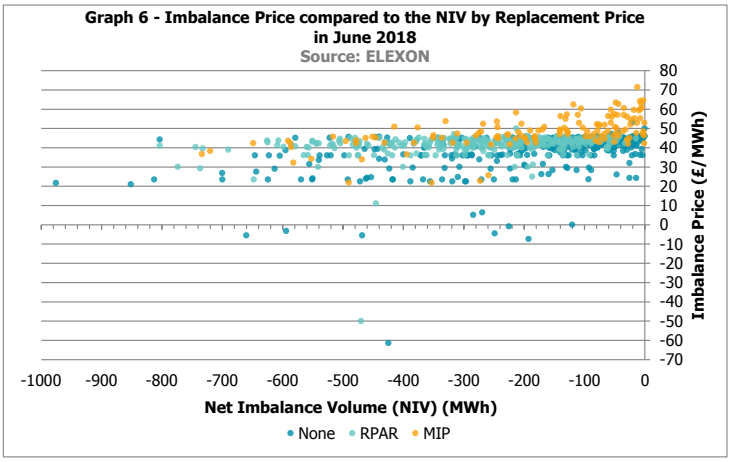


The average Imbalance Price is greater than the average action price after NIV tagging, by £3.71/MWh where RPAR was used, and by £15.53/MWh where MIP was used.

Graph 6 shows the Imbalance Price and calculation method against the NIV.

Where the NIV is more than -100MWh, the Imbalance Price was set by the MIP 29% of the time, by the RPAR 17% of the time, and in 54% of the time Imbalance prices were not set by a Replacement Price.

In contrast, where the NIV is less than -100MWh, the Imbalance Price was set by the MIP 15% of the time and by the RPAR 48% of the time. In 37% of the time the Imbalance prices was not set by a Replacement Price



The greatest NIV with a price set by the MIP is -733MWh, when the MIP was £36.63/MWh. Despite the buy actions being entirely flagged as constrained, the system is long as these flagged actions provide energy to the system.

What happens next?

The next scheduled Market Index Definition Statement (MIDS) review will incorporate this analysis, and is due to be presented at the ISG meeting in August.

Looking further ahead, the European Harmonisation Modification, scheduled to be implemented in 2020, may consider whether the MIP should continue to be used as a default.