ISG211-SPAR

REPORTING ON OCTOBER 2018

ISSUE 36 – PUBLISHED 20 NOVEMBER 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.

On 1 November 2018, the second part of Modification P305 went live. This reduced the PAR to 1MWh, introduced a 'dynamic' LoLP function and increased the VoLL to £6,000/MWh. As such, the System Price Analysis Dashboard on the ELEXON website ceased to be updated from 1 November 2018.

1 SYSTEM PRICES AND LENGTH

This report covers the month of October. 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 October 2018, with values shown in £/MWh.

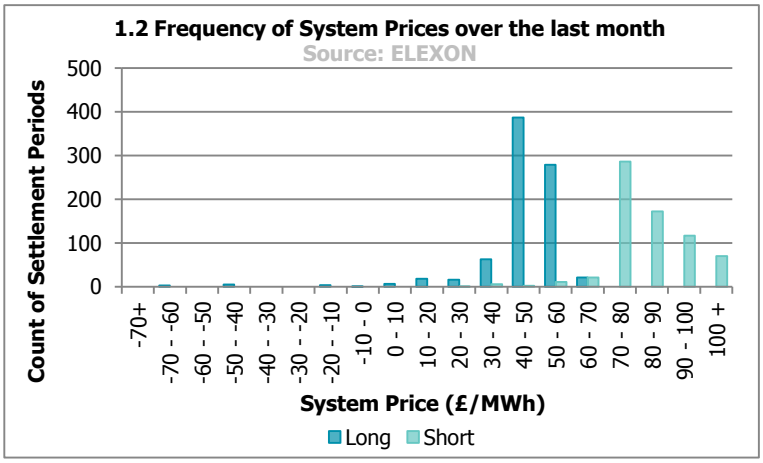
Graph 1.2 shows the distribution of System Prices across Settlement Periods in October 2018 when the market was long and short.

50% of System Prices were between £30/MWh and £60/MWh, regardless of system length. When the system was long, 83% of prices were between £40/MWh and £60/MWh. When the system was short, 84% of prices were between £70/MWh and £100/MWh, and 10% of prices were over £100/MWh.

	System Price (Long)				
Month	**Min**	**Max**	**Median**	**Mean**	**Std Dev**
October 2018	-64.66	69.31	48.80	45.61	14.25

	System Price (Short)				
Month	**Min**	**Max**	**Median**	**Mean**	**Std Dev**
October 2018	24.80	170.73	80.00	83.92	16.01

1.1 System Price summary by month (£/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/

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System Prices exceeded £100/MWh a total of 69 times in October 2018, compared to 45 times in September. The highest System Price of the month, £170.73/MWh, occurred in Settlement Period 21 on 14 October 2018. The price in this Settlement Period was set by Offers from a Pumped Storage and a CCGT BMU, priced at £175/MWh and £158/MWh respectively.

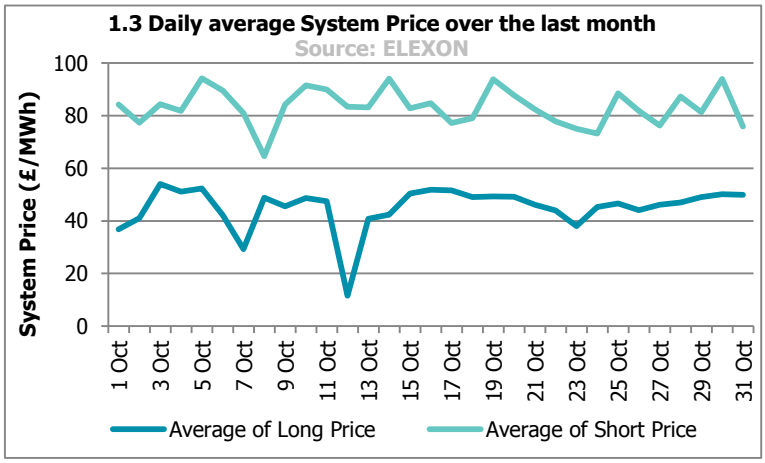
There were three Settlement Periods where the System Price was £0/MWh, and 13 negative System Prices, in October. The 13 negative System Prices occurred across four different days.

The lowest System Price, -£64.66/MWh, occurred during Settlement Period 10 on 12 October. This was set by Bids from six Wind BMUs, all priced at -£64.66/MWh.

Graph 1.3 shows daily average System Prices over the last month. In October, the average System Price was £45.61/MWh when the system was long and £83.92/MWh when the system was short.

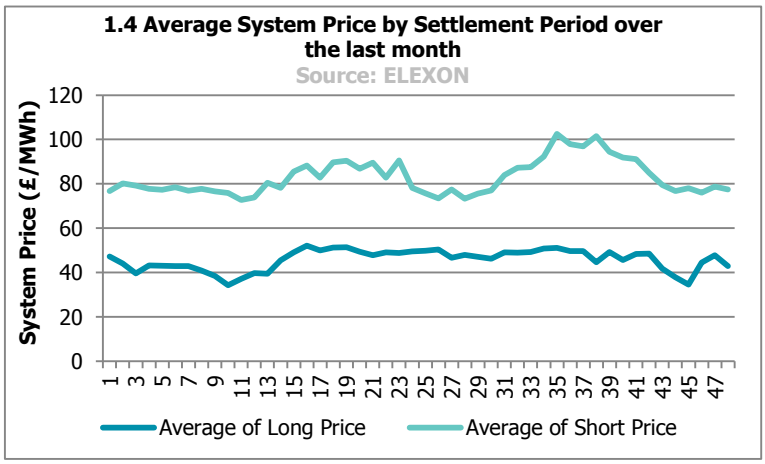
The highest daily average price when the system was short was £94.24/MWh, and occurred on 5 October. The system was short for 23 Settlement Periods on this day.

The lowest daily average price when the system was long was £11.47/MWh on 12 October 2018. The system was long in 19 Settlement Periods on this day.



Graph 1.4 shows the variation of System Prices across the day. Short prices were highest in Settlement Period 35, with long prices lowest in Settlement Period 10. The lowest average System Prices, regardless of market length, occurred during Settlement Period 8, when the System Price was £50.37/MWh.

Average long Settlement Period System Prices ranged between £34.22/MWh and £52.10/MWh. Average short Settlement Period prices varied from £72.73/MWh to £102.52/MWh.

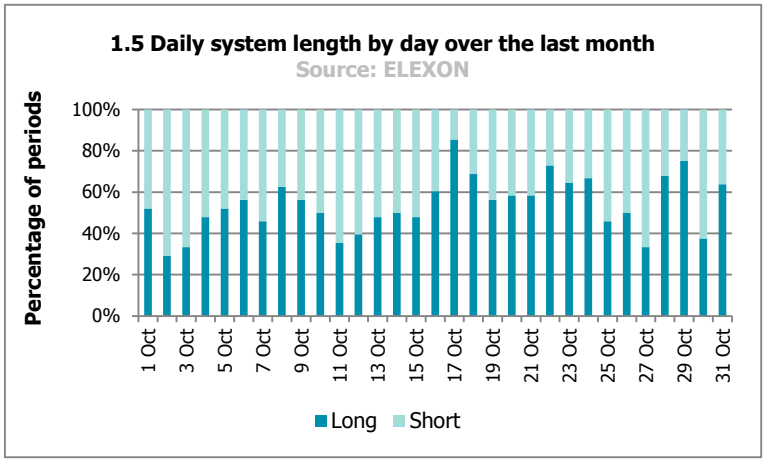


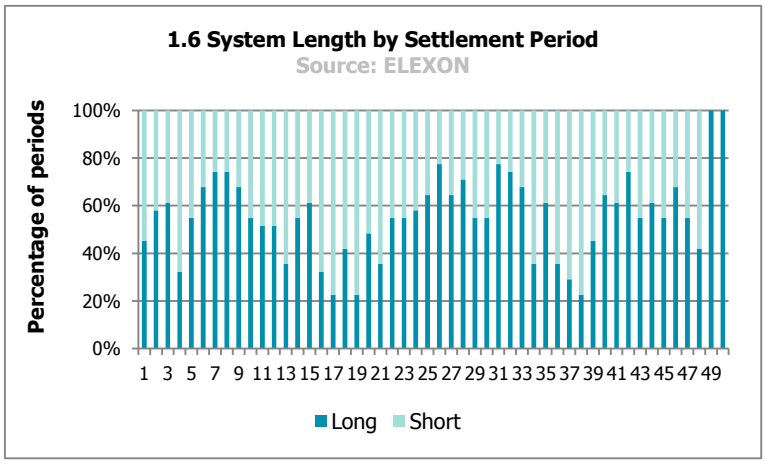
SYSTEM PRICE ANALYSIS REPORT

Graph 1.5 shows system length by day, and **Graph 1.6** shows system length by Settlement Period for October. The system was long for 54% of Settlement Periods in October, compared to 55% in September.

On 2 October, the system was short for 71% of Settlement Periods. On this day, the average NIV when the system was short was 293MWh. The average System Price in a short Settlement Period was £77.29/MWh on 2 October.

Settlement Periods 17, 19, and 38 were short for 77% of the month. The long clock change day, 28 October 2018, had 50 Settlement Periods instead of the standard 48. The system length in Settlement Periods 49 and 50 on this date was long.





2 PARAMETERS

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

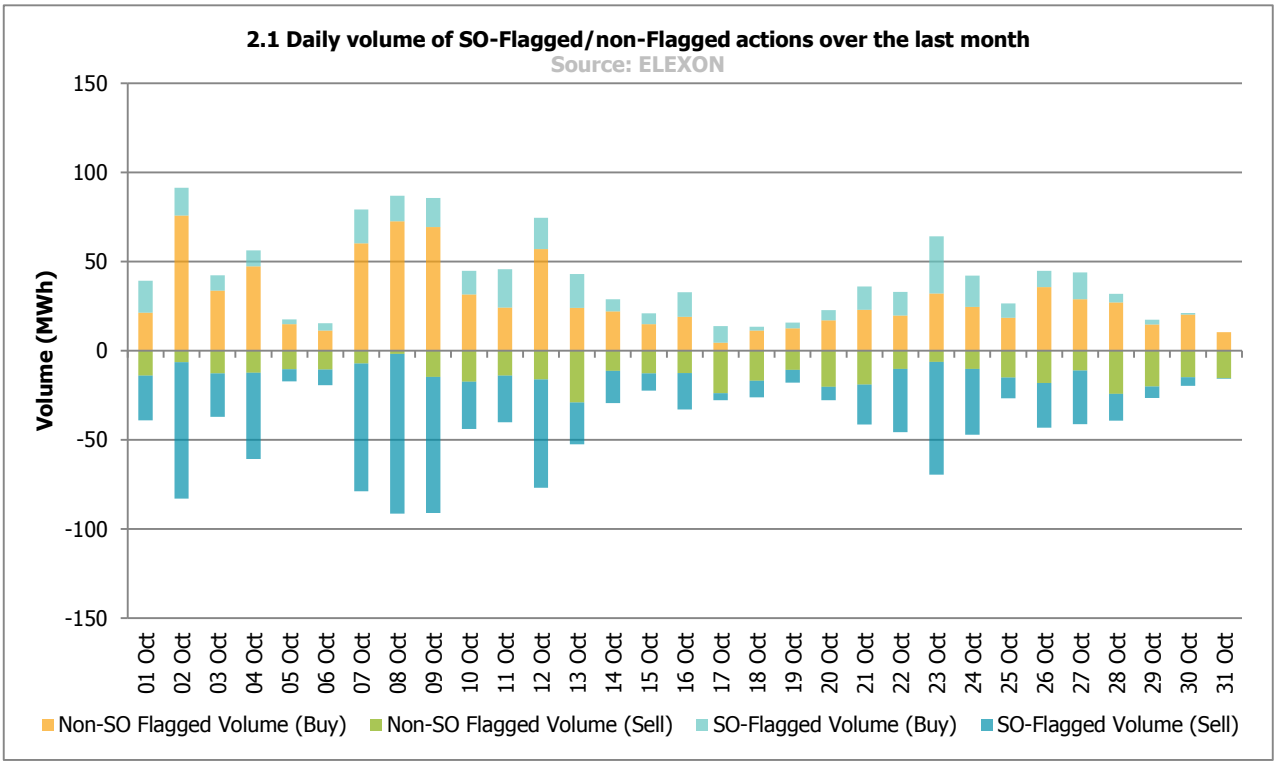
- The impact of Flagging balancing actions;
- The impact of NIV Tagging;
- The impact of PAR Tagging;
- The impact of the Replacement Price; and
- How these mechanisms affect which balancing actions feed into the price.

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 (SO) 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 in October 2018 that have been Flagged by the SO as being constraint related. On 8 October, 98% of sell volume was SO-Flagged.



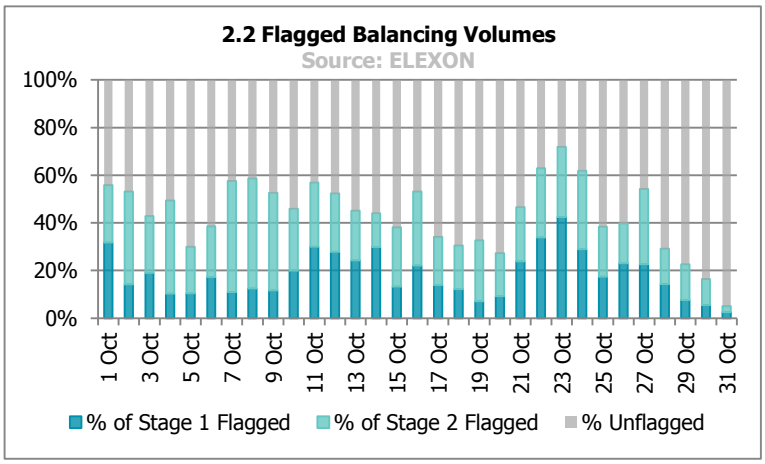
67% of sell balancing actions taken in October had an SO-Flag, compared with 79% in September. 37% of SO-Flagged sell actions came from Wind BMUs, 32% from Balancing Services Adjustment Actions (BSAAs) and 21% from CCGT BMUs. The average initial price (i.e. before any re-pricing) of a SO-Flagged sell action was -£33.97/MWh.

27% of buy balancing actions taken in October had an SO-Flag, compared to 24% in September. 51% of SO-Flagged buy actions came from BSAAs and 47% from CCGT BMUs. The average initial price of a SO-Flagged buy action was £84.32/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 October. The majority of CADL Flagged buy actions (92%) came from Pumped Storage BMUs. 49% of CADL Flagged sell actions came from CCGT BMUs, with Pumped Storage BMUs accounting for a further 44%.

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, 68% of sell actions in October were Flagged. Of these, 6% 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 October, 174 Settlement Periods had a Replacement Price based on the RPAR and 51 Settlement Periods had a Replacement Price based on the MIP. However, the majority of Settlement Periods (85%) 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 October, the average original price of a Second-Stage Flagged repriced sell action was £4.40/MWh and the average Replacement Price for sell actions (when the System was long) was £41.80/MWh.

29% of buy actions were Flagged; of these 0.4% 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 £99.58/MWh, and the average Replacement Price was £90.19/MWh.

If there are no Unflagged actions remaining in the NIV, the Replacement Price will default to the Market Index Price. This occurred in 49 long and two short Settlement Periods in October, compared to 66 long and two short Settlement Periods last month.

NIV and NIV Tagging

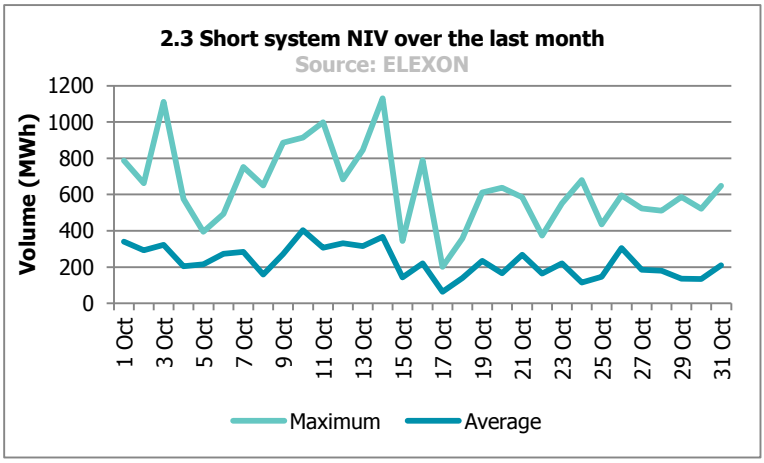
The Net Imbalance Volume (NIV) represents the direction of imbalance of the system – i.e. whether the system is long or short overall. **Graph 2.3** shows the greatest and average NIV when the system was short, and **Graph 2.4** shows the greatest and average NIVs when the system was long. Note short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

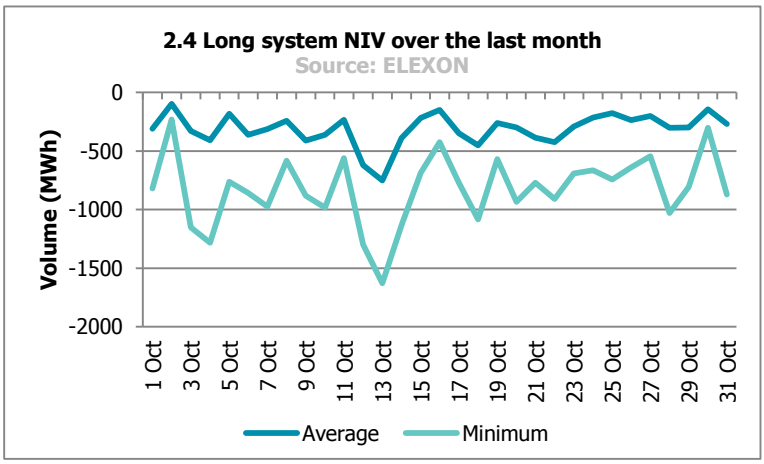
In almost all Settlement Periods, the System Operator will need to take balancing actions in both directions (buys and sells) to balance the system. However, for the purposes of calculating an Imbalance Price there can only be one imbalance in one direction (the Net Imbalance). 'NIV Tagging' is the process 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 October, 82% 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 (1,130MWh) was seen on 14 October in Settlement Period 21. The System Price was £170.73/MWh in this Settlement Period, which was the highest of the month.

The minimum long system NIV of the month was -1,629MWh, on 13 October 2018 during Settlement Period 41 when the System Price was £44.71/MWh.

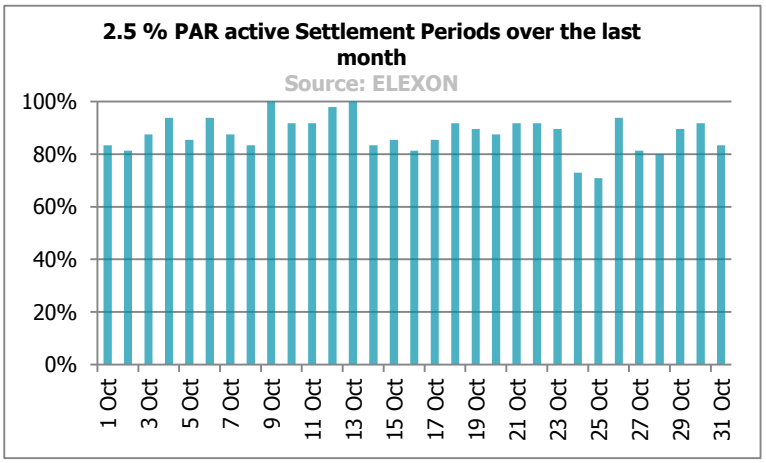




PAR Tagging

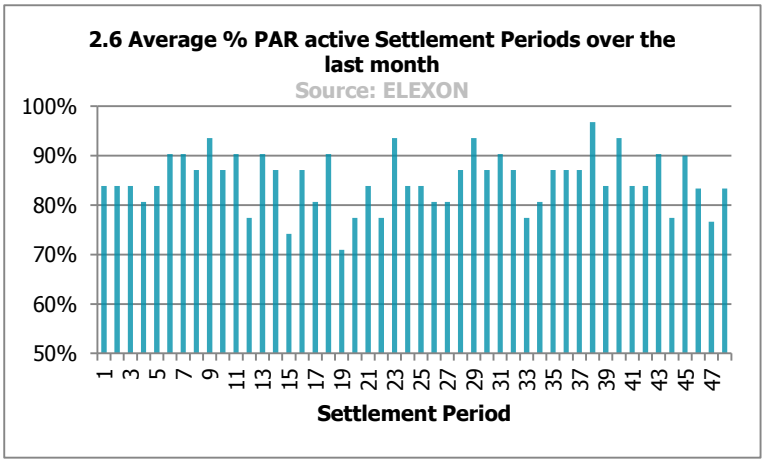
PAR is the final step of the Imbalance Price calculation. It takes a volume weighted average of the most expensive 50MWh of actions left in the stack. PAR is currently set to 50MWh, but is due to decrease to 1MWh on 1 November 2018.

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 Tagging was active for 88% of Settlement Periods in October.



Graph 2.6 shows the proportion of Settlement Periods over the last month when PAR Tagging was active. Settlement Period 19 had the lowest active PAR Tagging in October 2018 with 71%, representing the NIV being smaller in this period or the system being more balanced as a whole prior to System Operator balancing activity.

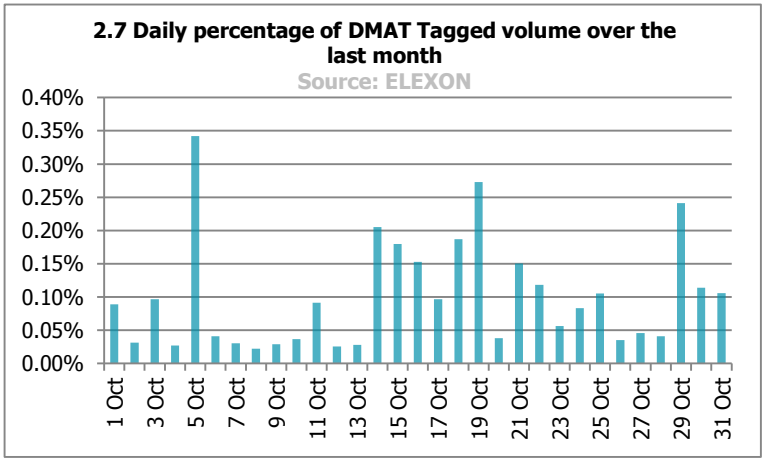
Settlement Period 38 had PAR Tagging active in all but one day in October.



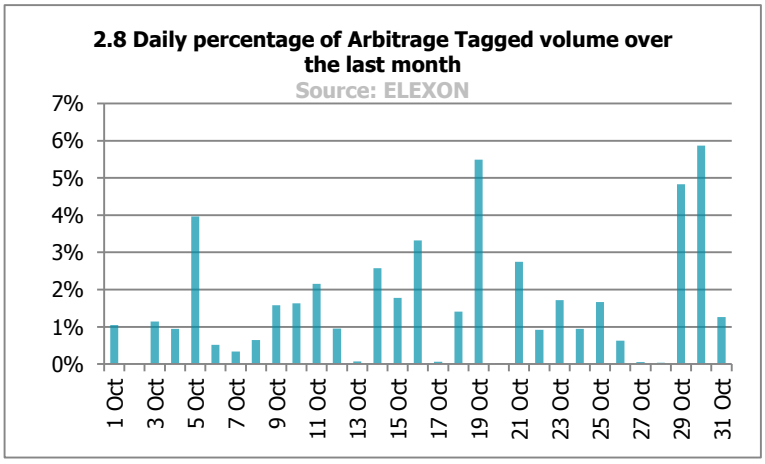
DMAT and Arbitrage Tagged Volumes

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. 0.07% of total buy and sell volume was removed by DMAT Tagging in October. 45% of DMAT Tagged volume came from Balancing Services Adjustment Actions (BSAAs), whilst 30% came from CCGT BMUs.



Graph 2.8 shows the volumes of actions that were removed due to Arbitrage Tagging. 1.28% of total buy and sell volume was removed by Arbitrage Tagging in October. 45% of Arbitrage Tagged volume was from BSAAs, with 35% from CCGT BMUs.



In October, the average initial price of an Arbitrage Tagged buy action was £32.20/MWh, and for a sell action was £51.31/MWh. The maximum price of an Arbitrage Tagged sell action was £142.55/MWh, and the lowest priced Arbitrage Tagged buy action was -£132.84/MWh.

On 30 October 2018, 2,395MWh of actions were Arbitrage Tagged, representing 6% of daily volume. The average price of an Arbitrage Tagged buy action was £25.53/MWh, and for a sell action was £51.26/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.

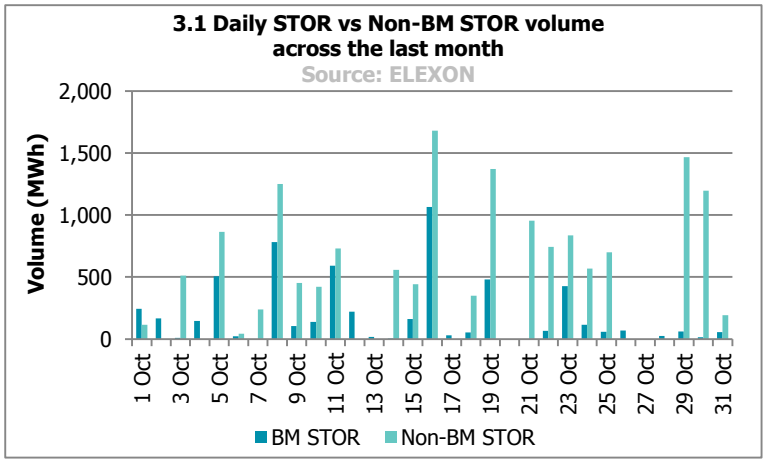
In addition to Bids and Offers available in the Balancing Mechanism, the SO can enter into contracts with providers of balancing capacity to deliver when called upon. These additional sources of power are referred to as reserve, and most of the reserve that the SO procures is called Short Term Operating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

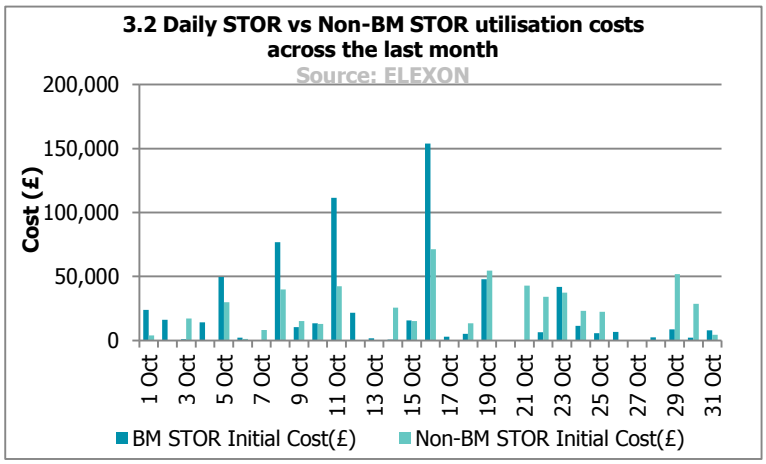
Under STOR contracts, availability payments are made to the balancing service provider in return for capacity being made available to the SO during specific times (STOR Availability Windows). When STOR is called upon, the SO pays for it at a pre-agreed price (its Utilisation Price). Some STOR is dispatched 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. 74% of the total STOR utilised in October came from outside of the Balancing Mechanism.

The average Utilisation Price for STOR capacity in October was £58.96/MWh (£117.60/MWh for BM STOR and £37.93/MWh for non-BM STOR).

On 16 October, 1,065MWh of BM STOR volume was called at an utilisation cost of £154,000. This represented 19% of the total BM STOR volume in October.





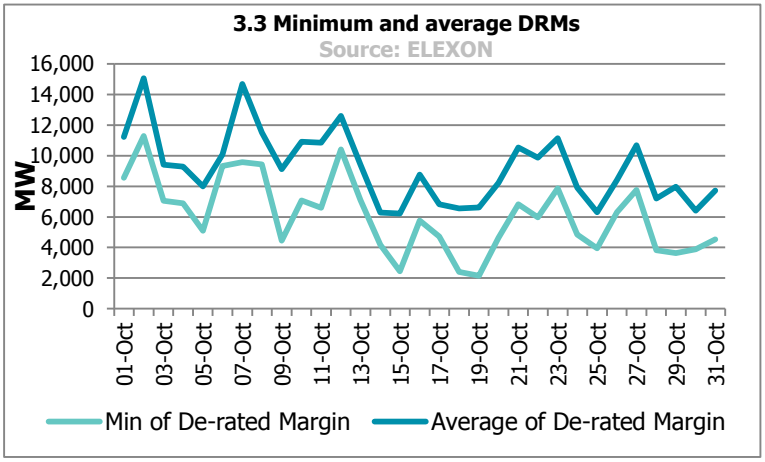
De-Rated Margin, Loss of Load Probability and the Reserve Scarcity Price

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, set at £3,000/MWh until 31 October 2018).

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

The System Operator has determined a relationship between each DRM and the LoLP[2], which will determine the RSVP. The minimum DRM in October was 2,155MW on 19 October in Settlement Period 38 (compared to 5,011MW in September).

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 October (see **Table 3.4**).



3.4 Top 5 LoLPs and RSVPs

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
19/10/2018	38	2,155.50	0.0010	**3.12**	No	Short	111.95
18/10/2018	39	2,414.22	0.0003	**0.85**	No	Long	52.15
15/10/2018	37	2,437.38	0.0002	**0.75**	No	Long	54.07
19/10/2018	39	2,554.48	0.0001	**0.40**	No	Short	111.95
15/10/2018	38	2,565.76	0.0001	**0.37**	No	Short	145.45

[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 came in on 1 November 2018. These are:

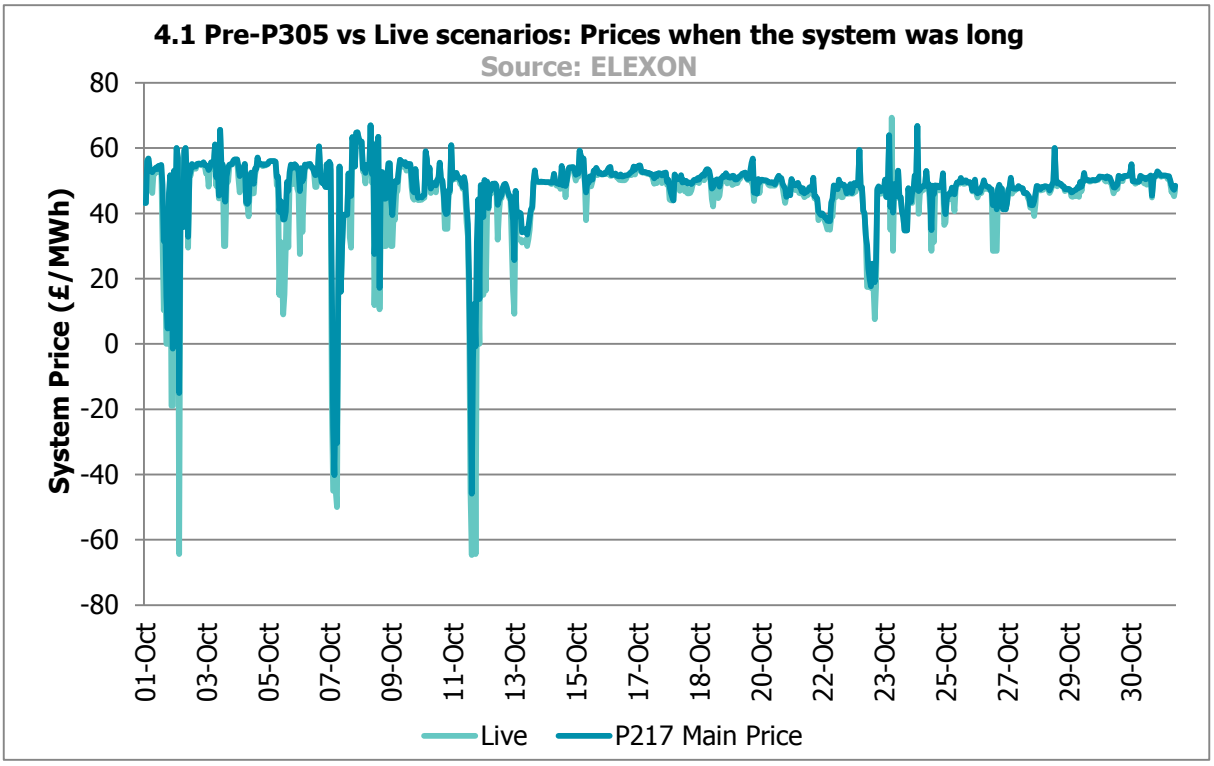
- A reduction in the PAR value to 1MWh (RPAR will remain at 1MWh);
- The introduction of a 'dynamic' LoLP function; and
- An increase in the VoLL to £6,000MWh, which will apply to all instances of VoLL in arrangements, including the RSVP function.

The 1 November 2018 changes to the System Price calculation were analysed in further detail as part of ELEXON's insights '1 November 2018 changes to the System Price Calculation' published in September 2018.

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 £2.32/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 81% of Settlement Periods; in 76% of these periods, the change was less than £1/MWh. The biggest price change occurred on the 12 October 2018 in Settlement Period 13, where the live price was £63.58/MWh lower than the System Price would have been under the P217 Scenario. This difference was due to the reduction in PAR.

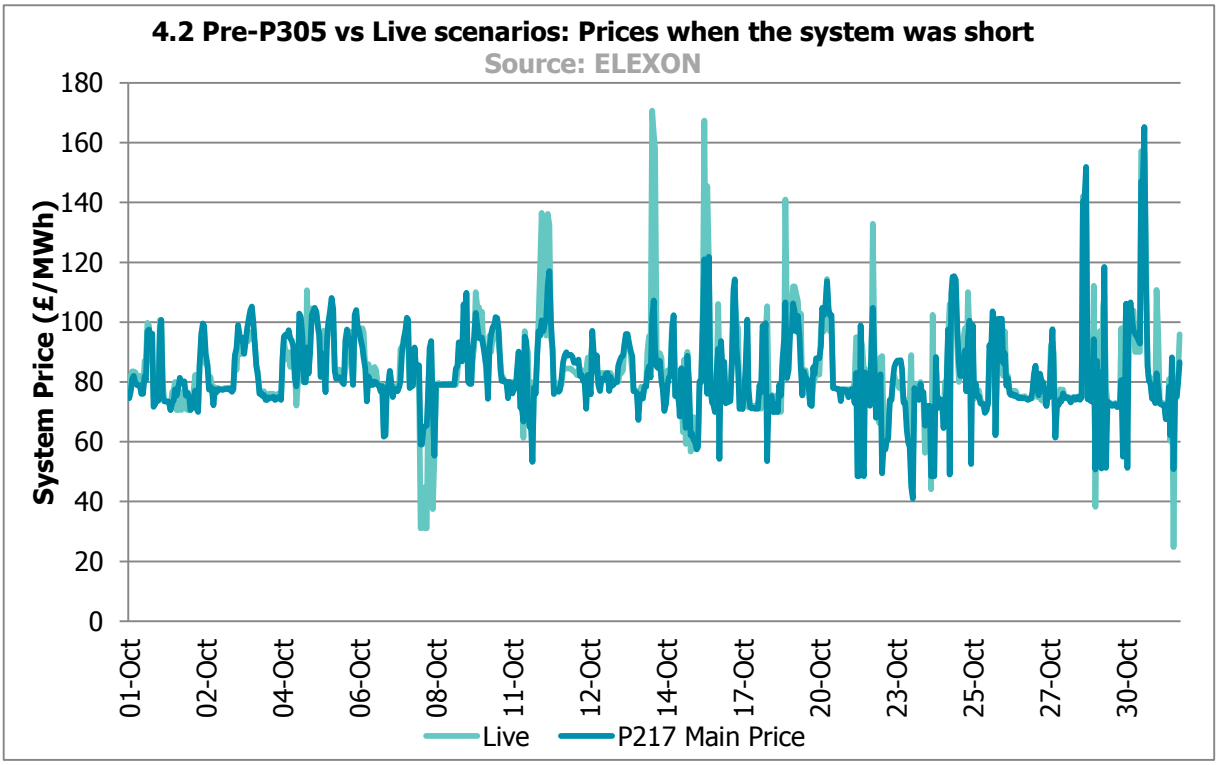


Graph 4.2 compares live System Prices when the system was short with prices re-calculated using the pre-P305 pricing scenario 'P217' (using the Main Price calculation).

Live prices were on average £1.54/MWh higher when the system was short. In October, 52% of Settlement Periods had live System Prices higher than the Pre-P305 scenario, 33% had lower System Prices and 15% had no change.

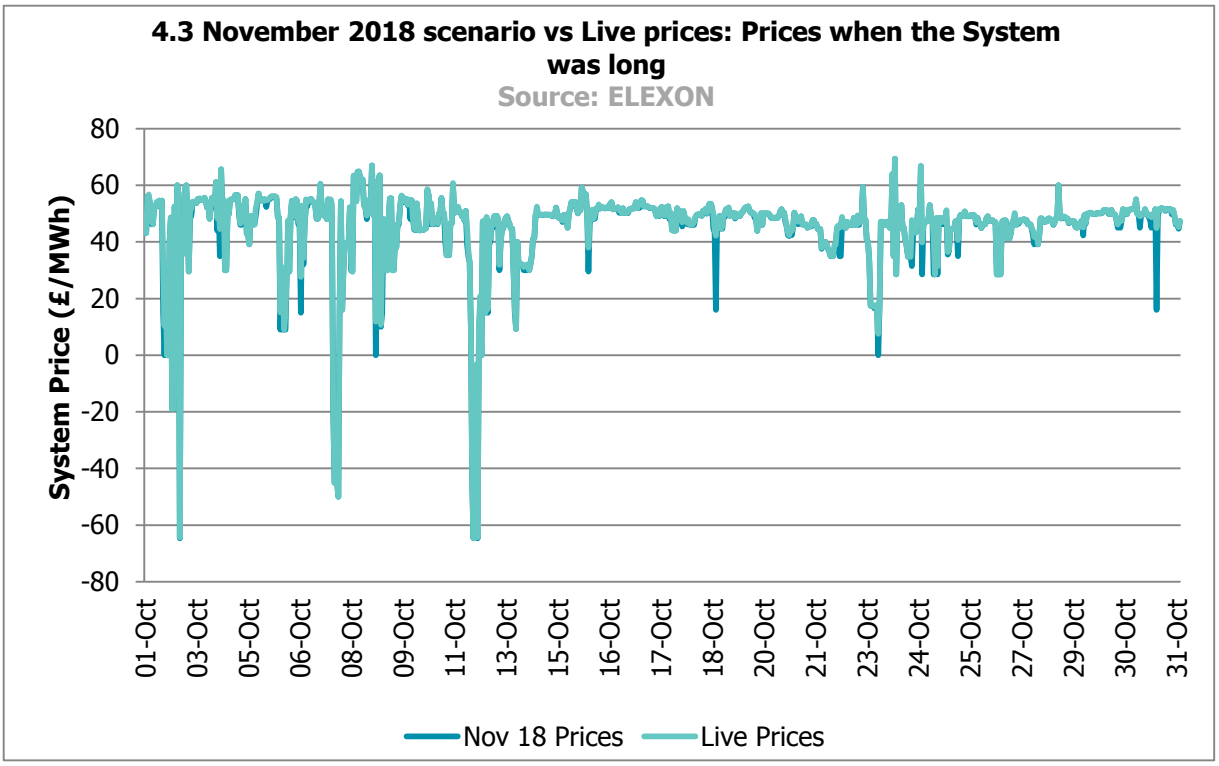
The biggest difference in prices when the system was short was £69.37/MWh (15 October 2018 during Settlement Period 38). In the P217 scenario, the Main Price would have been £76.08/MWh and the system long compared to the live scenario System Price of £145.45/MWh and the system short.

The inclusion of non-BM STOR volumes in the pricing stack changed the system length from long to short in 30 (2%) of Settlement Periods.



November 2018 Price Calculation

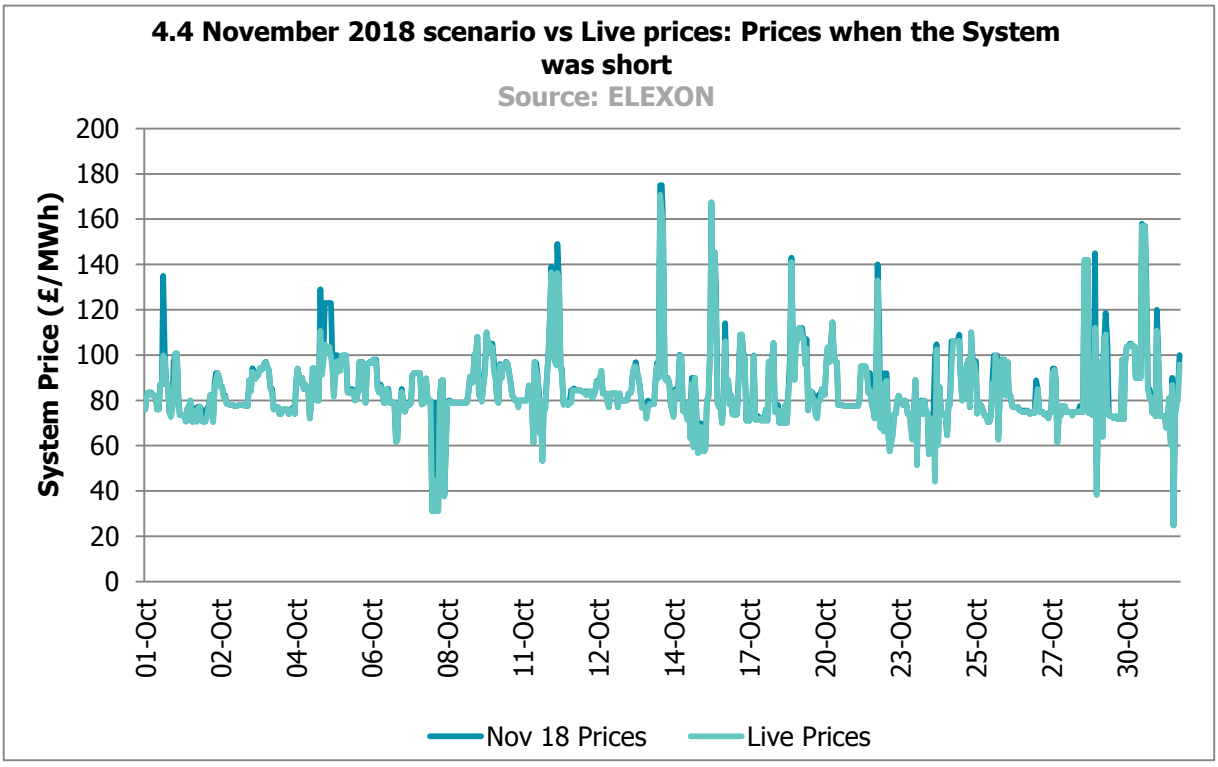
Under the November 2018 scenario, when the system is long prices would be the same or lower, and when the system is short prices would be the same or higher. **Graph 4.3** compares live System Prices with prices recalculated using the November 2018 scenario when the system was long.



The average price differences across the month are relatively small under the November 2018 scenario. Prices were different in 40% of Settlement Periods, with 15% of these changes greater than £1/MWh. System Prices would be £0.63/MWh lower when the system was long, and £1.28/MWh higher when the system was short. When the system was long and System Prices changed, price changes were less than £1/MWh in 73% of Settlement Periods, and greater than £5/MWh in 8% of Settlement Periods. The biggest shift in price was -£28.85/MWh (Settlement Period 27 on 31 October 2018), when the price would have been £16/MWh under the November 2018 scenario compared to the current live System Price of £44.85/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 35% of short Settlement Periods under the November 2018 scenario; 18% changed by more than £5/MWh and 9% by more than £10/MWh. The biggest difference in price was £54.73/MWh (Settlement Period 37 on 24 October); the price would have been £98.80/MWh under the November 2018 scenario, compared to the current live System Price of £44.07/MWh.

Under the November 2018 scenario, there would be 76 Settlement Periods in October 2018 with prices greater than £100/MWh, compared to 69 periods under the current live scenario.



There were no Demand Control actions taken during October 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 October.

4.5 Reserve Scarcity Prices with VoLL of £6,000

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
19/10/2018	38	2,155.50	0.0010	**6.24**	No	Short	111.95
18/10/2018	39	2,414.22	0.0003	**1.69**	No	Long	52.15
15/10/2018	37	2,437.38	0.0002	**1.50**	No	Long	54.07
19/10/2018	39	2,554.48	0.0001	**0.79**	No	Short	111.95
15/10/2018	38	2,565.76	0.0001	**0.74**	No	Short	145.45

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.