

ISG200-SPAR

REPORTING ON OCTOBER 2017

ISSUE 25 – PUBLISHED 11 DECEMBER 2017

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 Mechanism¹. It demonstrates out-turn prices and the data used to derive the prices. The data is a combination of II and SF Settlement Runs.

Due to the November and December ISG meetings being combined, this report refers to October data. Reporting on November and December prices will be presented at the January 2018 ISG. This month's SPAR contains an appendix on the negative System Prices in Settlement Periods 1 to 7 on 29 October 2017, and an appendix on the operational issues experienced by National Grid on this day is also included.

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 2017.

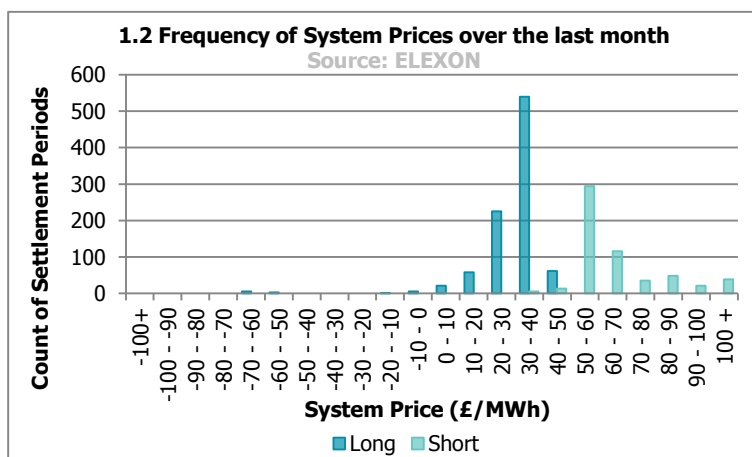
Graph 1.2 shows the distribution of System Prices across Settlement Periods in October 2017 when the market was long and short.

76% of System Prices were between £20/MWh and £60/MWh, regardless of system length. When the system was long, 83% of prices were between £20/MWh and £40/MWh. When the system was short, 72% of prices were between £50/MWh and £70/MWh and 7% of prices were over £100/MWh. 5% of System Prices regardless of length were between

Month	System Price (Long)				
	Min	Max	Median	Mean	Std Dev
October 2017	-69.17	49.66	33.35	29.66	12.03

Month	System Price (Short)				
	Min	Max	Median	Mean	Std Dev
October 2017	30.10	172.14	59.26	67.41	22.13

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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£40/MWh and £50/MWh.

System Prices exceeded £100/MWh 39 times in October 2017 (compared to 47 times in September). In October 2016 there were 100 System Prices above £100/MWh. The 39 System Prices which exceeded £100/MWh occurred across 15 different days.

The highest System Price for October 2017 was £172.14/MWh, occurring in Settlement Periods 17, 18 and 19 on 16 October. The System Prices in these Settlement Periods were set by Offers from a single CCGT BMU priced at £172.14/MWh, with volumes greater than the Price Average Reference (PAR) volume.

There were 15 negative System Prices in October, compared to five in September. The lowest System Price was -£69.17/MWh, on 29 October in Settlement Period 2. From Settlement Period 1 to Settlement Period 7 on 29 October, there were seven consecutive negative prices. The average System Price in these Settlement Periods was -£53.49/MWh, and these prices were set by Bids from Wind, Biomass and Pumped Storage BMUs and a Balancing Services Adjustment Action (BSAA). These Settlement Periods have been analysed further in the Appendix of this report.

For five Settlement Periods in October the System Price was £0/MWh.

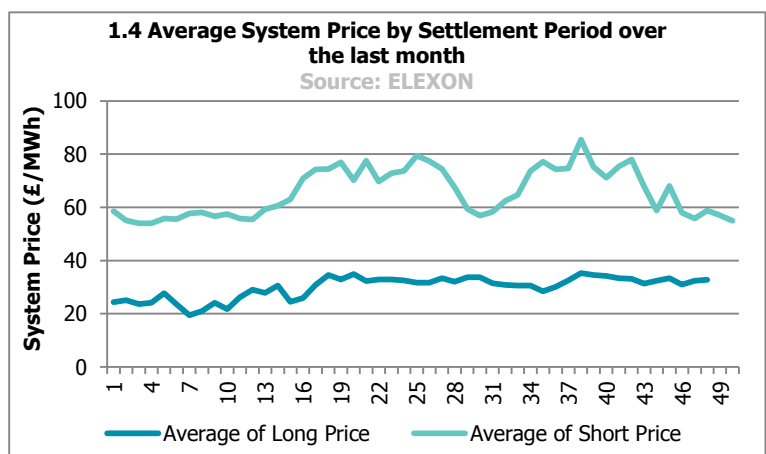
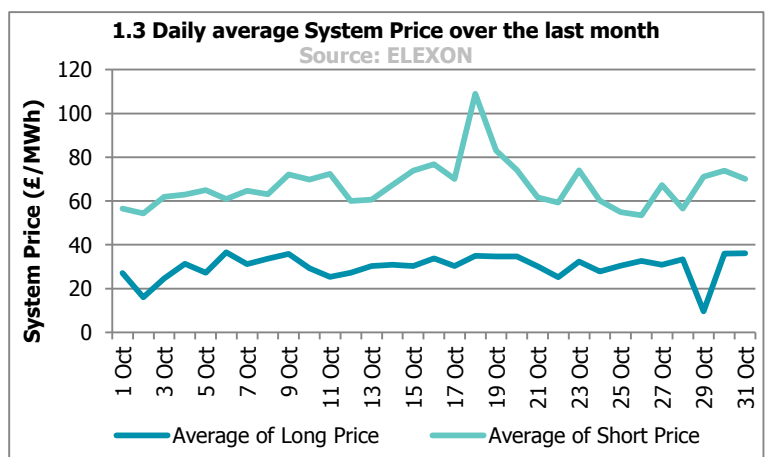
Graph 1.3 shows daily average System Prices over the last month. In October, the average System Price was £29.66/MWh when the system was long and £67.41/MWh when the system was short.

The highest daily average price when the system was short was £108.95/MWh and occurred on 18 October. The system was short for 18 Settlement Periods on this day.

The lowest daily average price when the system was short was £9.54/MWh on 29 October 2017. The system was long in 34 of the 50 Settlement Periods on this day, but the average was reduced by the seven negative prices seen on this day.

Graph 1.4 shows the variation of System Prices across the day. Short prices were highest in Settlement Period 38, with long prices lowest in Settlement Period 17. The lowest average System Prices regardless of market length was seen during Settlement Period 8, when the System Price was, on average, £26.99/MWh.

Long prices show less variance over Settlement Periods, with the prices between £19.42/MWh and £35.32/MWh. Average short Settlement Period prices vary from £53.97/MWh to £85.47/MWh.

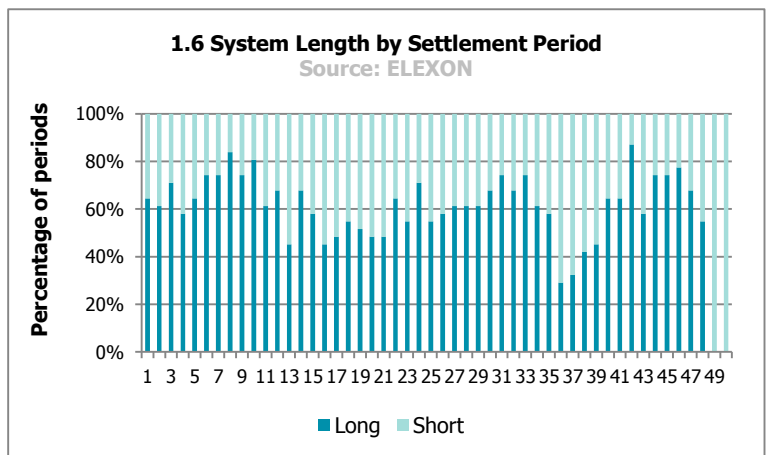
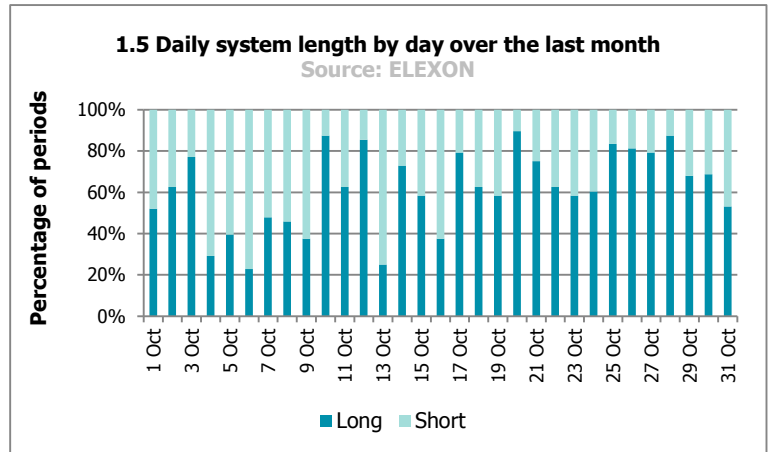


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Graph 1.5 shows system length by day, and **Graph 1.6** shows system length by Settlement Period for October. The system was long for 62% of Settlement Periods in October, compared to 61% in September.

On 6 October, the system was short for 77% of Settlement Periods. The average NIV while the system was long on this day was 215MWh. The average System Price on this day regardless of length was £62.66/MWh.

Settlement Period 36 was short for 71% of the month. 29 October 2017 was the long clock change date, and the additional Settlement Periods 49 and 50 on this date were both short. The average System Price in these Settlement Periods was £55.98/MWh.



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2 PARAMETERS

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

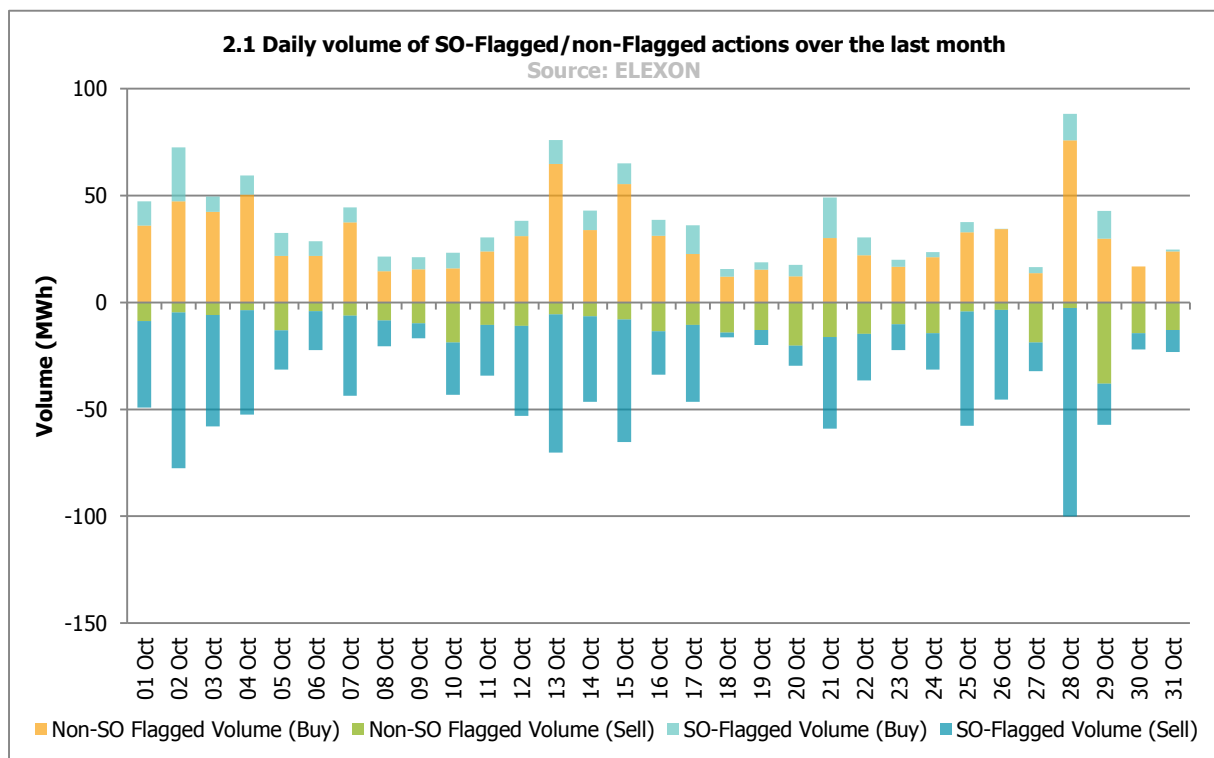
- The impact of Flagging balancing actions;
- The impact of NIV Tagging;
- The impact of PAR Tagging;
- The impact of the Replacement Price; and
- How these mechanisms affect which balancing actions feed into the price.

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 October 2017 as being constraint related. On 28 October, 97% of sell volume was SO-Flagged.



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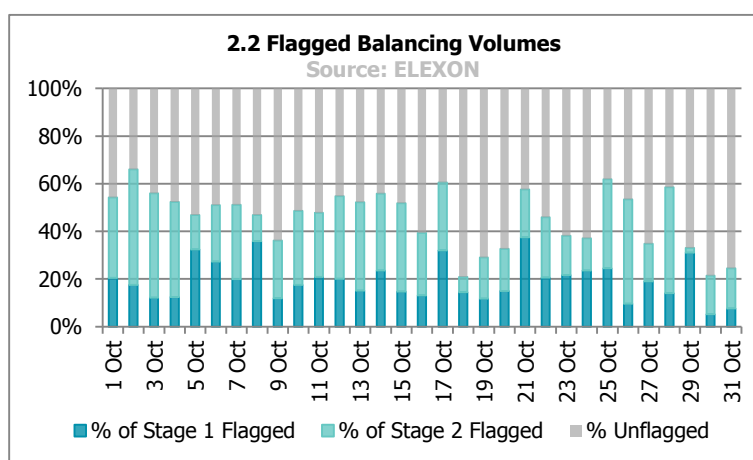
73% of sell balancing actions taken in October had an SO-Flag compared with 52% in September. 33% of SO-Flagged sell actions came from Balancing Services Adjustment Actions (BSAAs), 32% from Wind BMUs and 25% from CCGT BMUs. The average initial price (i.e. before any re-pricing) of a SO-flagged sell action was -£38.20/MWh.

21% of buy balancing actions taken in October had an SO-Flag, compared to 12% in September. 59% of SO-Flagged buy actions came from BSAAs, and 37% from CCGT BMUs. The average initial price of a SO-Flagged buy action was £76.08/MWh.

Any actions which are less than 15 minutes total duration are CADL Flagged. 1.4% of buy actions and less than 1% of sell actions were CADL Flagged in October. The majority of CADL Flagged buy actions (93%) and CADL Flagged sell actions (48%) came from Pumped Storage BMUs, with CCGT BMUs accounting for a further 47% of CADL Flagged sell actions.

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 balancing actions that were accepted – only a proportion of these will feed through to the final price calculation.



The Replacement Price

If there are Second-Stage Flagged action volumes left in the NIV, these will be repriced by the Replacement Price. In total 74% of sell actions in October were flagged. Of these 12% were assigned a Replacement Price, currently based on the most expensive 1MWh of Unflagged actions.

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 -£0.15/MWh and the average Replacement Price for sell actions (when the System was long) was £29.07/MWh.

22% of buy actions were Flagged; of these 0.5% had the Replacement Price applied. The average original price of a buy action with the Replacement Price applied was £153.37/MWh, and the average Replacement Price was £93.70/MWh.

If there are no Unflagged actions remaining in the NIV, the Replacement Price will default to the Market Index Price. This occurred in 85 long and one short Settlement Period (compared to 31 long Settlement Periods last month).

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NIV and NIV Tagging

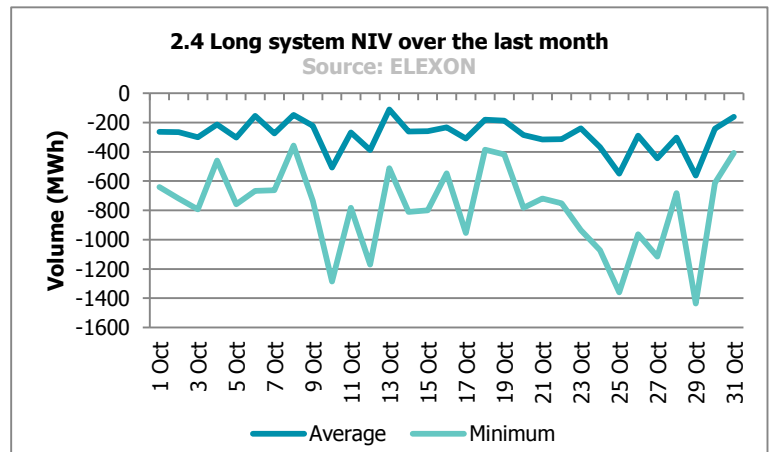
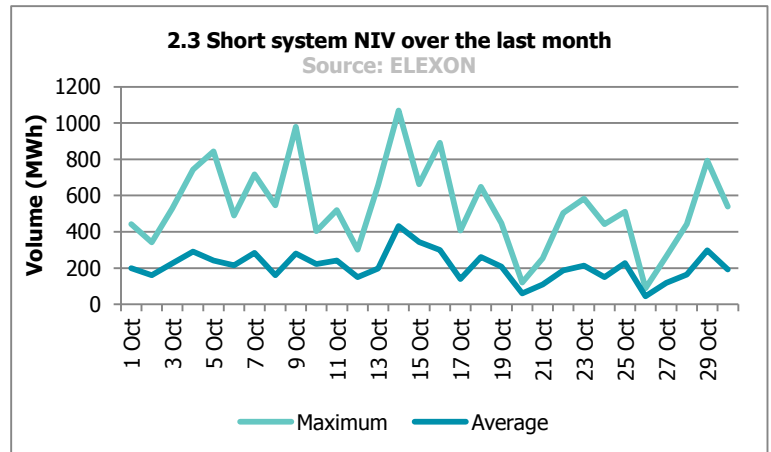
The Net Imbalance Volume (NIV) represents the direction of imbalance of the System – i.e. whether the system is long or short overall. **Graph 2.3** shows the greatest and average NIV when the system was short and **Graph 2.4** shows greatest and average NIVs when the system was long. Note short NIVs 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. 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. 83% of volume was removed due to NIV tagging in October. 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 long system NIV of the month was -1438MWh, on 29 October 2017 during Settlement Period 2. There were -2925MWh of sell actions and 1487MWh of buy actions in this Settlement Period. The System Price was -£69.17/MWh, which represented the lowest of the month.

The maximum short system NIV of the month (1070MWh) was seen on 14 October in Settlement Period 38.



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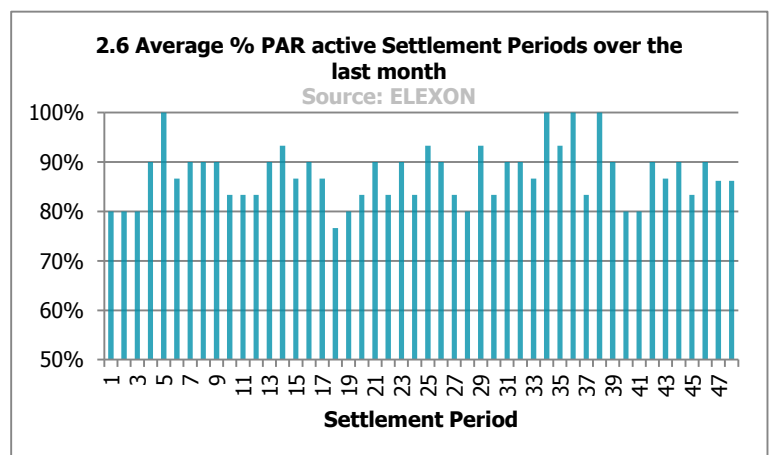
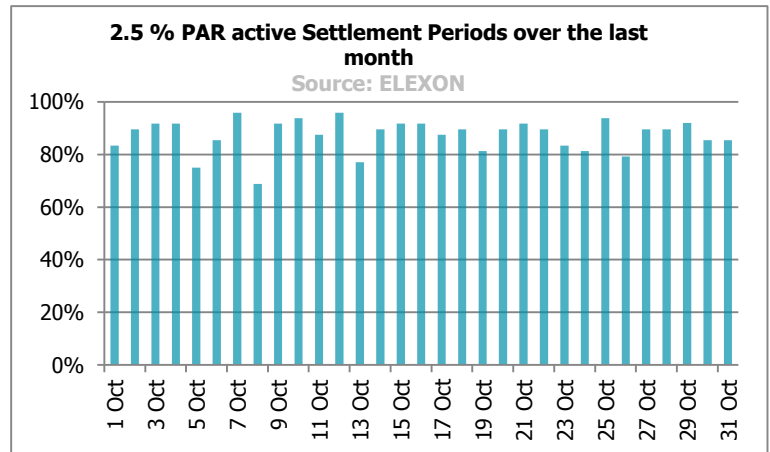
PAR Tagging

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.

The impact of PAR Tagging across the month can be seen in **Graph 2.5**. 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 87% 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 23 had the lowest active PAR Tagging in October 2017 with 77%, representing the NIV being smaller in this period or the system being more balanced as a whole prior to System Operator balancing activity.

There was PAR Tagging in Settlement Periods 5, 34, 36 and 38 on every day of the month.



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DMAT and Arbitrage Tagged Volumes

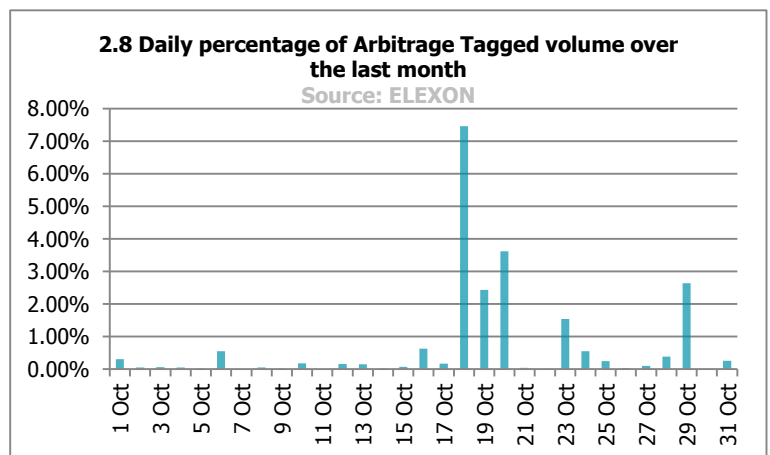
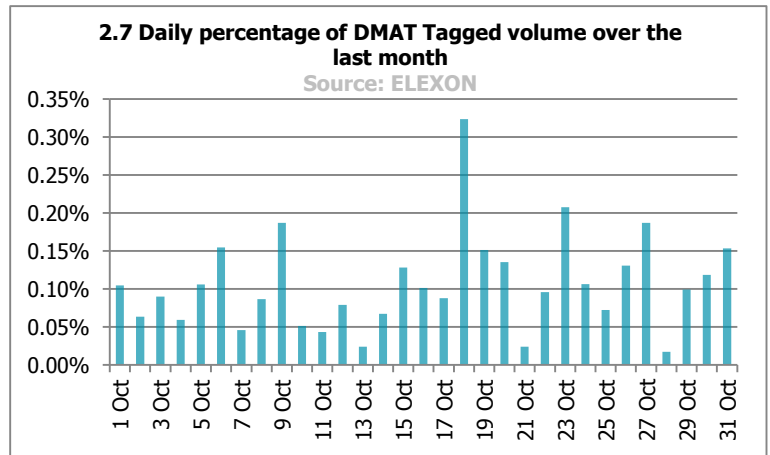
Some actions are always removed from the price calculation (before NIV Tagging). These are actions which are less than 1MWh (De Minimis Acceptance Threshold (DMAT) Tagging) or buy actions which are either the same price or lower than the price of sell actions (Arbitrage Tagging).

Graph 2.7 shows the volumes of actions which were removed due to DMAT Tagging. A total of 3.30% of buy and sell volume was removed by DMAT Tagging. 41% of DMAT Tagged volume came from Balancing Services Adjustment Actions (BSAAs), with 38% coming from CCGT BMUs.

Graph 2.8 shows the volumes of actions that were removed due to Arbitrage Tagging. 41% of Arbitrage Tagged volume was from BSAAs, 36% from CCGT BMUs and 11% from Wind BMUs.

In October the average initial price of an Arbitrage Tagged buy action was £32.33/MWh, and for a sell action was £60.68/MWh. The maximum price of an Arbitrage Tagged sell action was £150/MWh, and the lowest priced Arbitrage Tagged buy action was -£92.34/MWh.

On 18 October 2017, 2,377MWh of actions were Arbitrage Tagged, representing 7.5% of daily volume. The average price of an Arbitrage Tagged buy action was £52.85/MWh and for a sell action was £70.33/MWh. 0.32% of daily volume was DMAT Tagged on this day.



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3 BALANCING SERVICES

Short Term Operating Reserve (STOR) costs and volumes

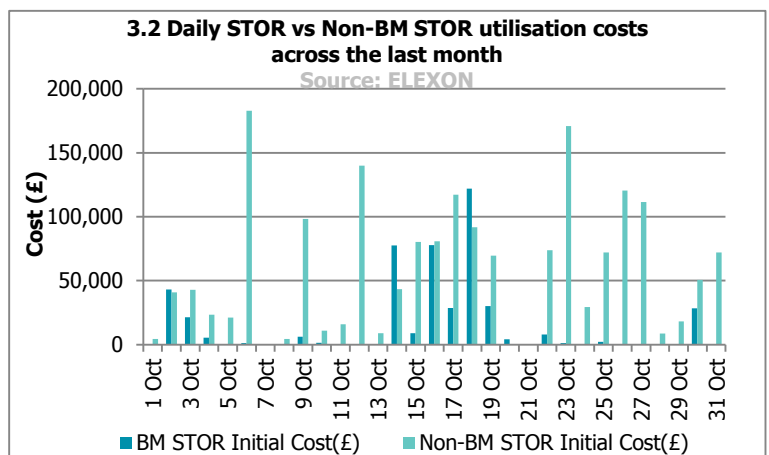
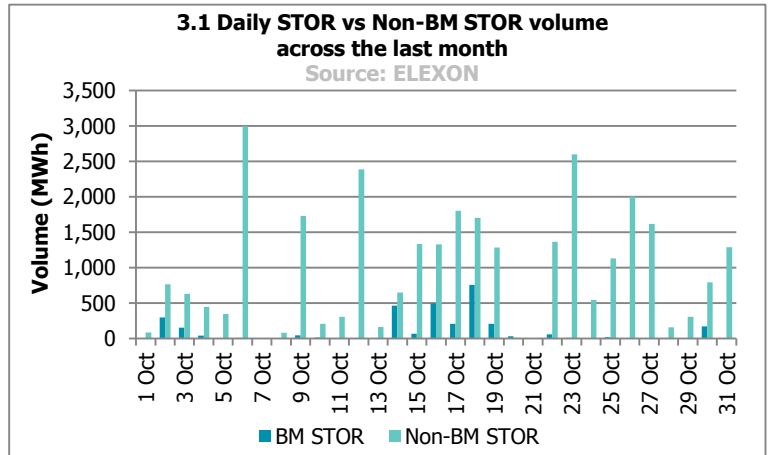
This section covers the balancing services that the System Operator (SO) takes outside the Balancing Mechanism that can have an impact on the price.

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 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. 91% of the total STOR utilised in October came from outside of the Balancing Mechanism.

The average Utilisation Price for STOR capacity in October was £68.73/MWh (£155.16/MWh for BM STOR and £60.07/MWh for non-BM STOR).



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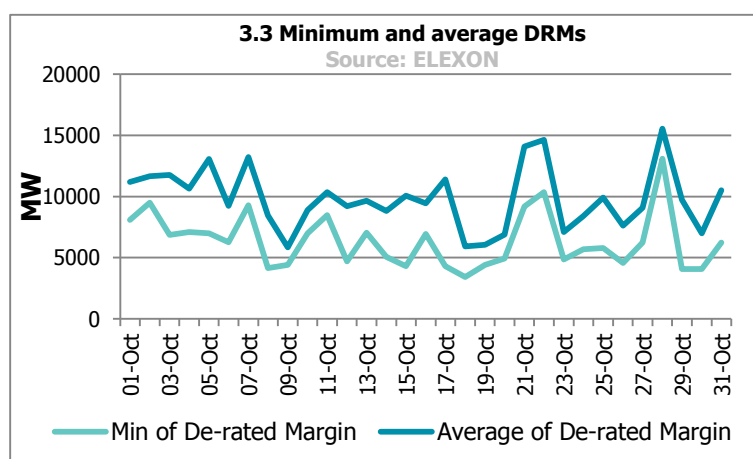
De-Rated Margin, Loss of Load Probability and the Reserve Scarcity Price

There are times when the Utilisation Prices of STOR plants are uplifted using the **Reserve Scarcity Price (RSP)** in order to calculate System Prices. The RSP 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 October 2017.

The System Operator has determined a relationship between each DRM and the LoLP, which will determine the RSP². The minimum DRM in October was 3,247MW on 18 October in Settlement Period 27 (compared to 2,033MW in September).

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



3.4 Top 5 LoLPs and RSPs

Date	SP	DRM	LoLP	RSP	RSP Used	System Length	System Price
18/10/2017	27	3,427.76	0.0000	0.00	No	Short	169.50
18/10/2017	28	3,459.30	0.0000	0.00	No	Short	169.50
29/10/2017	38	4,073.97	0.0000	0.00	No	Short	95.00
30/10/2017	35	4,084.69	0.0000	0.00	No	Short	115.00
30/10/2017	34	4,143.07	0.0000	0.00	No	Short	87.42

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

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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:

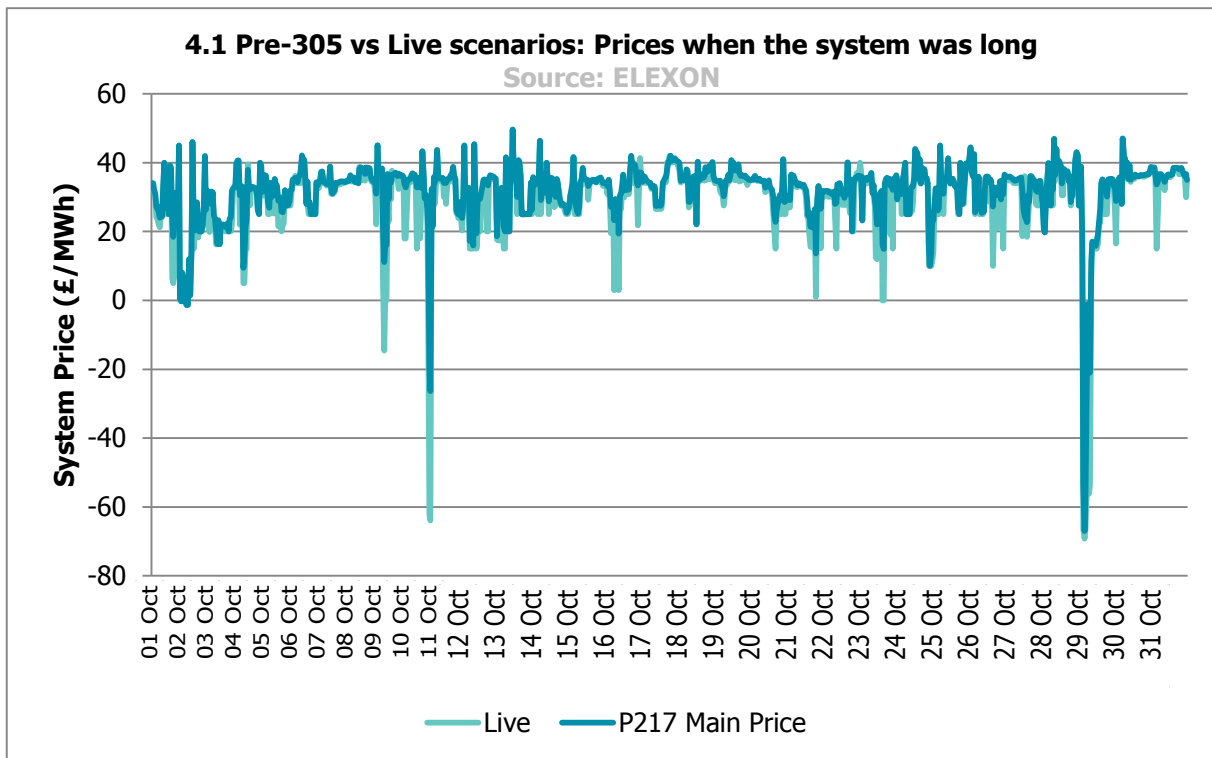
- A reduction in the PAR value to 1MWh (RPAR will remain at 1MWh);
- The introduction of a 'dynamic' LoLP function; and
- An increase in the VoLL to £6,000MWh, which will apply to all instances of VoLL in arrangements, including the RSP function.

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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 £2.08/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 79% of Settlement Periods; in 75% of these periods the change was less than £1/MWh. The biggest price change occurred on the 11 October 2017 in Settlement Period 7, where the live price was £42.66/MWh lower than the System Price would have been under the P217 Scenario. Again this is due to the reduction in PAR.



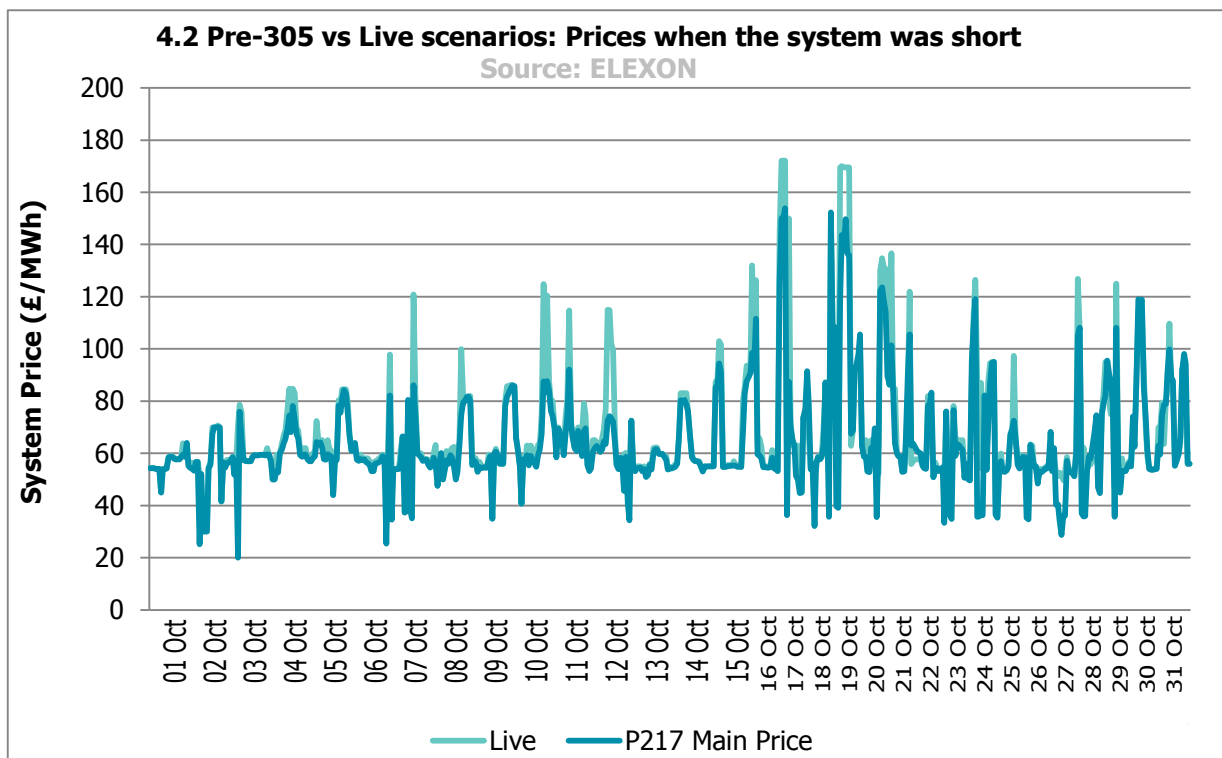
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Graph 4.2 compares live System Prices when the system was short with prices re-calculated using the pre-P305 pricing scenario 'P217' (using the Main Price calculation).

Live prices were on average £3.64/MWh higher when the system was short, and 14% of short Settlement Periods had price changes greater than £10/MWh.

The biggest difference in prices when the system was short was £62.52/MWh (16 October 2017 during Settlement Period 21), again as a result of the reduction in PAR. In the P217 scenario, the Main Price would have been £87.43/MWh compared to the live scenario System Price of £149.95/MWh.

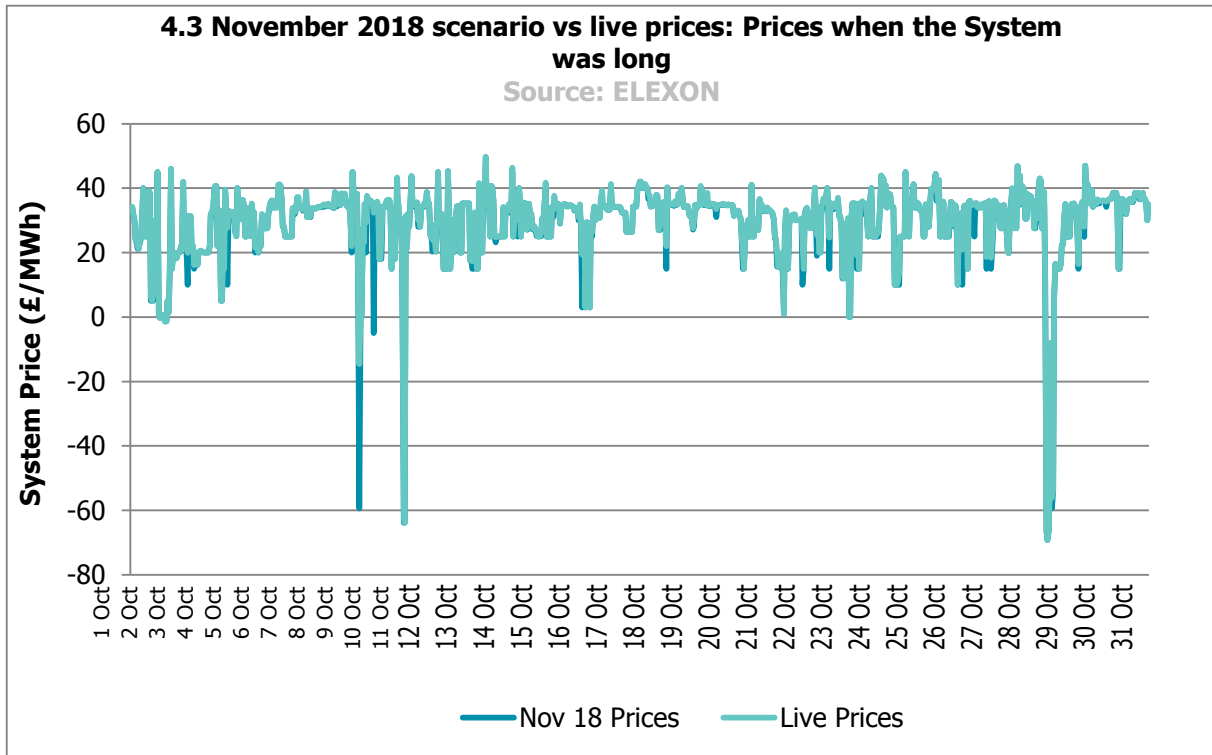
The inclusion of non-BM STOR volumes in the pricing stack changed the system length from long to short in 41 Settlement Periods.



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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.

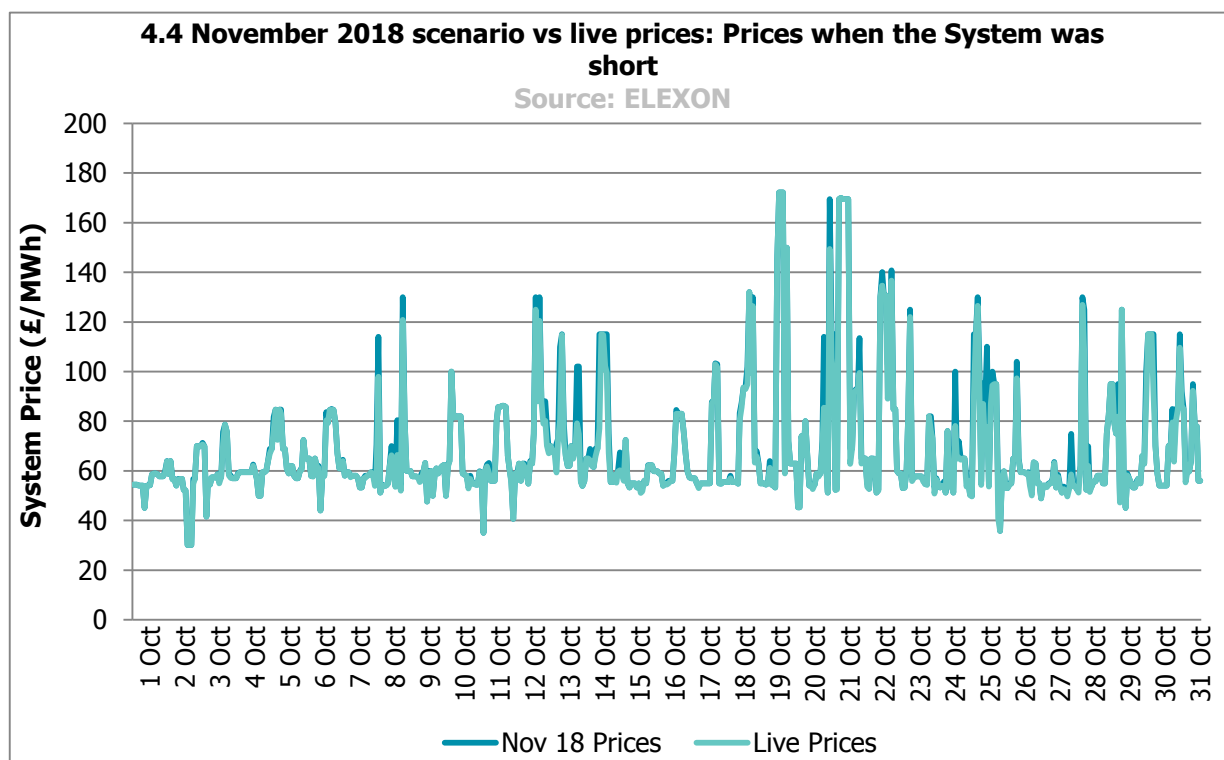


The average price differences across the month are relatively small under the November 2018 scenario, with prices unchanged in prices in 63% of Settlement Periods. System Prices would be £0.58/MWh lower when the system was long and £1.54/MWh higher when the system was short. When the system was long, price changes were less than £1/MWh in 68% of Settlement Periods and greater than £5/MWh in 8% of Settlement Periods. The biggest shift in price was £44.87/MWh (Settlement Period 8 on 10 October 2017), when the price would have been -£59.41/MWh under the November 2018 scenario compared to the current live System Price of -£14.54/MWh.

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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 38% of short Settlement Periods under the November 2018 scenario; 25% changed by more than £5/MWh and 12% by more than £10/MWh. The biggest difference in price was £37.92/MWh (Settlement Period 24 on 11 October 2017), when the price would have been £115/MWh under the November 2018 scenario compared to the current live System Price of £77.08/MWh.

Under the November 2018 scenario, there would be 58 Settlement Periods in October 2017 with prices greater than £100/MWh, compared to 39 periods under the current live scenario.



There were no Demand Control actions taken during October 2017. 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 RSPs can be seen in **Table 4.5**. The RSP would have re-priced no STOR actions in October.

4.5 Reserve Scarcity Prices with VoLL of £6,000

Date	SP	DRM	LoLP	RSP	RSP Used	System Length	System Price
18/10/2017	27	3,427.76	0.0000	0.00	No	Short	169.50
18/10/2017	28	3,459.30	0.0000	0.00	No	Short	169.50
29/10/2017	38	4,073.97	0.0000	0.00	No	Short	95.00
30/10/2017	35	4,084.69	0.0000	0.00	No	Short	115.00
30/10/2017	34	4,143.07	0.0000	0.00	No	Short	87.42

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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	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: <ul style="list-style-type: none"> • 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.

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APPENDIX 1 - NEGATIVE SYSTEM PRICES 29 OCTOBER 2017 SETTLEMENT PERIODS 1 TO 7

In this section, one of our Market Analysts, Nick Baker, takes a detailed look at System Prices for Settlement Periods 1 to 7 on 29 October 2017 using SF run data.



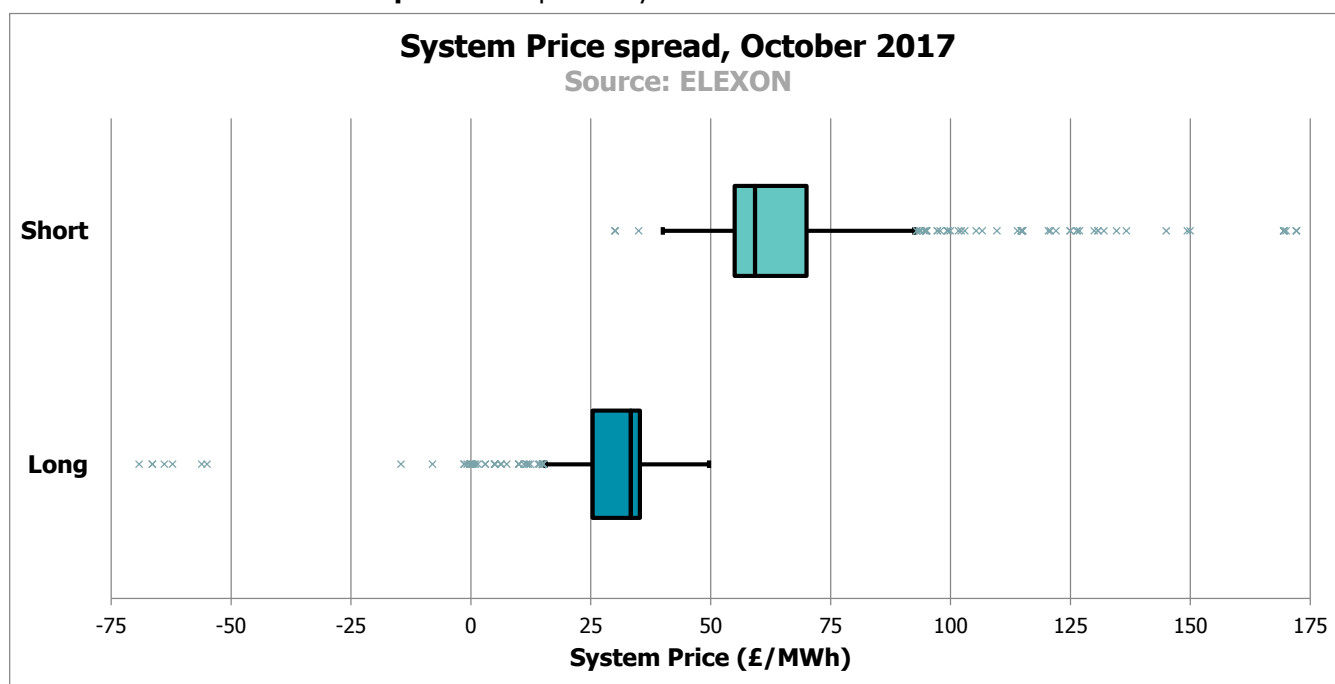
nick.baker@elexon.co.uk

Nine Settlement Periods in October 2017 had negative System Prices greater than $-\text{£}50/\text{MWh}$, with six occurred between Settlement Periods 1 to 7 on 29 October. Settlement Period 5 was the only exception in this range, with a System price of $-\text{£}8/\text{MWh}$.

Graph A1 shows the spread of System Prices in October 2017 displayed as a box plot diagram, and split between a short and long system. The middle line in each box represents the median System Price of the month, which is $\text{£}59.26/\text{MWh}$ for short Settlement Periods and $\text{£}33.35/\text{MWh}$ 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 $\text{£}14.99/\text{MWh}$ for short System Prices and $\text{£}9.87/\text{MWh}$ 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, 67 of the 919 (7.3%) long System Prices for October were outliers - with 53 of these outliers greater or equal to $\text{£}0/\text{MWh}$. The graph also shows how the eight long System Prices above $-\text{£}50/\text{MWh}$ differ to the other System Prices in October, with all other outliers being $-\text{£}15/\text{MWh}$ or less

Graph A1. Box plot of System Prices in October 2017



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Table A2 displays the System Price and the volume of Buy and Sell actions taken in Settlement Periods 1 to 7 on 29 October. As discussed in the main body of the SPAR, Settlement Period 2 had the lowest System Price of the month (-£69.17/MWh) and the largest longest Net Imbalance Volume (NIV) of the month (-1,438MWh).

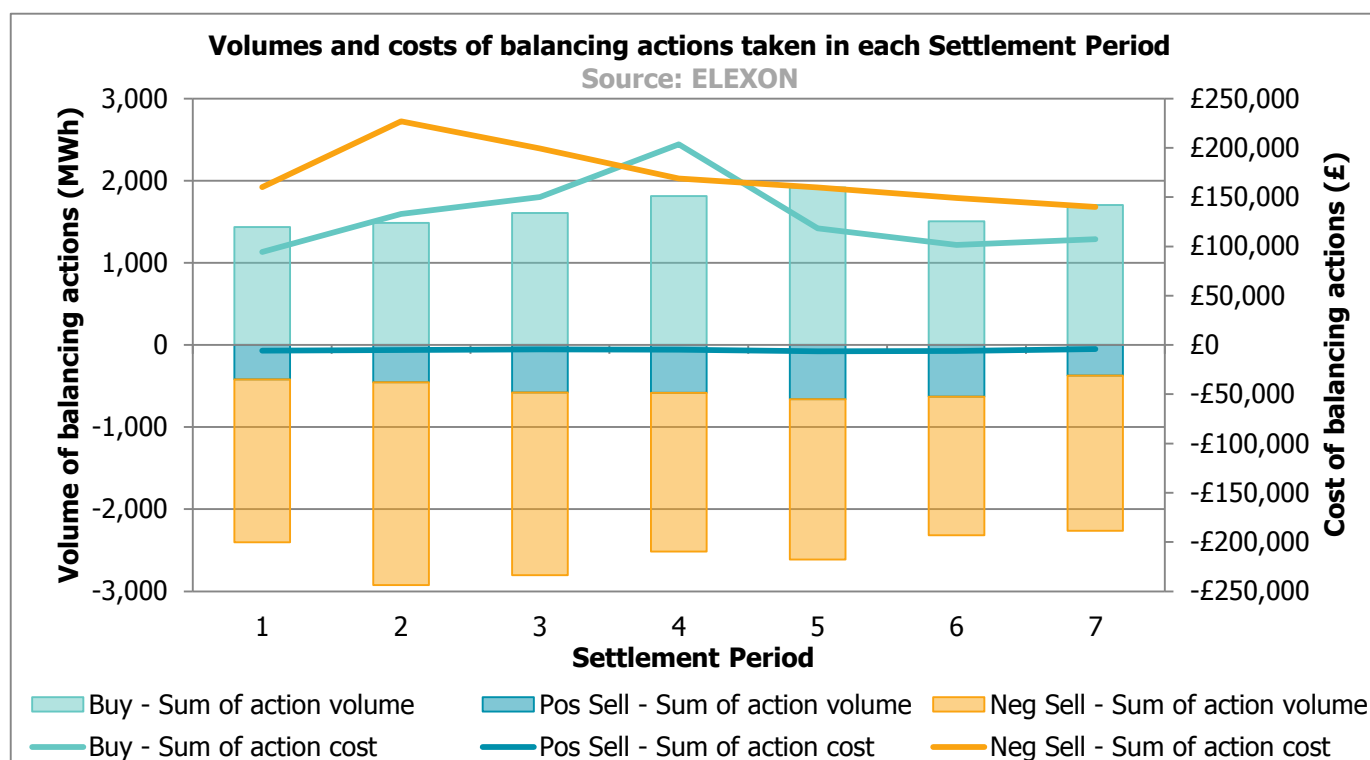
The average volume of Sell actions in a Settlement Period in October was -888MWh. Settlement Periods 2 and 3 had the highest volume of Sell actions in the month, at -2,925MWh and -2,803MWh respectively.

Table A2. System Price and NIV

Settlement Period	System Price (£/MWh)	Volume of Buy Actions (MWh)	Volume of Sell Actions (MWh)	Net Imbalance Volume (MWh)
1	-66.41	1436	-2403	-967
2	-69.17	1487	-2925	-1438
3	-66.40	1606	-2803	-1197
4	-55.00	1813	-2517	-704
5	-8.00	1920	-2614	-694
6	-56.10	1508	-2315	-807
7	-53.38	1705	-2262	-557

Graph A3 shows the volumes and costs of Buy actions, negatively priced Sell actions (Neg Sell) and positively priced Sell actions (Pos Sell). The majority of sell actions were negatively priced, and contributed to the majority of the balancing costs incurred during Settlement Periods 1 to 7. The total cost of negatively priced sell actions between Settlement Periods 1 to 7 was £1.2m, while the total cost of buy actions was £0.9m.

Graph A3. Total volumes and costs of balancing actions in Settlement Periods 1 to 7 on 29 October 2017



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Graph A4 displays the volume of Sell actions, by price, and whether they were First-Stage Flagged.

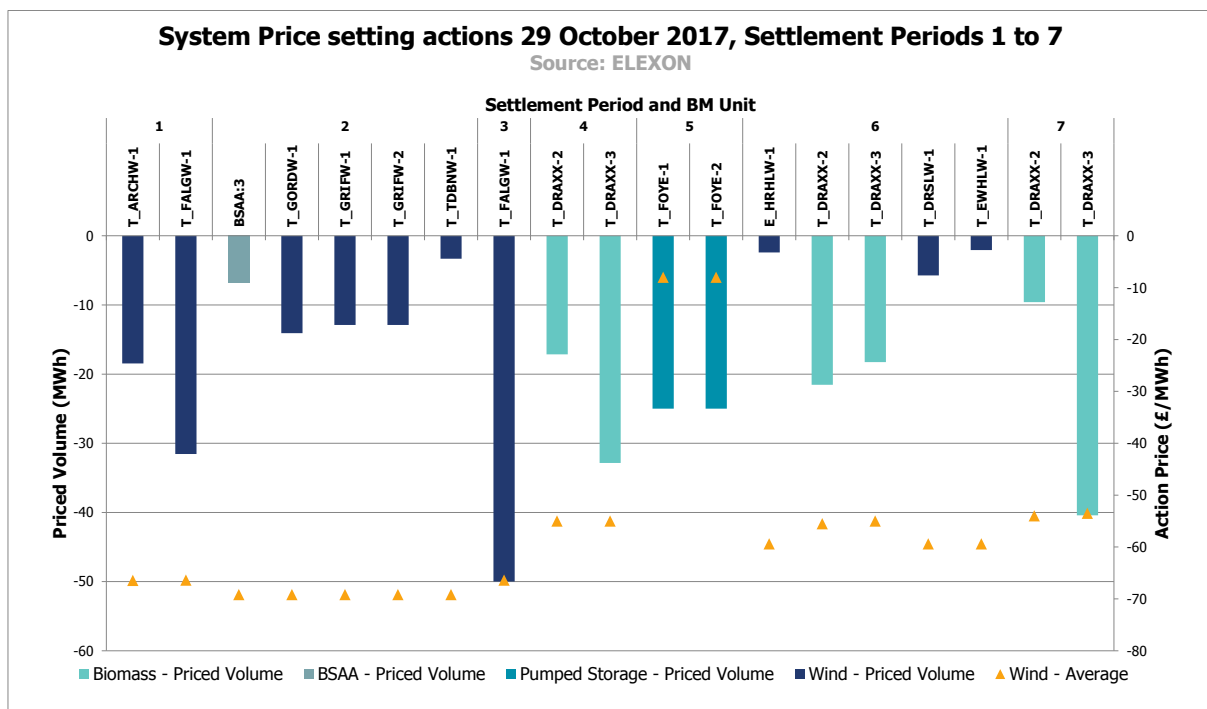
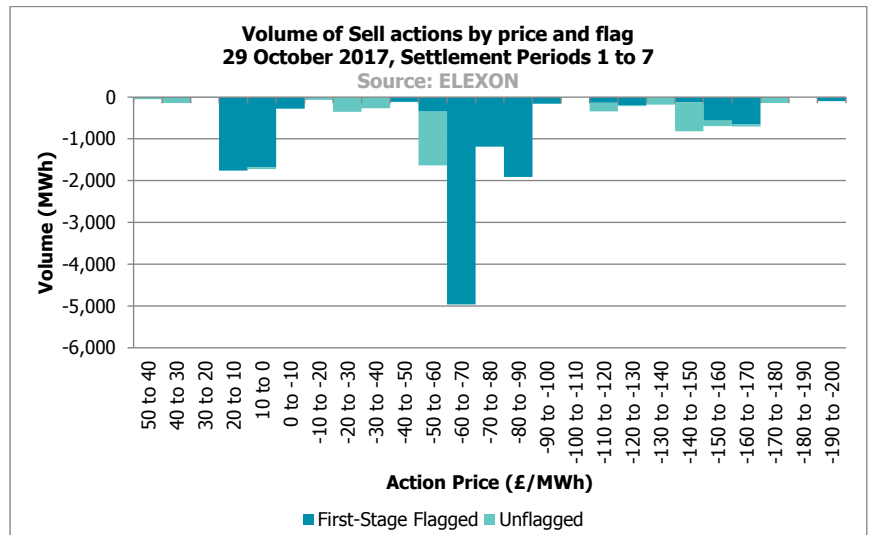
79.7% of Sell actions in Settlement Periods 1 to 7 were First-Stage Flagged, with 79.4% of volume was SO-Flagged and 0.3% of volume was CADL Flagged. Settlement Period 5 was the highest in the range with 83.6% of First-Stage Flagged actions, and Settlement Period 7 the lowest with 72.6%.

The average price of a First-Stage Flagged Sell action in Settlement Periods 1 to 7 was -£76.59/MWh, and the average price of an Unflagged Sell action was -£71.41/MWh. The minimum price of a First-Stage Flagged Sell action was -£192.40/MWh, and the minimum price of an Unflagged Sell action was also -£192.40/MWh (both actions occurred during Settlement Periods 3 and 4).

Of the 79.7% of First-Stage Flagged volume, 4.1% were Second-Stage Flagged and hence re-priced. However, no Second-Stage Flagged volume remained in the final price stack after PAR Tagging. All actions which set the System Price in Settlement Periods 1 to 7 retained their initial price, regardless of whether they were First-Stage Flagged.

Graph A5 shows the individual actions in the PAR volume, and which set the System Price in Settlement Periods 1 to 7 on 29 October 2017. Price setting actions were by Bids from Wind, Biomass, Pumped Storage BMUs and a Balancing Services Adjustment Action. The price for each action is shown using the orange triangle.

Graph A4. Flagged actions in Settlement Periods 1 to 7



Graph A5. System Price setting actions in Settlement Periods 1 to 7 on 29 October.

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APPENDIX 2 - NATIONAL GRID DATA ISSUES ON 29 OCTOBER 2017

On this day, National Grid experienced problems with their Bid Offer Acceptance (BOA) profiling system caused by a BOA dividing by zero. This is the second time the issue has occurred, as it was also seen on 24 June 2017.

National Grid has provided the timeline of events below:

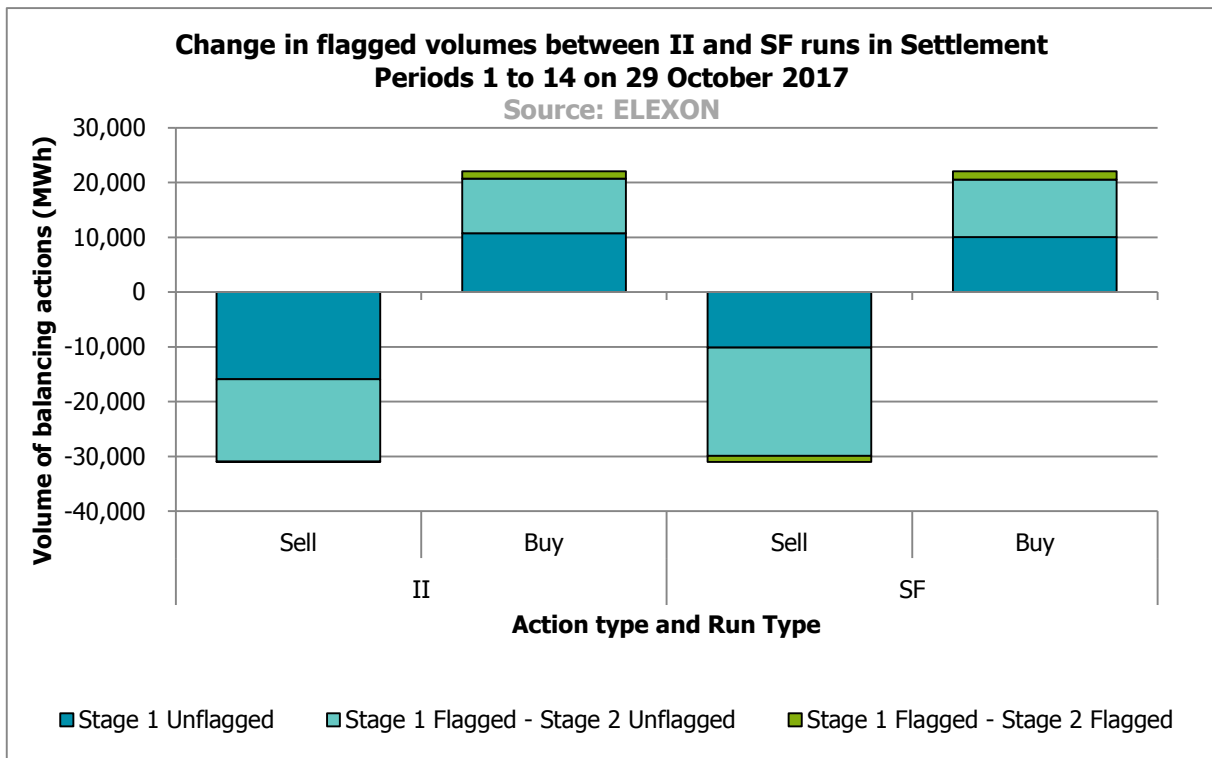
- Around 00:45 on 29 October 2017, an issue was reported by the Energy Balancing team whereby the BOA profiling process for the Control Centre BOA screens were not updating correctly. A high volume of BOA instructions (over 50) had been issued, with the majority being Wind bids. Due to the volume of BOAs that were required to be issued, it was agreed to remain using the system for as long as possible.
- On investigation it was discovered that the profiling servers had "locked out", due to BMU data causing a "divide by zero" error, as happened on 24 June 2017.
- Though the Control Centre BOA screens were not updating, affected generators confirmed that they were receiving, accepting and following the BOA instructions.
- The BOA profiling was working again by 01:47
- The frequency was kept within Operational Limits throughout the incident despite situational awareness being impaired.

The National Grid IT team have now developed a fix which they intend to install by Tuesday 5 December. ELEXON will continue to work with National Grid to resolve any outstanding data issues arising from 24 June 2017 and 29 October 2017 via the Trading Disputes Process.

The issue affected the data being sent to ELEXON for use in Settlement. After the II Settlement Run, an ISG Member alerted ELEXON and National Grid that some of the accepted Bids from this day should potentially have been SO flagged. Prior to the SF Settlement Run, National Grid can correct Bids and Offers (see BSCP18 for details).

Using this process, National Grid corrected the SO flags of 432 BOAs from Wind BMU's during Settlement Periods 1 to 14. This represented -5,750MWh of Bid volume and 728MWh of Offer volume. These changes did not change the System Price in any of the effected Settlement Periods.

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Graph A6. Change in volumes of Stage 1 and Stage 2 flagged actions as a result of BSCP18 corrections

Graph A6 shows the volume of Stage 1 and Stage 2 Flagged actions at II and SF run during Settlement Periods 1 to 14. The volume of Stage 2 Flagged actions increased from -73MWh at II run to -1,105MWh at SF as a result of the SO flag corrections. All of the Stage 2 Flagged volumes were removed by Net Imbalance Volume (NIV) tagging, hence did not enter into the volume weighted average used to calculate the System Price at the II or SF run.