

# ISG210-SPAR

## REPORTING ON SEPTEMBER 2018

ISSUE 35 – PUBLISHED 23 OCTOBER 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<sup>1</sup>. 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 appendix focuses on the negative System Price seen on 18 September, which was the first time since the introduction of P305 that a negative System Price occurred where the system was short.

#### 1 SYSTEM PRICES AND LENGTH

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

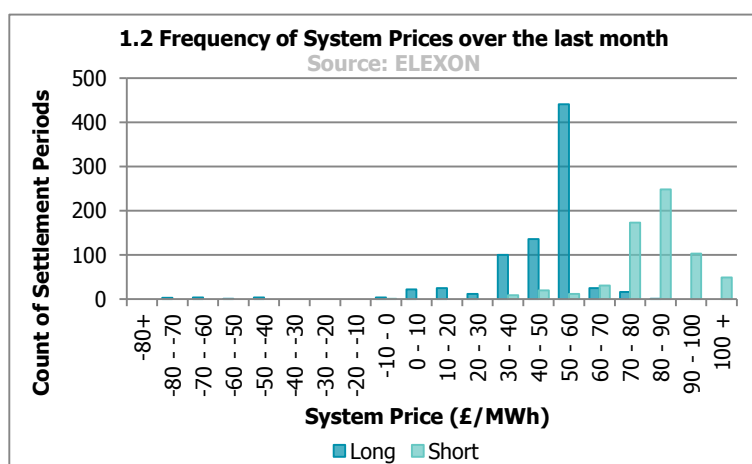
**Graph 1.2** shows the distribution of System Prices across Settlement Periods in September 2018 when the market was long and short.

50% of System Prices were between £30/MWh and £60/MWh, regardless of system length. When the system was long, 56% of prices were between £50/MWh and £60/MWh. When the system was short, 65% of prices were between £70/MWh and £90/MWh and 8% of prices were over £100/MWh.

System Price (Long)					
Month	Min	Max	Median	Mean	Std Dev
September 2018	-71.45	88.73	52.53	46.15	18.90

System Price (Short)					
Month	Min	Max	Median	Mean	Std Dev
September 2018	-6.25	189.26	83.10	82.71	15.50

#### 1.1 System Price summary by month (£/MWh)



<sup>1</sup> 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

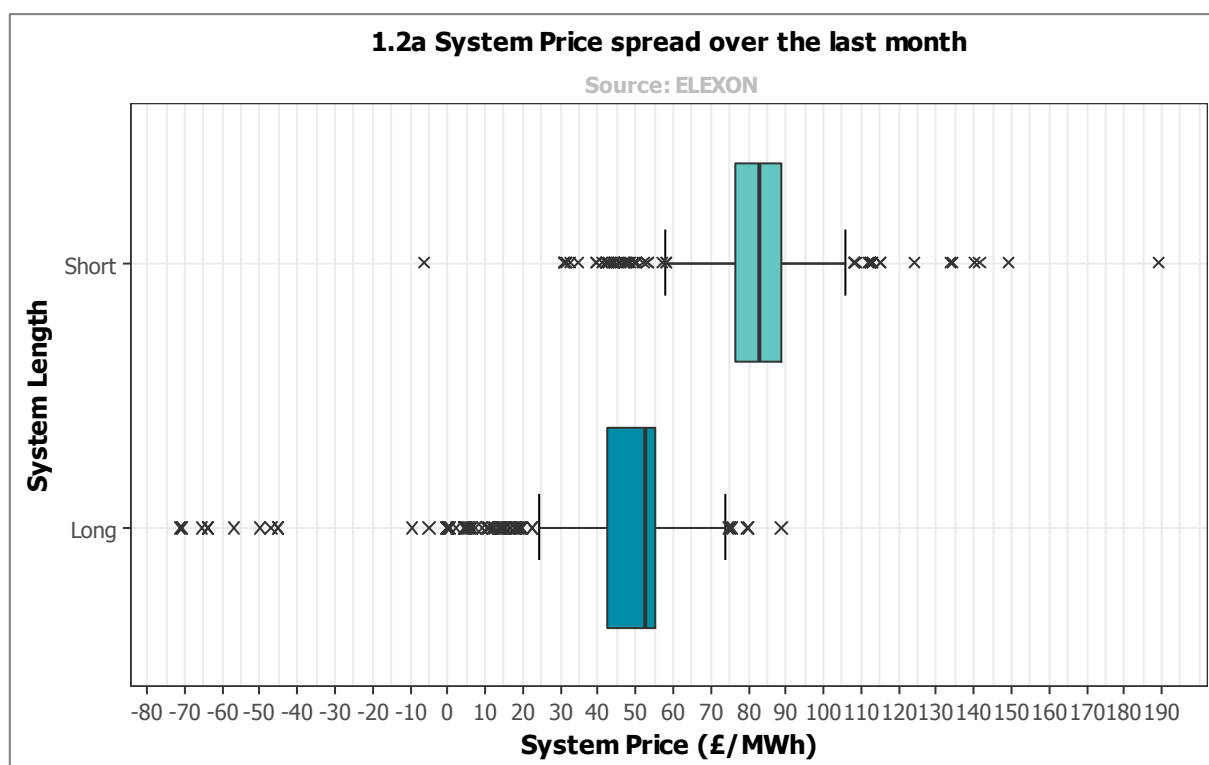
System Prices exceeded £100/MWh a total of 45 times in September 2018, compared to 40 times in August. The highest System Price of the month, £189.26/MWh, occurred in Settlement Period 35 on 20 September 2018. The price in this Settlement Period was set by Offers from a CCGT and Pumped Storage BMU, priced at £149/MWh and £210/MWh respectively.

There were 10 Settlement Periods where the System Price was £0/MWh, and 17 negative System Prices, in September. The 17 negative System Prices occurred across eight different days.

The lowest System Price, -£71.45/MWh, occurred in Settlement Period 32 on 23 September. This was set by Bids from four Wind BMUs priced between -£70.69/MWh and -£79/MWh.

**Graph 1.2a** displays the spread of System Prices in September 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 £83.10/MWh for short Settlement Periods and £52.53/MWh for long Settlement Periods. Each box edge represents the lower and upper quartiles (25<sup>th</sup> and 75<sup>th</sup> percentile respectively), with the Interquartile Range (difference between the Upper and Lower quartiles) being £12.37/MWh for short System Prices and £12.87/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 (IQR) away from the Upper and Lower quartiles. Under this definition, 71 long and 58 short System Prices for September were outliers. Of the 58 short outliers, 38 were below 1.5 x the IQR away from the Lower quartile. These prices ranged from -£6.25/MWh to £58/MWh. The System Price of -£6.25/MWh, on the 18 September in Settlement Period 9, was the lowest and only negative short price of 2018 (up to the end of September 2018).

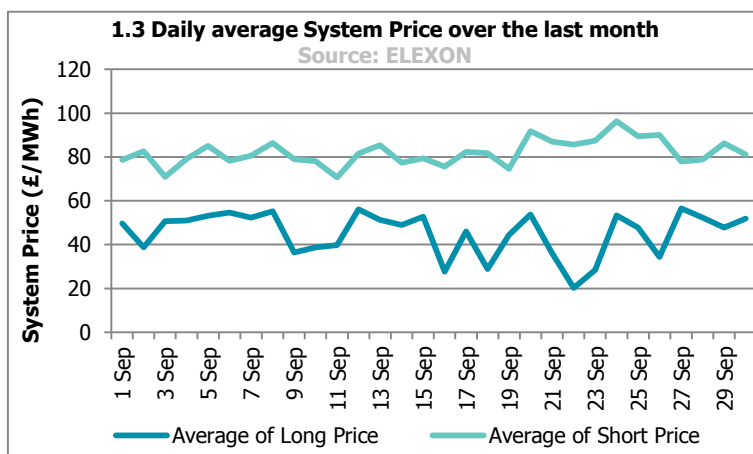


# SYSTEM PRICE ANALYSIS REPORT

**Graph 1.3** shows daily average System Prices over the last month. In September, the average System Price was £46.15/MWh when the system was long and £82.71/MWh when the system was short.

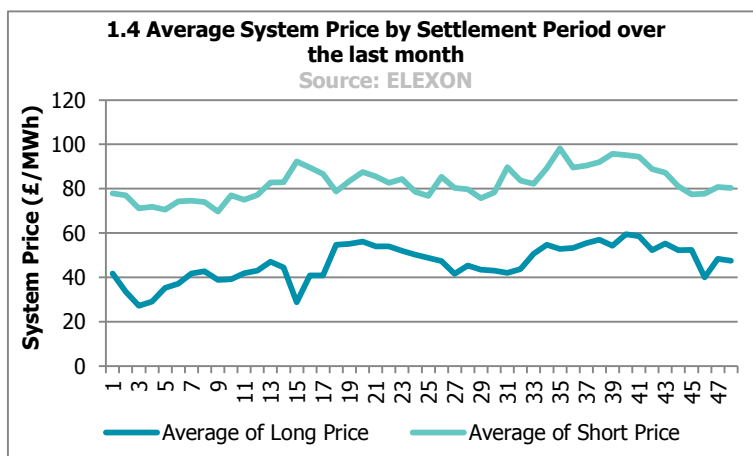
The highest daily average price when the system was short was £96.27/MWh, and occurred on 24 September. The system was short for 22 Settlement Periods on this day.

The lowest daily average price when the system was long was £20.21/MWh on 22 September 2018. The system was long in 5 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 3. The lowest average System Prices, regardless of market length, occurred during Settlement Period 31, when the System Price was £46.83/MWh.

Average long Settlement Period System Prices ranged between £27.25/MWh and £59.51/MWh. Average short Settlement Period prices varied from £69.62/MWh to £98.15/MWh.

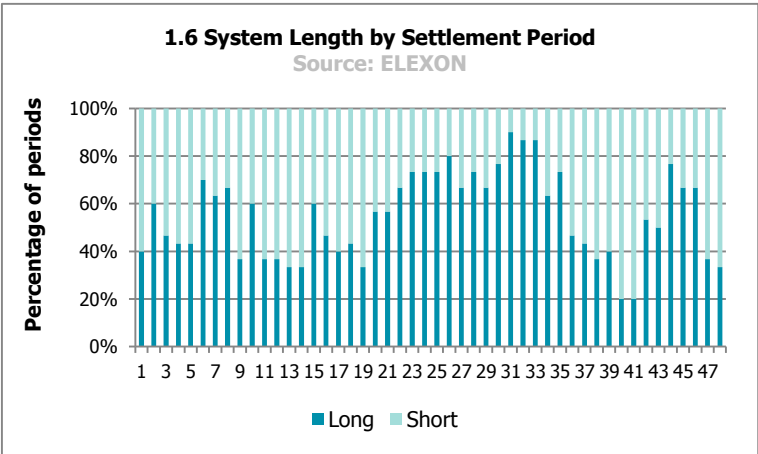
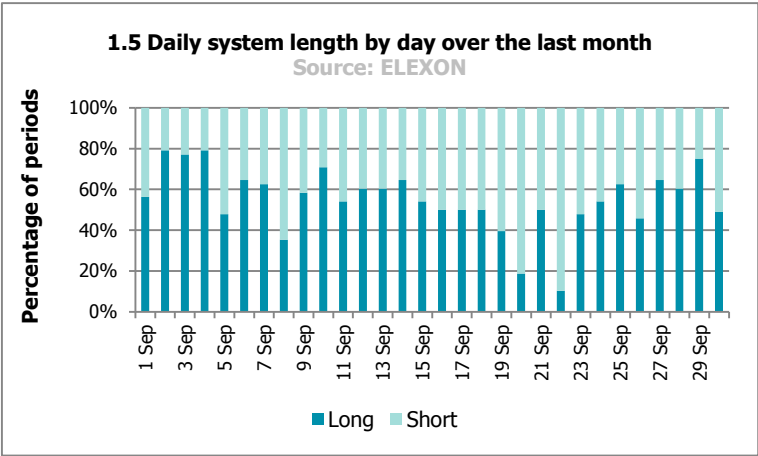


# SYSTEM PRICE ANALYSIS REPORT

**Graph 1.5** shows system length by day, and **Graph 1.6** shows system length by Settlement Period for September. The system was long for 55% of Settlement Periods in September, compared to 58% in August.

On 22 September, the system was short for 90% of Settlement Periods. On this day, the average NIV when the system was short was 395MWh. The average System Price in a short Settlement Period was £85.70/MWh on 22 September.

Settlement Periods 40 and 41 were short for 80% of the month, whilst Settlement Period 31 was short for 10% of the month.



# SYSTEM PRICE ANALYSIS REPORT

## 2 PARAMETERS

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

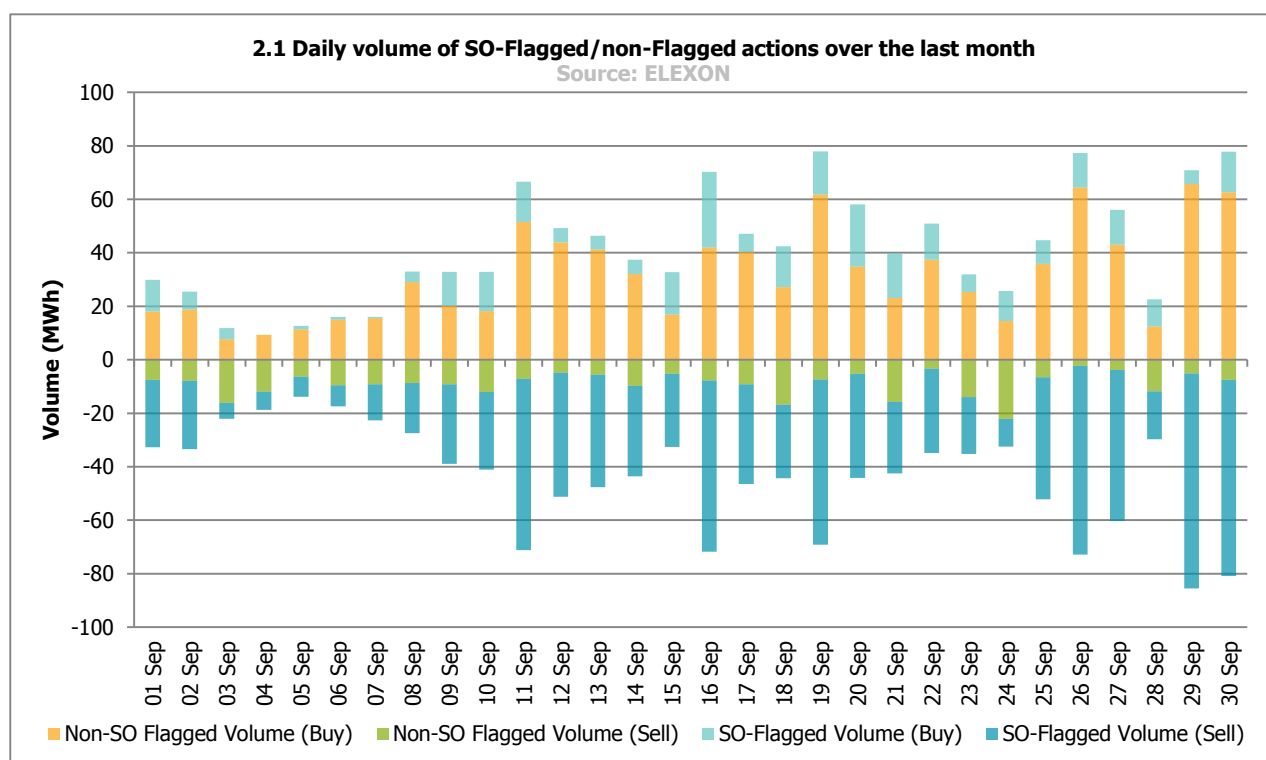
- The impact of Flagging balancing actions;
- The impact of NIV Tagging;
- The impact of PAR Tagging;
- The impact of the Replacement Price; and
- How these mechanisms affect which balancing actions feed into the price.

### 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 September 2018 that have been Flagged by the SO as being constraint related. On 26 September, 97% of sell volume was SO-Flagged.



# SYSTEM PRICE ANALYSIS REPORT

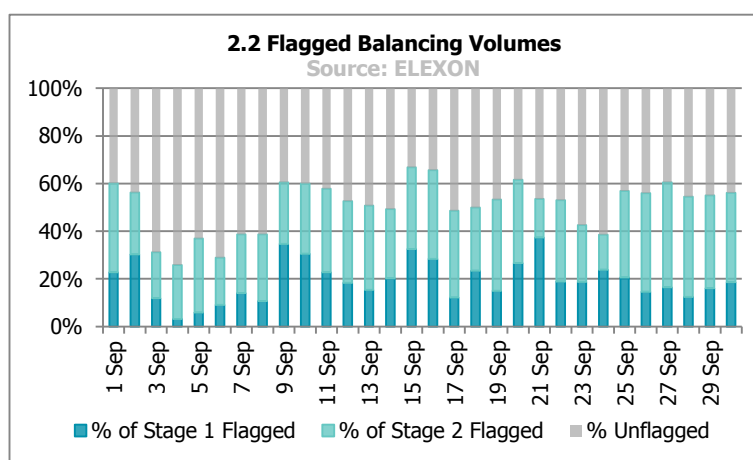
79% of sell balancing actions taken in September had an SO-Flag, compared with 57% in August. 36% of SO-Flagged sell actions came from Wind BMUs, 30% from Balancing Services Adjustment Actions (BSAAs) and 24% from CCGT BMUs. The average initial price (i.e. before any re-pricing) of a SO-Flagged sell action was -£39.56/MWh.

24% of buy balancing actions taken in September had an SO-Flag, compared to 23% in August. 55% of SO-Flagged buy actions came from BSAAs and 39% from CCGT BMUs. The average initial price of a SO-Flagged buy action was £87.32/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 September. The majority of CADL Flagged buy actions (94%) came from Pumped Storage BMUs. 52% of CADL Flagged sell actions came from Pumped Storage BMUs, with CCGT BMUs accounting for a further 42%.

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, 80% of sell actions in September were Flagged. Of these, 10% 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 September, 266 Settlement Periods had a Replacement Price based on the RPAR and 68 Settlement Periods had a Replacement Price based on the MIP. However, the majority of Settlement Periods (77%) 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 September, the average original price of a Second-Stage Flagged repriced sell action was £12.88/MWh and the average Replacement Price for sell actions (when the System was long) was £51.31/MWh.

26% of buy actions were Flagged; of these 0.2% 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 £104.180/MWh, and the average Replacement Price was £87.75/MWh.

If there are no Unflagged actions remaining in the NIV, the Replacement Price will default to the Market Index Price. This occurred in 66 long and two short Settlement Periods in September, compared to 24 long Settlement Periods last month.

# SYSTEM PRICE ANALYSIS REPORT

## NIV and NIV Tagging

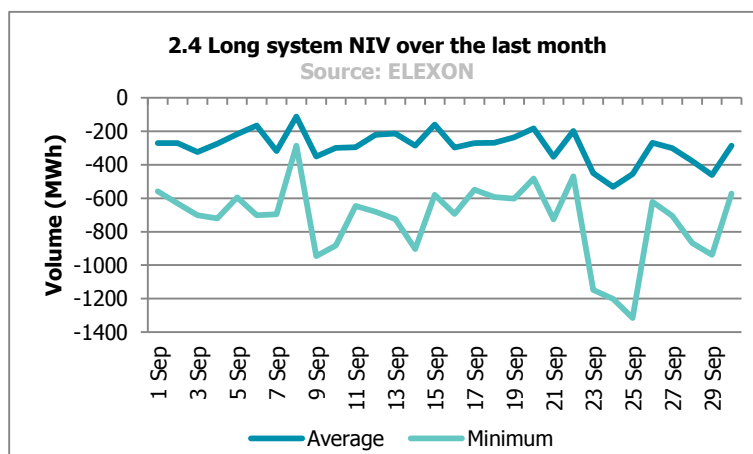
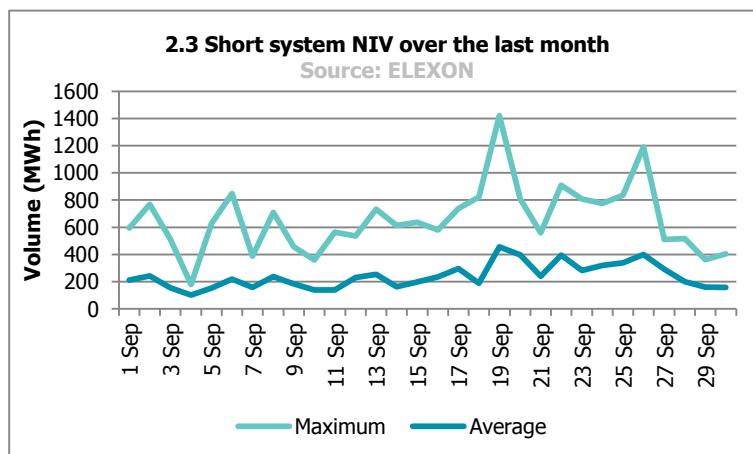
The Net Imbalance Volume (NIV) represents the direction of imbalance of the system – i.e. whether the system is long or short overall. **Graph 2.3** shows the greatest and average NIV when the system was short, and **Graph 2.4** shows the greatest and average NIVs when the system was long. Note short 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 September, 83% 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 (1,421MWh) was seen on 19 September in Settlement Period 25. The System Price was £88/MWh in this Settlement Period.

The minimum long system NIV of the month was -1,316MWh, on 25 September 2018 during Settlement Period 27 when the System Price was £56.40/MWh.



# SYSTEM PRICE ANALYSIS REPORT

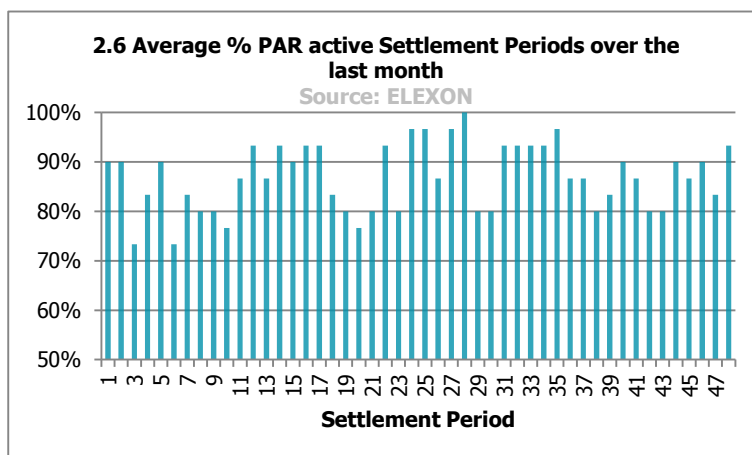
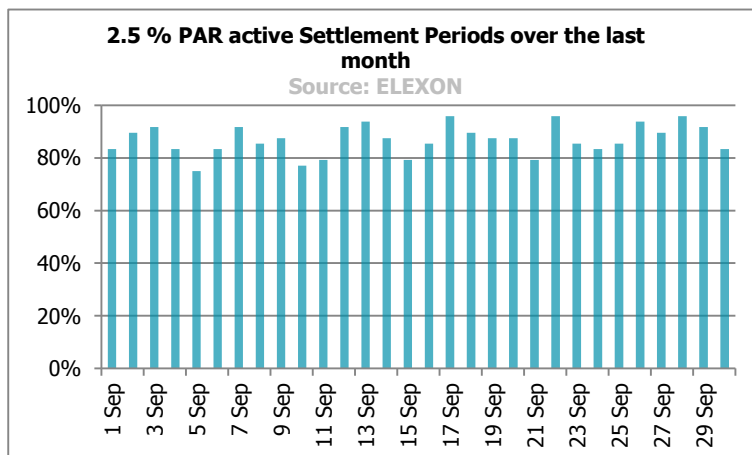
## PAR Tagging

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 87% of Settlement Periods in September.

**Graph 2.6** shows the proportion of Settlement Periods over the last month when PAR Tagging was active. Settlement Periods 3 and 6 had the lowest active PAR Tagging in September 2018 with 73%, 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 28 had PAR Tagging active every day during September.





# SYSTEM PRICE ANALYSIS REPORT

## DMAT and Arbitrage Tagged Volumes

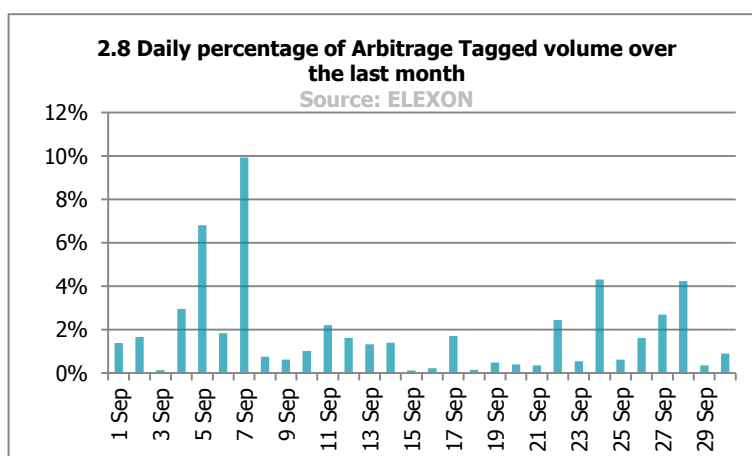
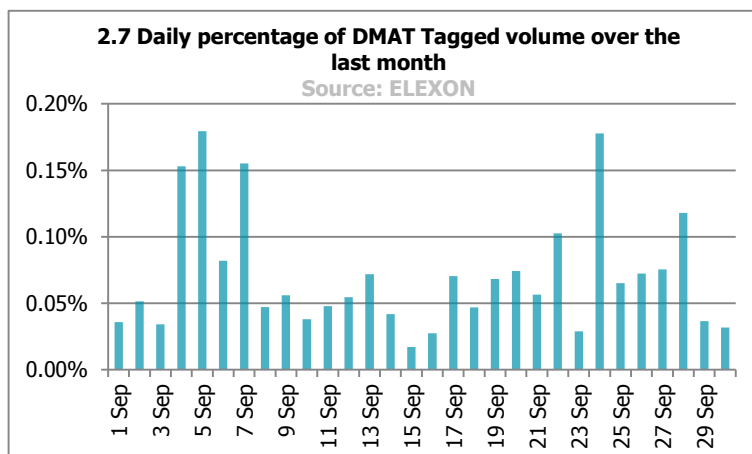
Some actions are always removed from the price calculation (before NIV Tagging). These are actions which are less than 1MWh (De Minimis Acceptance Threshold (DMAT) Tagging) or buy actions which are either the same price or lower than the price of sell actions (Arbitrage Tagging).

**Graph 2.7** shows the volumes of actions removed due to DMAT Tagging. 0.06% of total buy and sell volume was removed by DMAT Tagging in September. 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. 1.43% of total buy and sell volume was removed by Arbitrage Tagging in September. 50% of Arbitrage Tagged volume was from BSAAs, with 29% from CCGT BMUs.

In September, the average initial price of an Arbitrage Tagged buy action was £31.80/MWh, and for a sell action was £50.74/MWh. The maximum price of an Arbitrage Tagged sell action was £138.00/MWh, and the lowest priced Arbitrage Tagged buy action was -£122.14/MWh.

On 7 September 2018, 3,893MWh of actions were Arbitrage Tagged, representing 10% of daily volume. The average price of an Arbitrage Tagged buy action was £31.80/MWh, and for a sell action was £50.74/MWh.



# SYSTEM PRICE ANALYSIS REPORT

## 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).

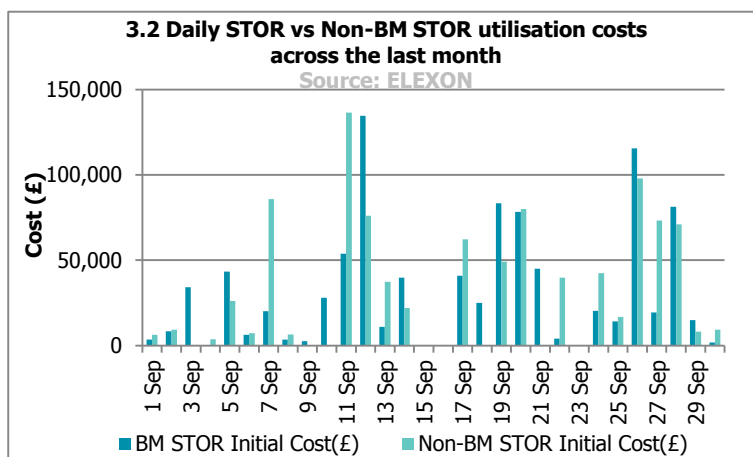
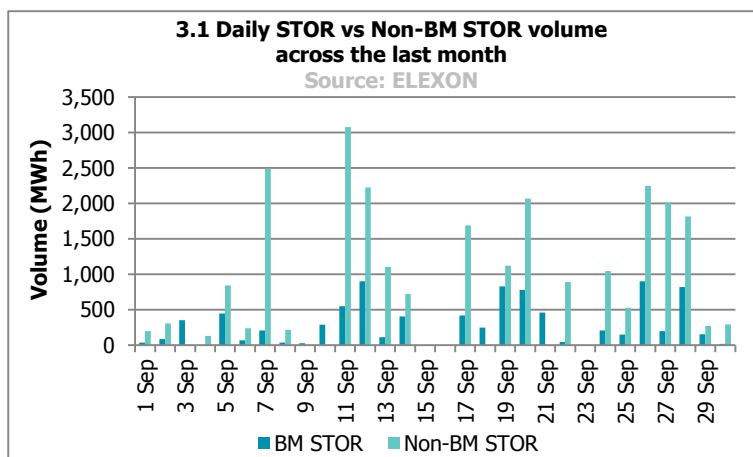
Under STOR contracts, availability payments are made to the balancing service provider in return for capacity being made available to the SO during specific times (STOR Availability Windows). When STOR is called upon, the SO pays for it at a pre-agreed price (its Utilisation Price). Some STOR is dispatched 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. 75% of the total STOR utilised in September came from outside of the Balancing Mechanism.

The average Utilisation Price for STOR capacity in September was £55.57/MWh (£107.31/MWh for BM STOR and £37.93/MWh for non-BM STOR).

On 11 September, 3,078MWh of non-BM STOR volume was called at an utilisation cost of £137,000. This represented 12% of the total non-BM STOR volume in August.

10% of BM STOR volume in September was called upon on 12 September. This had a utilisation cost of £135,000.



# SYSTEM PRICE ANALYSIS REPORT

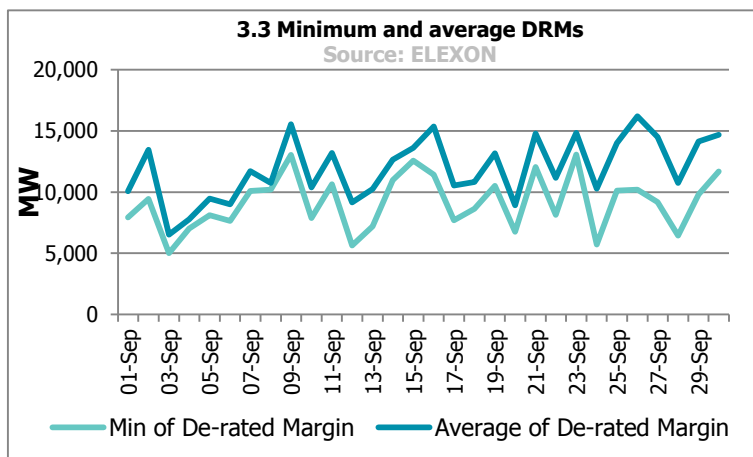
## De-Rated Margin, Loss of Load Probability and the Reserve Scarcity Price

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 September 2018.

The System Operator has determined a relationship between each DRM and the LoLP<sup>2</sup>, which will determine the RSVP. The minimum DRM in September was 5,011MW on 3 September in Settlement Period 40 (compared to 2,360MW in August).

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 September (see **Table 3.4**).



## 3.4 Top 5 LoLPs and RSVPs

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
03/09/2018	40	5,010.74	0.0000	0.00	No	Long	52.45
03/09/2018	41	5,273.75	0.0000	0.00	No	Long	53.41
03/09/2018	36	5,592.50	0.0000	0.00	No	Long	52.17
12/09/2018	40	5,637.58	0.0000	0.00	No	Short	98.76
24/09/2018	39	5,709.39	0.0000	0.00	No	Short	124.30

<sup>2</sup> 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](https://www.elexon.co.uk/wp-content/uploads/2015/10/Loss_of_Load_Probability_Calculation_Statement_v1.0.pdf)

# SYSTEM PRICE ANALYSIS REPORT

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## 4 P305 - SPECIFIC ANALYSIS

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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<sup>3</sup>; 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 have been analysed in further detail as part of ELEXON's insights '[1 November 2018 changes to the System Price Calculation](#)'.

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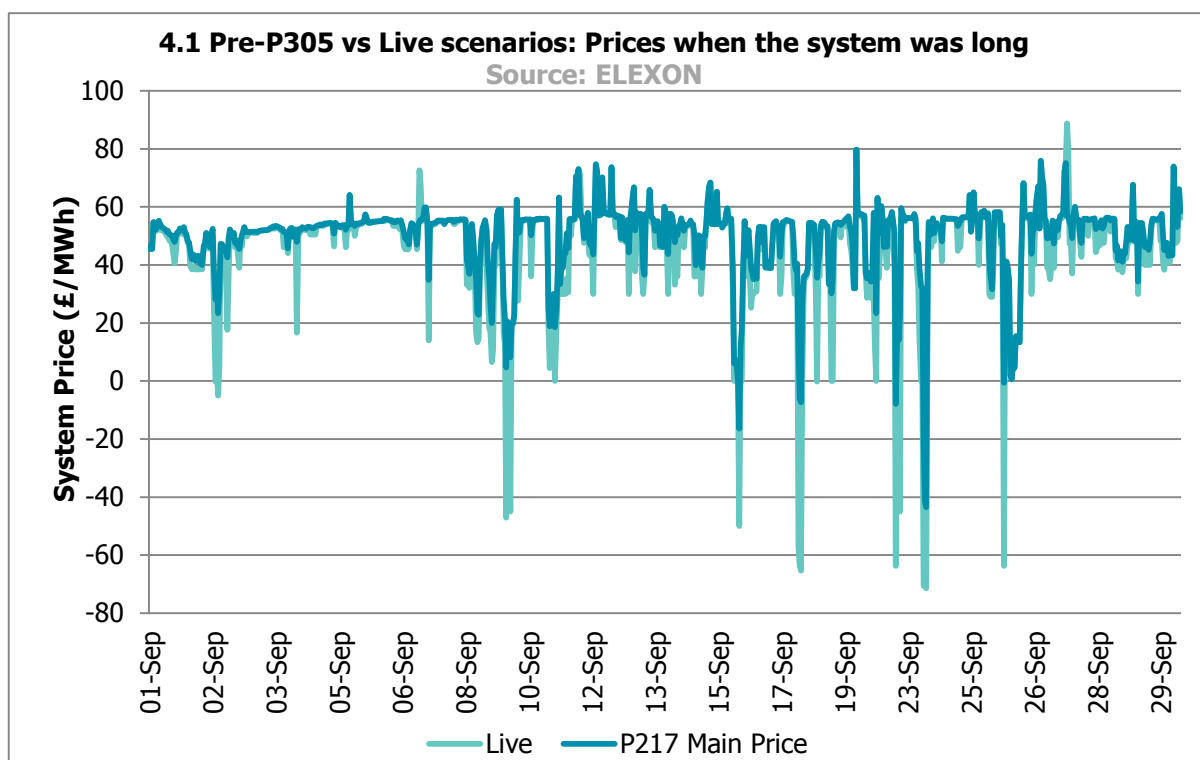
<sup>3</sup> From 1 May 2018 the Transmission Company will calculate Indicative LoLP values using the Dynamic Method, whilst it continues to calculate Final LoLP values using the Static Method. Indicative LoLP values using the Dynamic Method are published on the ELEXON Portal.

# SYSTEM PRICE ANALYSIS REPORT

## 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 £3.56/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 73% of these periods, the change was less than £1/MWh. The biggest price change occurred on the 18 September 2018 in Settlement Period 2, where the live price was £69.04/MWh lower than the System Price would have been under the P217 Scenario. This difference was due to the reduction in PAR.



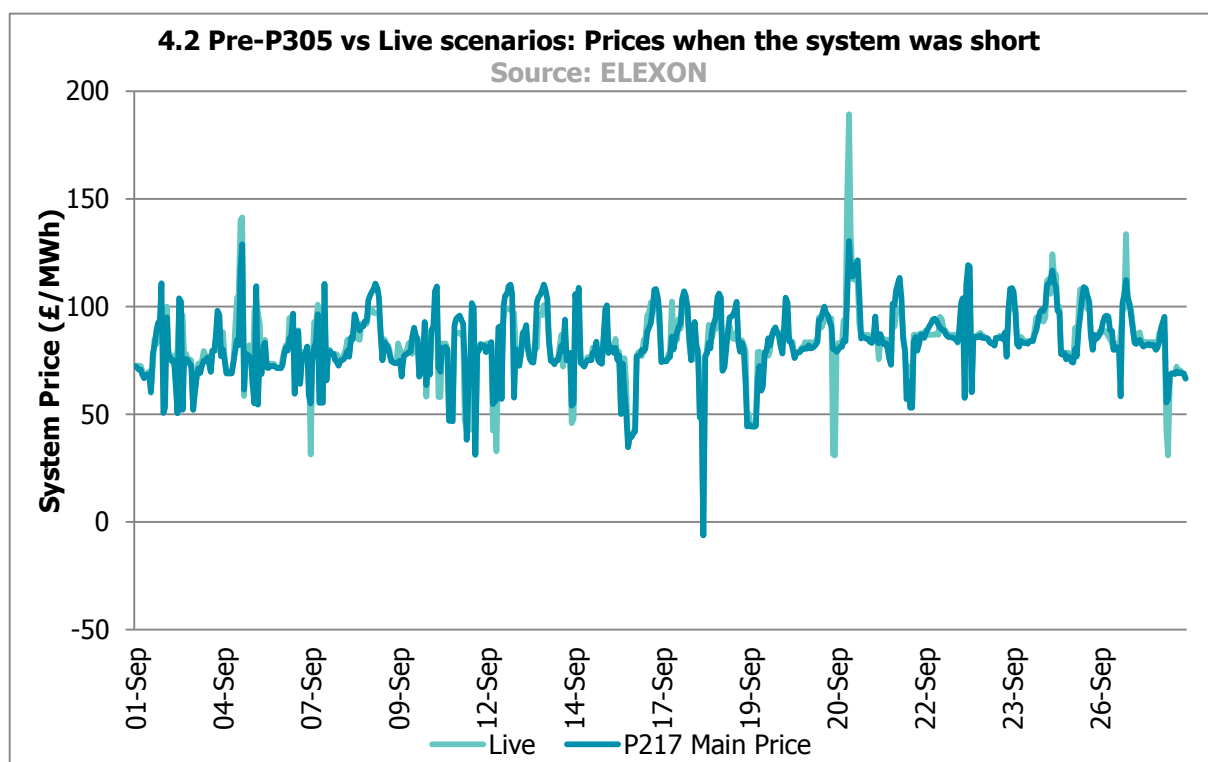
## SYSTEM PRICE ANALYSIS REPORT

**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 £0.25/MWh higher when the system was short. In September, 55% of Settlement Periods had live System Prices higher than the Pre-P305 scenario, 33% had lower System Prices and 12% had no change.

The biggest difference in prices when the system was short was £58.84/MWh (20 August 2018 during Settlement Period 35), as a result of the reduction in PAR. In the P217 scenario, the Main Price would have been £130.42/MWh and the system long compared to the live scenario System Price of £189.26/MWh and the system short. This was the highest System Price in September.

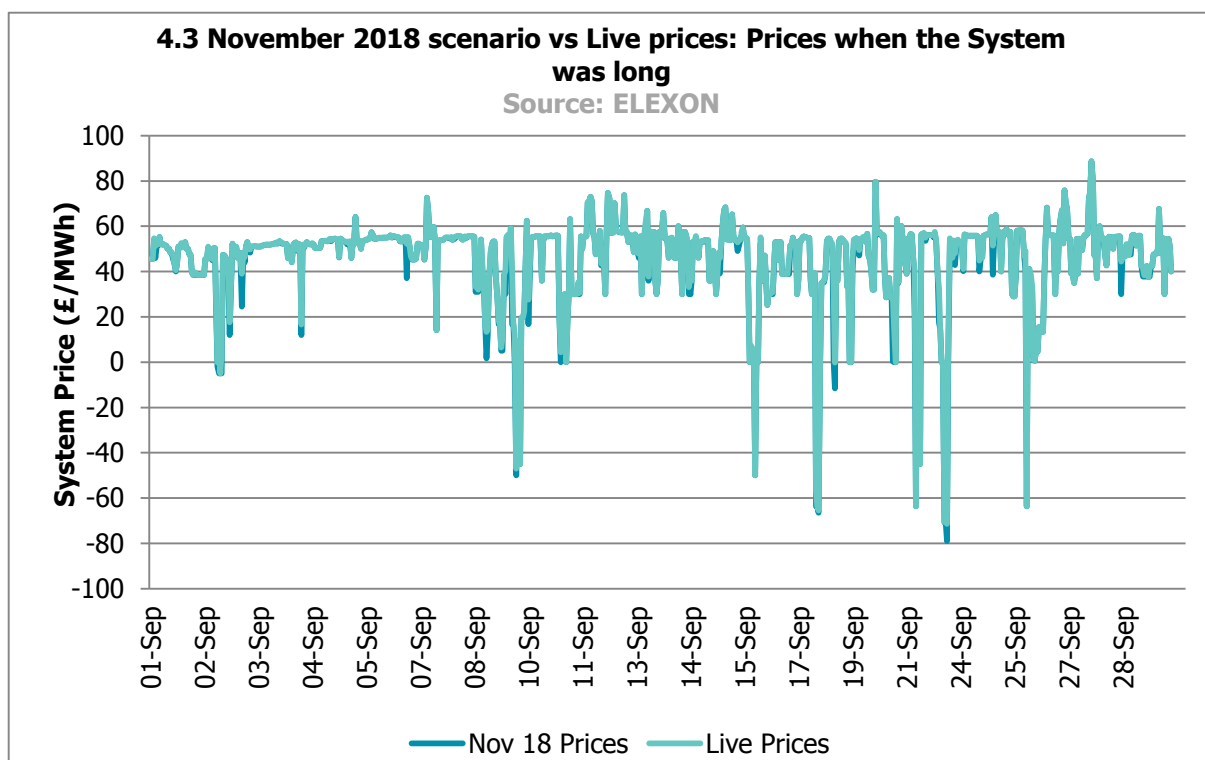
The inclusion of non-BM STOR volumes in the pricing stack changed the system length from long to short in 35 (2%) of Settlement Periods.



# SYSTEM PRICE ANALYSIS REPORT

## 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.

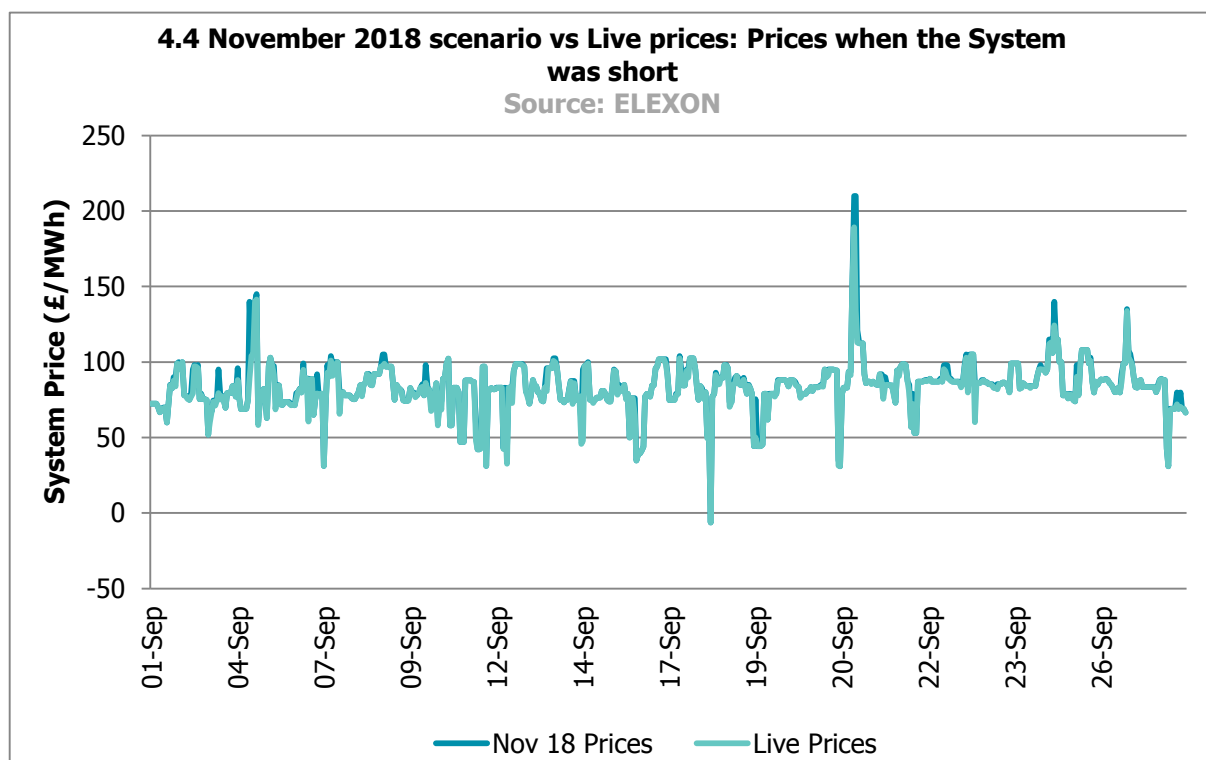


The average price differences across the month are relatively small under the November 2018 scenario. Prices were different in 40% of Settlement Periods, with 16% of these changes greater than £1/MWh. System Prices would be £0.82/MWh lower when the system was long, and £1.41/MWh higher when the system was short. When the system was long and System Prices changed, price changes were less than £1/MWh in 65% of Settlement Periods, and greater than £5/MWh in 14% of Settlement Periods. The biggest shift in price was -£35.32/MWh (Settlement Period 5 on 10 September 2018), when the price would have been -£45/MWh under the November 2018 scenario compared to the current live System Price of -£9.68/MWh.

# SYSTEM PRICE ANALYSIS REPORT

**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; 21% changed by more than £5/MWh and 9% by more than £10/MWh. The biggest difference in price was £75.82/MWh (Settlement Period 36 on 20 September); the price would have been £210/MWh under the November 2018 scenario, compared to the current live System Price of £134.18/MWh.

Under the November 2018 scenario, there would be 50 Settlement Periods in September 2018 with prices greater than £100/MWh, compared to 45 periods under the current live scenario.



There were no Demand Control actions taken during September 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 September.

## 4.5 Reserve Scarcity Prices with VoLL of £6,000

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
03/09/2018	40	5,010.74	0.0000	0.00	No	Long	52.45
03/09/2018	41	5,273.75	0.0000	0.00	No	Long	53.41
03/09/2018	36	5,592.50	0.0000	0.00	No	Long	52.17
12/09/2018	40	5,637.58	0.0000	0.00	No	Short	98.76
24/09/2018	39	5,709.39	0.0000	0.00	No	Short	124.30



# SYSTEM PRICE ANALYSIS REPORT

## 5 GLOSSARY

Term	Abbrev.	Definition
<b>Bid</b>		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).
<b>Bid/Offer Acceptance</b>	<b>BOA</b>	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.
<b>Offer</b>		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).
<b>System Price</b>		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.
<b>Replacement Price</b>		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.
<b>Utilisation Price</b>		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.
<b>Market Index Price</b>	<b>MIP</b>	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).
<b>Reserve Scarcity Price</b>	<b>RSVP</b>	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: <ul style="list-style-type: none"> <li>the Loss of Load Probability (LoLP), which will be calculated by the SO at Gate Closure for each Settlement Period; and</li> <li>the Value of Lost Load (VoLL), a defined parameter currently set to £3,000/MWh.</li> </ul>
<b>Replacement Price Average Reference</b>	<b>RPAR</b>	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.
<b>Long</b>		In reference to market length, this means that the volume of Accepted Bids exceeds that of Accepted Offers.
<b>Short</b>		In reference to market length, this means that the volume of Accepted Offers exceeds that of Accepted Bid.
<b>Net Imbalance Volume</b>	<b>NIV</b>	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 – NEGATIVE SHORT SYSTEM PRICE ON 18 SEPTEMBER 2018



This month Emma Tribe looks at Settlement Period 9 on 18 September 2018, when the System Price was -£6.25/MWh. In this Settlement Period the system was short, and the System Price set by the Market Index Price.

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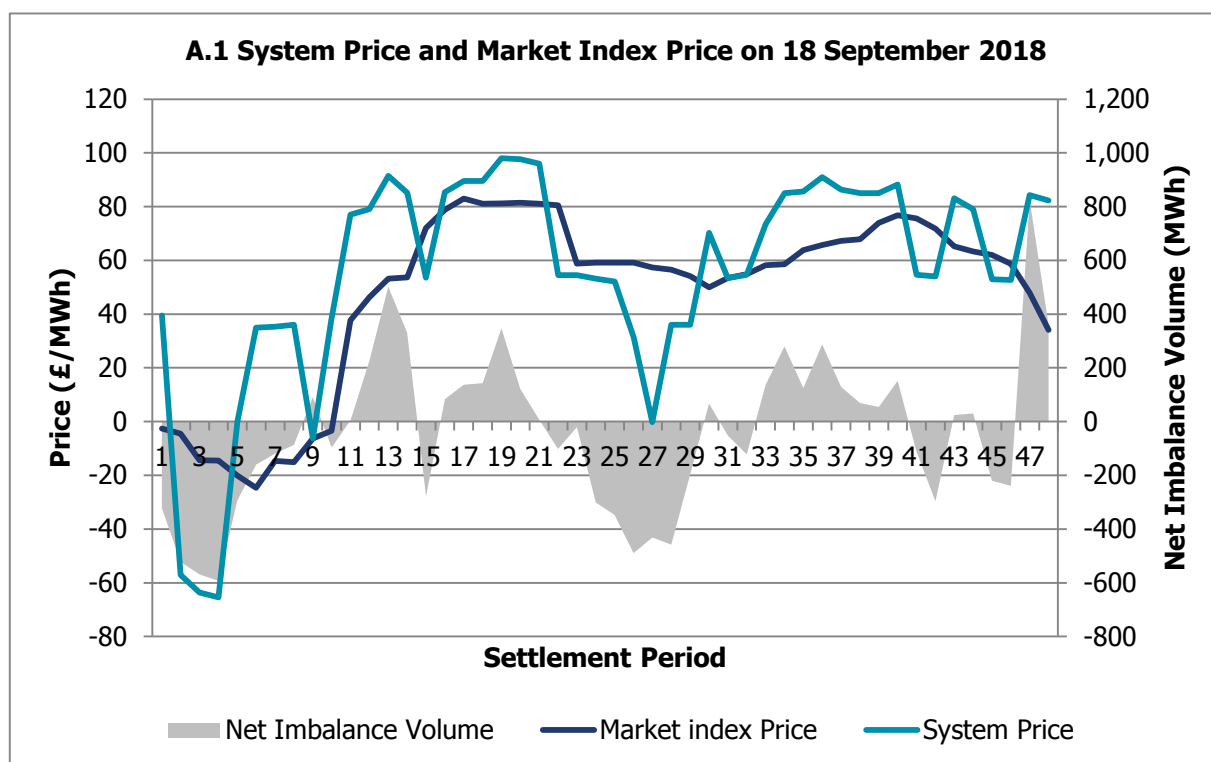
During Settlement Period 9 on 18 September 2018, the System Price was -£6.25/MWh. What made this negative System Price unusual was that the system was short for this Settlement Period, meaning that there was a net deficit of energy.

This is the only incidence of the System Price being negative while the market is short since the introduction of BSC Modification P305 in November 2015. Prior to P305, when the System Buy Price and System Sell Price were calculated differently. There were four Settlement Periods where the market was short and the System Sell Price was negative, but where the market was short the System Buy Price was never negative.

On 18 September 2018, Settlement Period 9, National Grid took 1,020MWh of buy actions to increase the level of energy on the system, and -931.31MWh of sell actions to decrease the level of energy on the system. The Net Imbalance Volume (NIV) for this Settlement Period was 90.63MWh, taking into account -1.96MWh that was De Minimis Acceptance Threshold (DMAT) Tagged.

All of the actions taken to increase the level of energy on the system were System Operator (SO) Flagged, which meant that there were no unflagged actions remaining after NIV Tagging. The Replacement Price, and consequently the System Price, was set by the Market Index Price (MIP).

**Graph A.1** shows that between Settlement Periods 1 and 10 on 18 September, the MIP was negative. Settlement Period 9 was the only Settlement Period that was short while the MIP was negative.



# SYSTEM PRICE ANALYSIS REPORT

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The MIP also set the System Price in Settlement Period 31 on this day, when the system was long and the MIP £54.60/MWh.

In September there were 68 Settlement Periods where the MIP set the System Price; for two of those Settlement Periods, the system was short. This was the only Settlement Period in the month where a negative MIP set the System Price.