

# ISG208-SPAR

## REPORTING ON JULY 2018

ISSUE 33 – PUBLISHED 21 AUGUST 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 SPAR contains an appendix on temperature and the System Price.

#### 1 SYSTEM PRICES AND LENGTH

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

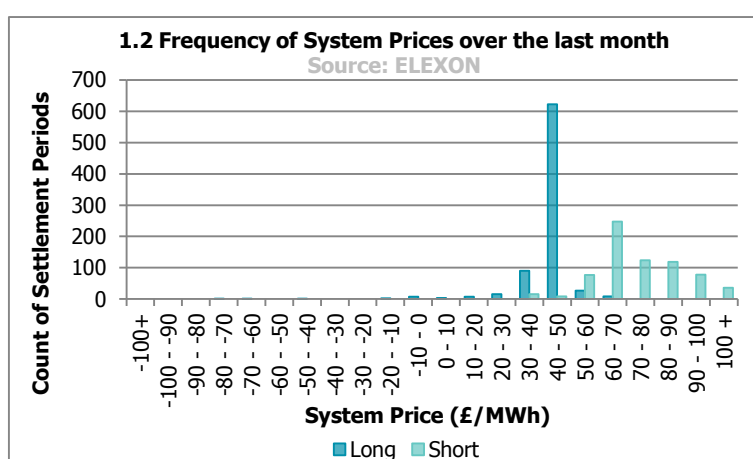
**Graph 1.2** shows the distribution of System Prices across Settlement Periods in July 2018 when the market was long and short.

56% of System Prices were between £30/MWh and £60/MWh, regardless of system length. When the system was long, 91% of prices were between £30/MWh and £50/MWh. When the system was short, 53% of prices were between £60/MWh and £80/MWh and 5% of prices were over £100/MWh.

System Price (Long)					
Month	Min	Max	Median	Mean	Std Dev
July 2018	-70.45	66.04	44.16	42.21	10.54

System Price (Short)					
Month	Min	Max	Median	Mean	Std Dev
July 2018	37.35	158.00	70.00	74.00	15.75

#### 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

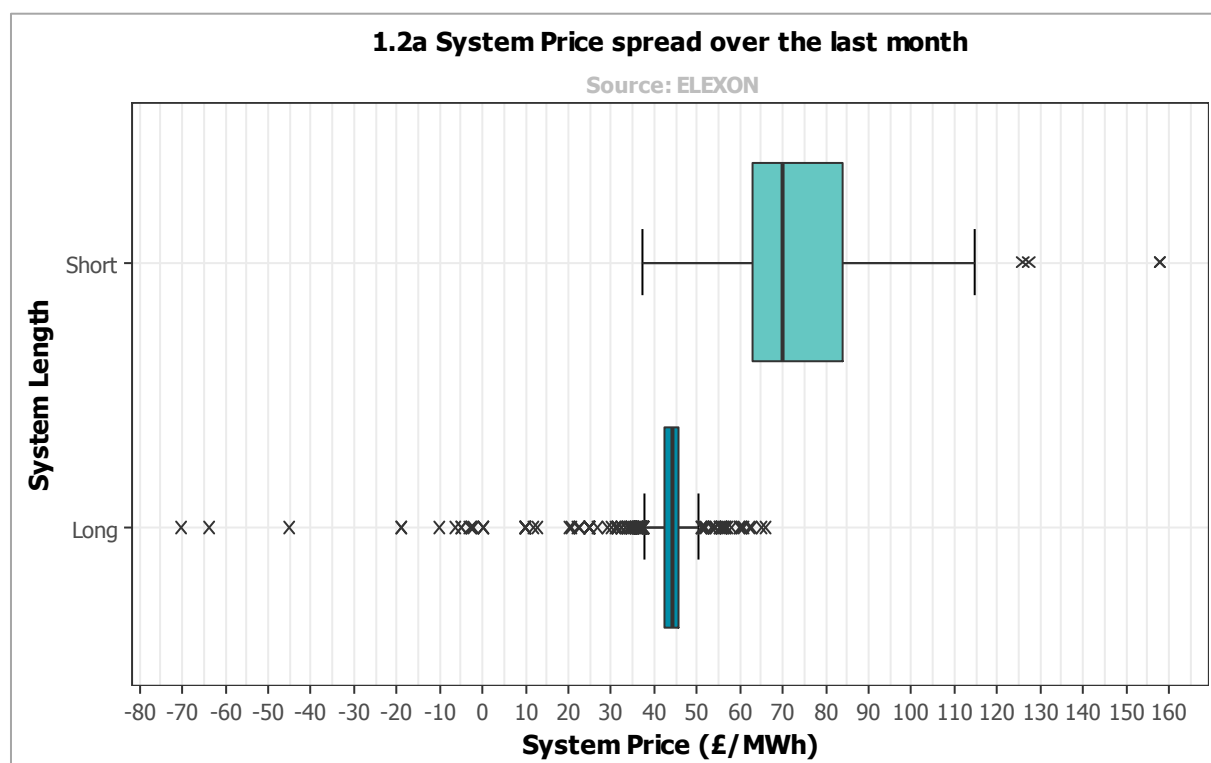
System Prices exceeded £100/MWh a total of 36 times in July 2018, compared to six times in June. The highest System Price of the month, £158/MWh, occurred in Settlement Periods 19 and 20 on 27 July 2018. The prices in these Settlement Periods were set by Offers from a Gas BMU priced at £158/MWh.

There were three Settlement Periods where the System Price was £0/MWh, and 12 negative System Prices, in July. 11 of the 12 negative System Prices occurred on 28 July, with the other occurring on 31 July.

The lowest System Price, -£70.45/MWh, occurred during Settlement Period 26 on 28 July. This price was set by a weighted average of negatively priced Bids from two Wind BMUs, priced at -£69.76/MWh and -£70.69/MWh.

**Graph 1.2a** displays the spread of System Prices in July 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 £70/MWh for short Settlement Periods and £44.16/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 £21/MWh for short System Prices and £3.20/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, 129 of 784 long System Prices (16%) for July were outliers. 20 of the 21 lowest System Prices in the month occurred on 28 July. Settlement Period 46 on 31 July was the only negative System Price in the month not on 28 July. The System Price in this Settlement Period was -£10/MWh.



# SYSTEM PRICE ANALYSIS REPORT

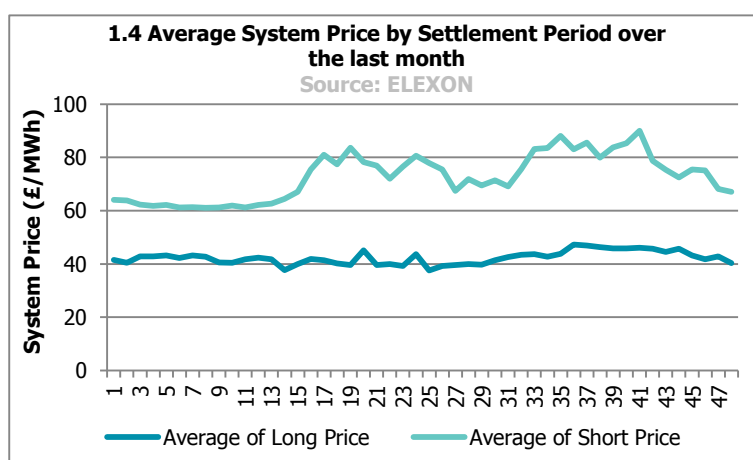
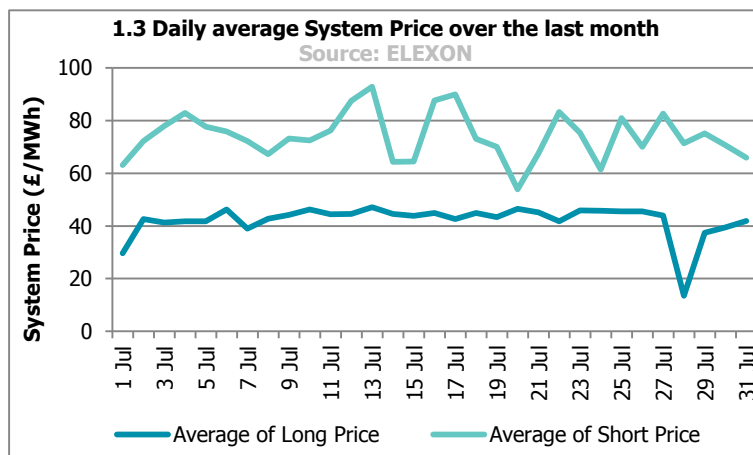
**Graph 1.3** shows daily average System Prices over the last month. In July, the average System Price was £42.21/MWh when the system was long and £74/MWh when the system was short.

The highest daily average price when the system was short was £92.87/MWh, and occurred on 13 July. The system was short for 26 Settlement Periods on this day.

The lowest daily average price when the system was long was £13.52/MWh on 28 July 2018. The system was long in 38 Settlement Periods on this day.

**Graph 1.4** shows the variation of System Prices across the day. Short prices were highest in Settlement Period 41, with long prices lowest in Settlement Period 25. The lowest average System Prices, regardless of market length, occurred during Settlement Period 10, when the System Price was £47.32/MWh.

Average long Settlement Period System Prices ranged between £37.55/MWh and £47.27/MWh. Average short Settlement Period prices varied more, from £61.12/MWh to £89.95/MWh.



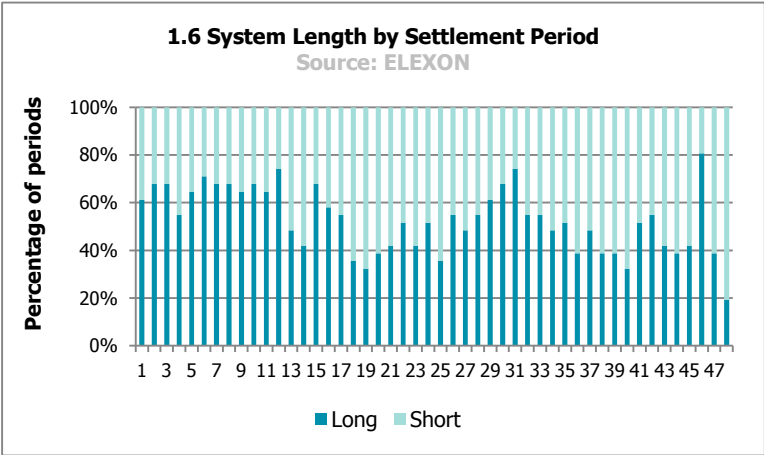
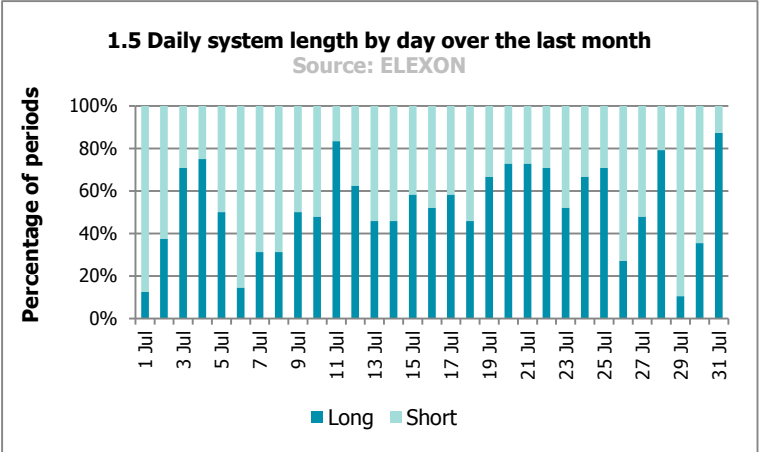
# SYSTEM PRICE ANALYSIS REPORT

**Graph 1.5** shows system length by day, and **Graph 1.6** shows system length by Settlement Period for July. The system was long for 53% of Settlement Periods in July, compared to 58% in June.

On 29 July, the system was short for 90% of Settlement Periods. On this day, the average NIV when the system was short was 333MWh, while the average System Price in a short Settlement Period was £75.13/MWh.

On 31 July, the system was long in 87% of Settlement Periods.

Settlement Period 48 was short for 81% of the month, whilst Settlement Period 46 was short for 19% of the month.



# SYSTEM PRICE ANALYSIS REPORT

## 2 PARAMETERS

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

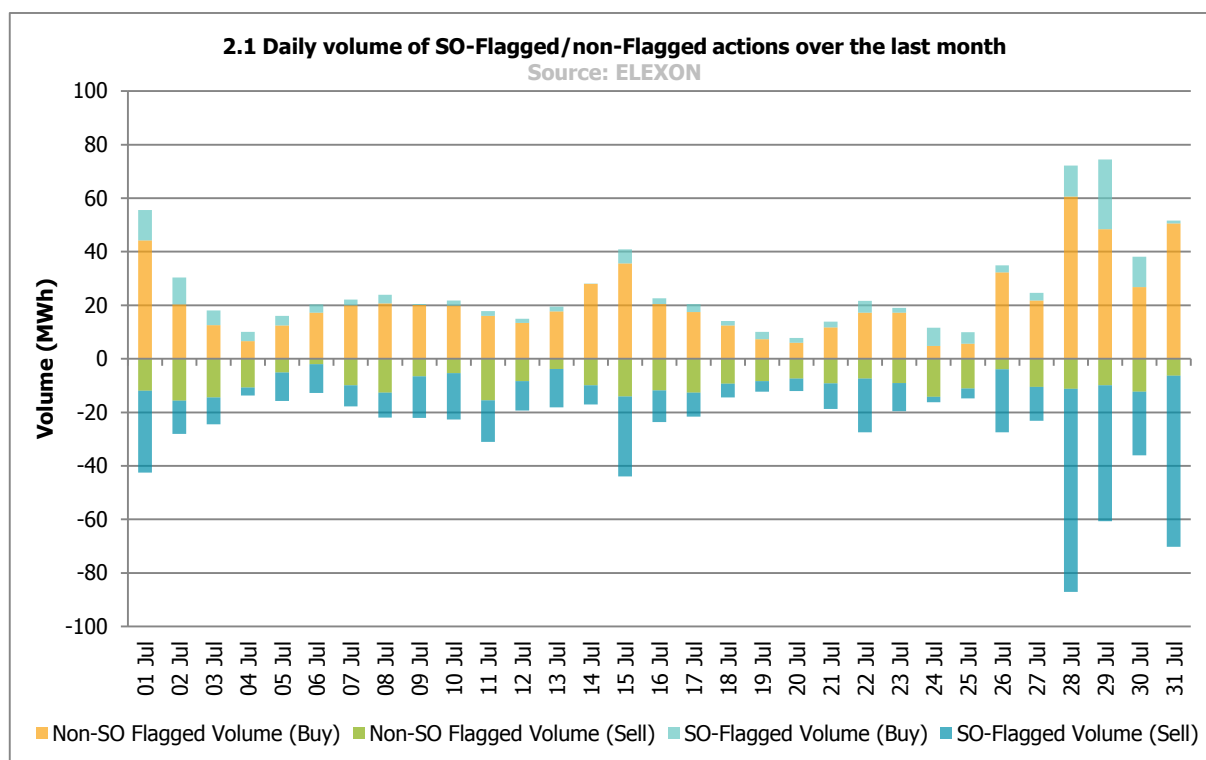
- The impact of Flagging balancing actions;
- The impact of NIV Tagging;
- The impact of PAR Tagging;
- The impact of the Replacement Price; and
- How these mechanisms affect which balancing actions feed into the price.

### 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 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 July 2018 that have been Flagged by the SO as being constraint related. On 31 July, 91% of sell volume was SO-Flagged. 30% of buy and sell actions in July 2018 were taken in the last four days of the month, and 54% of these were SO-Flagged.



# SYSTEM PRICE ANALYSIS REPORT

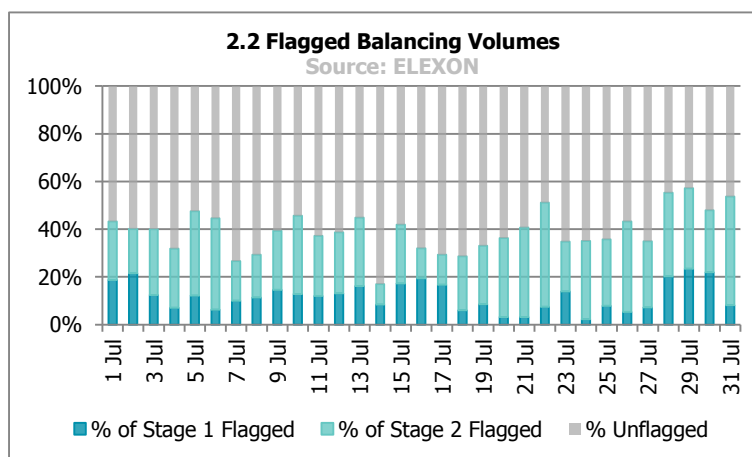
64% of sell balancing actions taken in July had an SO-Flag, compared with 80% in June. 52% of SO-Flagged sell actions came from Balancing Services Adjustment Actions (BSAAs), 26% from CCGT BMUs and 20% from Wind BMUs. The average initial price (i.e. before any re-pricing) of a SO-flagged sell action was -£29.96/MWh.

17% of buy balancing actions taken in July had an SO-Flag, compared to 23% in June. 78% of SO-Flagged buy actions came from BSAAs and 21% from CCGT BMUs. The average initial price of a SO-Flagged buy action was £81.41/MWh.

Any actions with a total duration of less than 15 minutes are CADL Flagged. 2% of buy actions and less than 1% of sell actions were CADL Flagged in July. 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 49%.

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, 65% of sell actions in July 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 July, 198 Settlement Periods had a Replacement Price based on the RPAR and 93 Settlement Periods had a Replacement Price based on the MIP. However the majority of Settlement Periods (80%) 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 July, the average original price of a Second-Stage Flagged repriced sell action was £24.33/MWh and the average Replacement Price for sell actions (when the System was long) was £43.05/MWh.

19% of buy actions were Flagged; of these 1% 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 £101.23/MWh, and the average Replacement Price was £77.30/MWh.

If there are no Unflagged actions remaining in the NIV, the Replacement Price will default to the Market Index Price. This occurred in 89 long and four short Settlement Periods in July, compared to 141 long Settlement Periods last month.

# SYSTEM PRICE ANALYSIS REPORT

## NIV and NIV Tagging

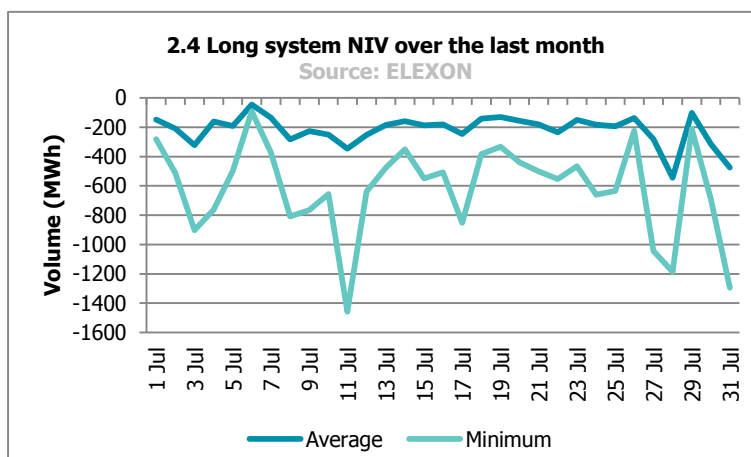
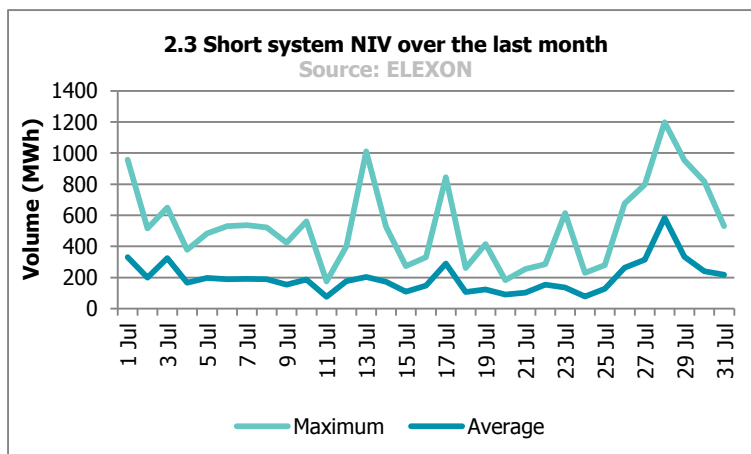
The Net Imbalance Volume (NIV) represents the direction of imbalance of the system – i.e. whether the system is long or short overall. **Graph 2.3** shows the greatest and average NIV when the system was short, and **Graph 2.4** shows the greatest and average NIVs when the system was long. Note short 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 July, 74% 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 (1,198MWh) was seen on 28 July in Settlement Period 36. The System Price was £37.35/MWh in this Settlement Period.

The minimum long system NIV of the month was -1,459MWh, on 11 July 2018 during Settlement Period 42 when the System Price was £44.00/MWh.



# SYSTEM PRICE ANALYSIS REPORT

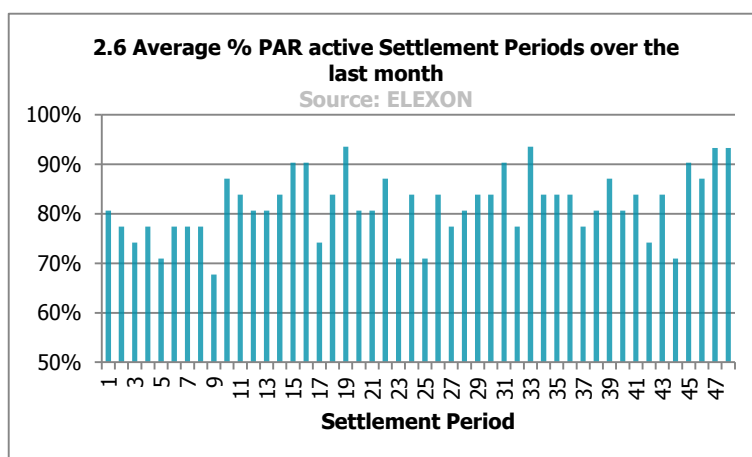
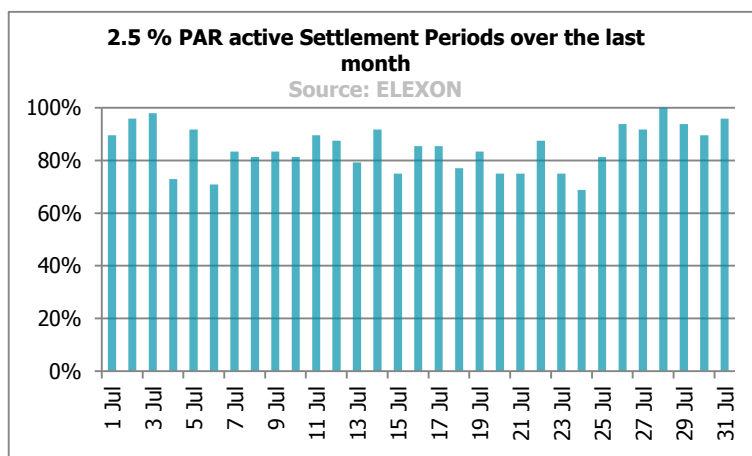
## PAR Tagging

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 was active for 85% of Settlement Periods in July.

**Graph 2.6** shows the proportion of Settlement Periods over the last month when PAR Tagging was active. Settlement Period 9 had the lowest active PAR Tagging in July 2018 with 68%, representing the NIV being smaller in this period or the system being more balanced as a whole prior to System Operator balancing activity.

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





# 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. 0.09% of total buy and sell volume was removed by DMAT Tagging in July. 49% of DMAT Tagged volume came from Balancing Services Adjustment Actions (BSAAs), whilst 31% came from CCGT BMUs.

**Graph 2.8** shows the volumes of actions that were removed due to Arbitrage Tagging. 61% of Arbitrage Tagged volume was from BSAAs, with 36% from CCGT BMUs.

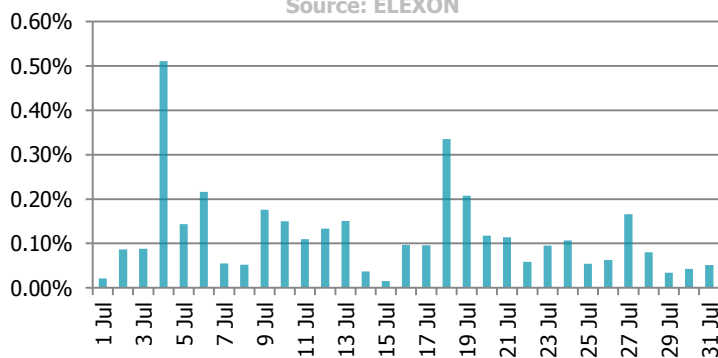
In July, the average initial price of an Arbitrage Tagged buy action was £38.47/MWh, and for a sell action was £46.00/MWh. The maximum price of an Arbitrage Tagged sell action was £148.42/MWh, and the lowest priced Arbitrage Tagged buy action was £0/MWh.

On 6 July 2018, 10,518MWh of actions were Arbitrage Tagged, representing 31.8% of daily volume. The average price of an Arbitrage Tagged buy action was £39.41/MWh, and for a sell action was £43.59/MWh.

**Graph 2.9** shows the percentage of Arbitrage Tagged volume, and the number of arbitrage active Settlement Periods, by month. In July 2018, 4.91% of volume was arbitrage tagged; this is the highest percentage of Arbitrage Tagged volume in a month since the introduction of BSC Modification P305 in November 2015. Arbitrage Tagging was active in 452 (31%) of Settlement Periods in July, which was also the highest in a month since November 2015.

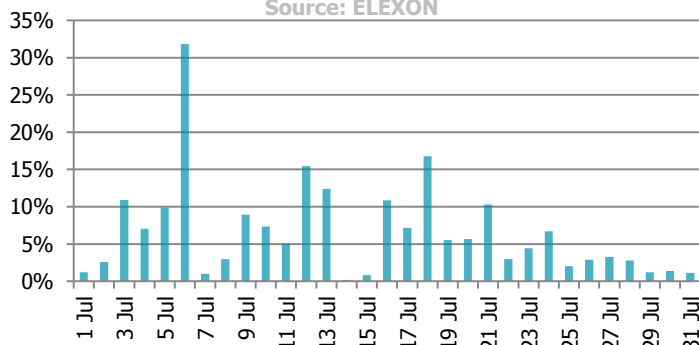
**2.7 Daily percentage of DMAT Tagged volume over the last month**

Source: ELEXON



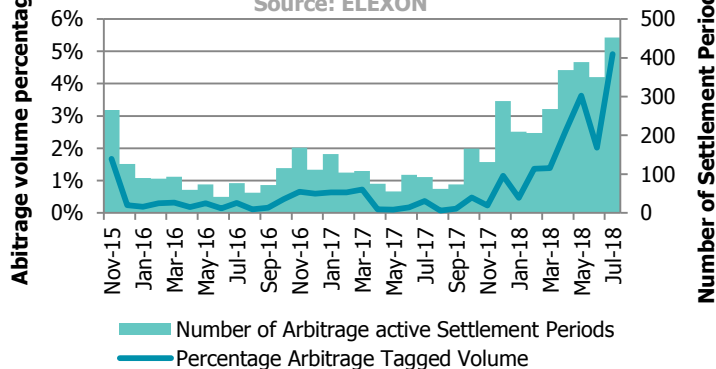
**2.8 Daily percentage of Arbitrage Tagged volume over the last month**

Source: ELEXON



**2.9 Percentage of Arbitrage Tagged volume, and number of arbitrage active Settlement Periods**

Source: ELEXON



# 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.

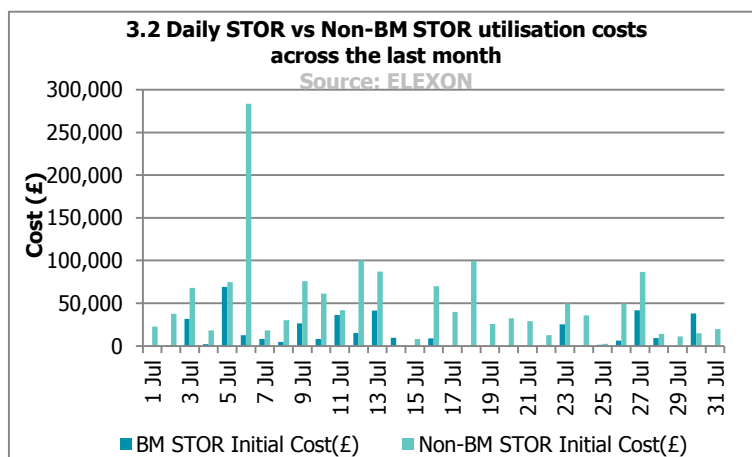
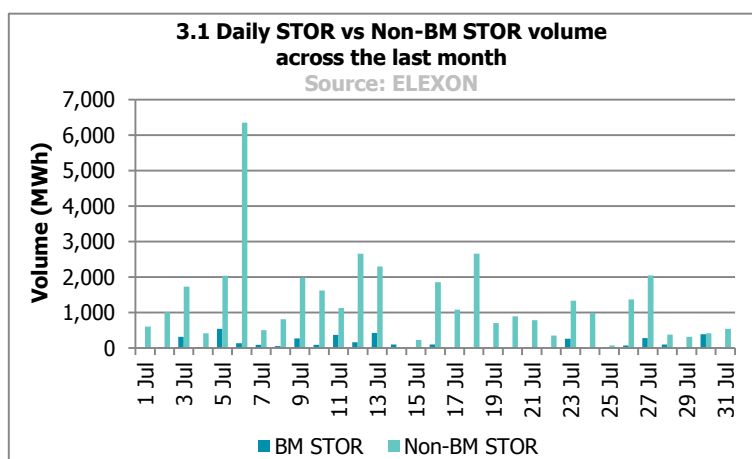
In addition to Bids and Offers available in the Balancing Mechanism, the SO can enter into contracts with providers of balancing capacity to deliver when called upon. These additional sources of power are referred to as reserve, and most of the reserve that the SO procures is called Short Term Operating 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. 91% of the total STOR utilised in July came from outside of the Balancing Mechanism.

The average Utilisation Price for STOR capacity in July was £44.83/MWh (£106.83/MWh for BM STOR and £38.93/MWh for non-BM STOR).

On 6 July, 6,356MWh of non-BM STOR volume was called at an utilisation cost of £283,000. This represented 16% of the total non-BM STOR volume in July.



# SYSTEM PRICE ANALYSIS REPORT

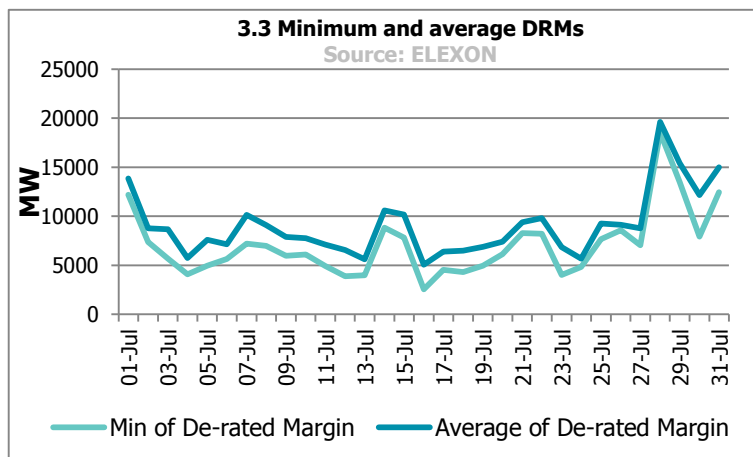
## De-Rated Margin, Loss of Load Probability and the Reserve Scarcity Price

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 July 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 July was 2,562MW on 16 July in Settlement Period 38 (compared to 3,499MW in June).

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 July (see **Table 3.4**).



## 3.4 Top 5 LoLPs and RSVPs

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
16/07/2018	38	2,562.05	0.0001	0.38	No	Long	44.99
16/07/2018	37	2,754.67	0.0000	0.12	No	Short	100.69
16/07/2018	36	3,829.88	0.0000	0.00	No	Short	105.34
12/07/2018	38	3,884.65	0.0000	0.00	No	Short	95.79
13/07/2018	37	3,990.74	0.0000	0.00	No	Short	94.50

<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.

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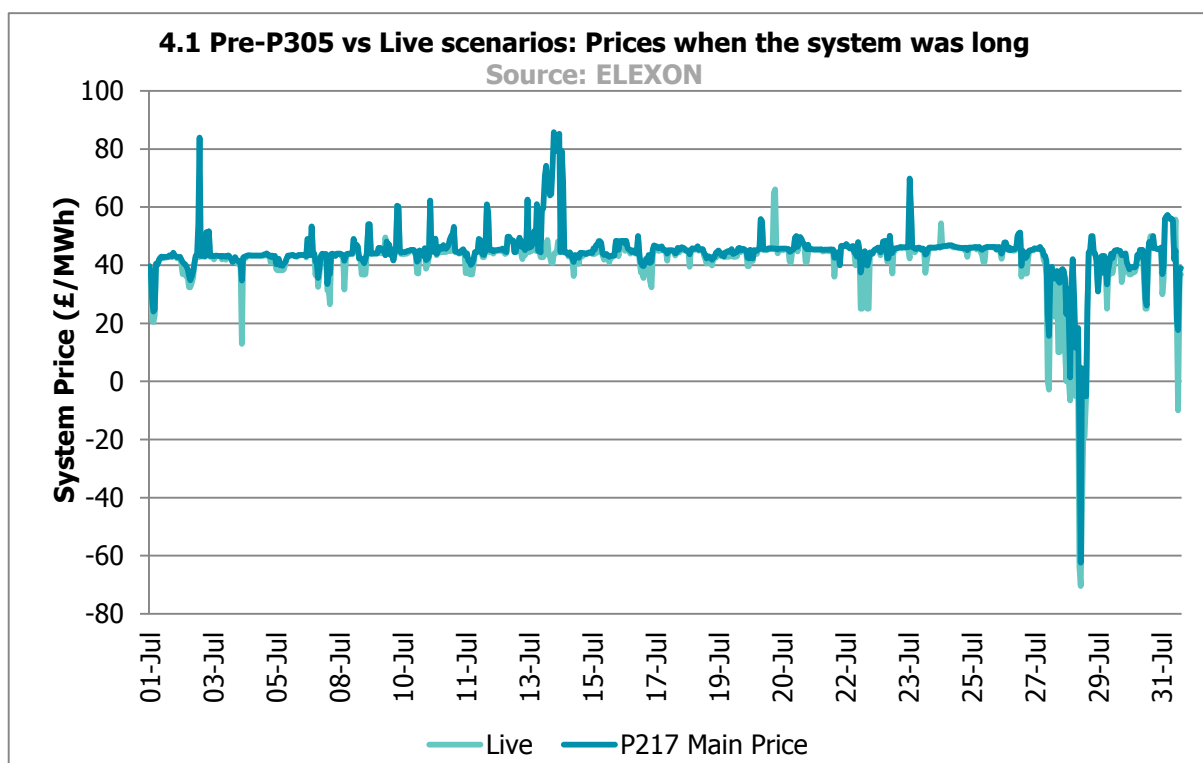
<sup>3</sup> From 1 May 2018 the Transmission Company will calculate Indicative LoLP values using the Dynamic Method, whilst it continues to calculate Final LoLP values using the Static Method. Indicative LoLP values using the Dynamic Method will be published on the ELEXON Portal.

# 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 £2.13/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 76% of Settlement Periods; in 92% of these periods, the change was less than £1/MWh. The biggest price change occurred on the 28 July 2018 in Settlement Period 27, where the live price was £49.50/MWh lower than the System Price would have been under the P217 Scenario. This difference was due to the reduction in PAR.



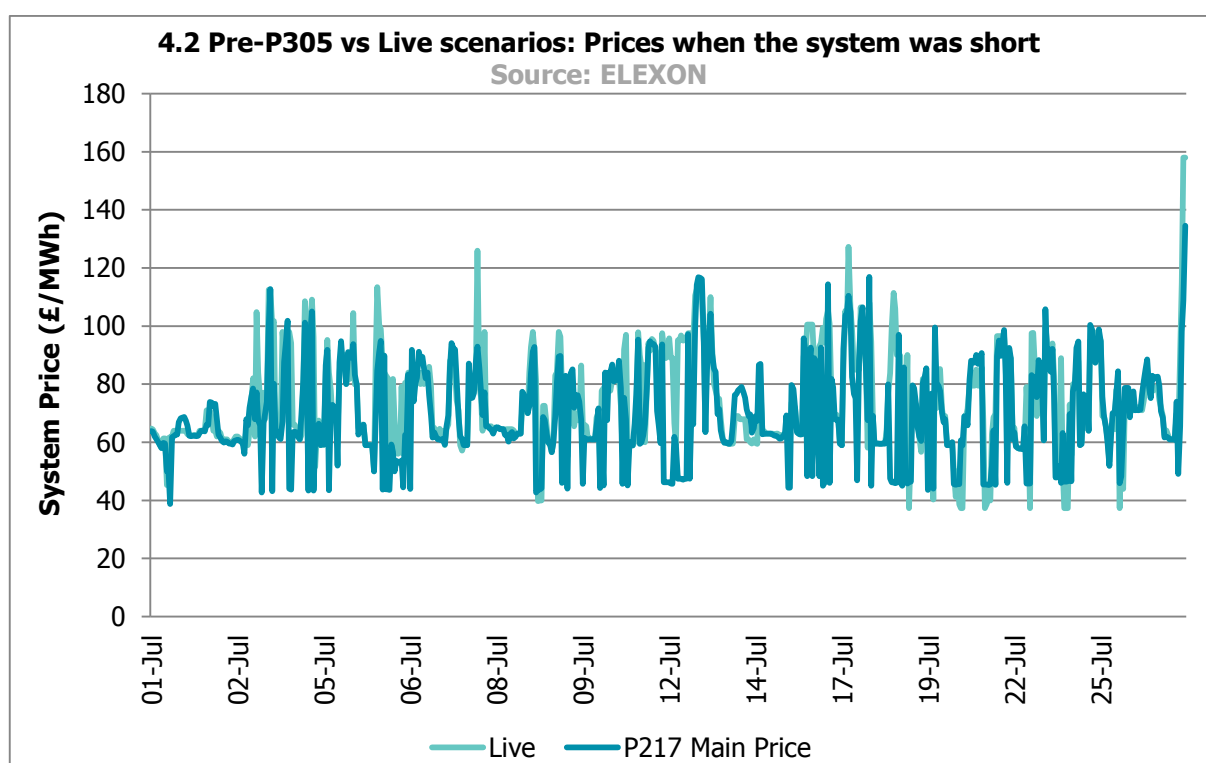
## SYSTEM PRICE ANALYSIS REPORT

**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 £4.03/MWh higher when the system was short. In July, 57% of Settlement Periods had live System Prices higher than the Pre-P305 scenario, 33% lower and 10% with no change.

The biggest difference in prices when the system was short was £65.24/MWh (18 July 2018 during Settlement Period 20), as a result of the inclusion of non-BM STOR in the pricing calculation. In the P217 scenario, the Main Price would have been £46.16/MWh and the system long compared to the live scenario System Price of £111.40/MWh and the system short.

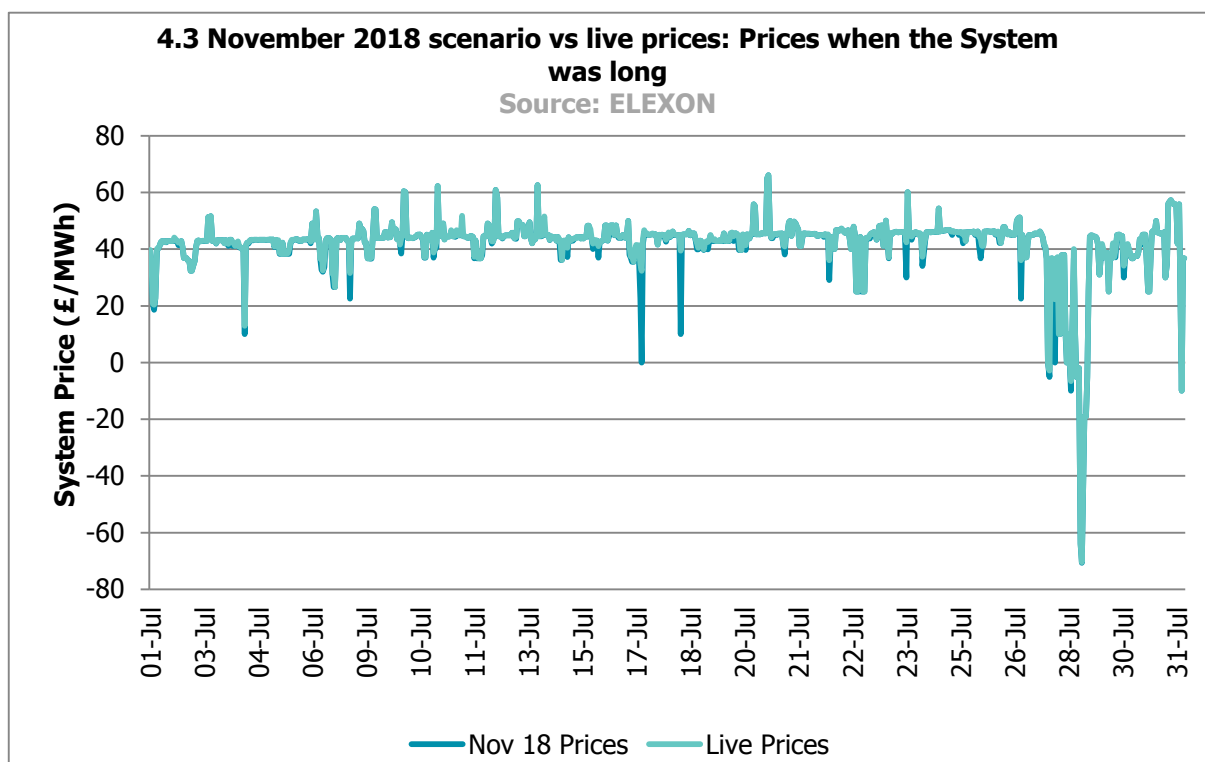
The inclusion of non-BM STOR volumes in the pricing stack changed the system length from long to short in 132 (9%) of Settlement Periods.



# 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.

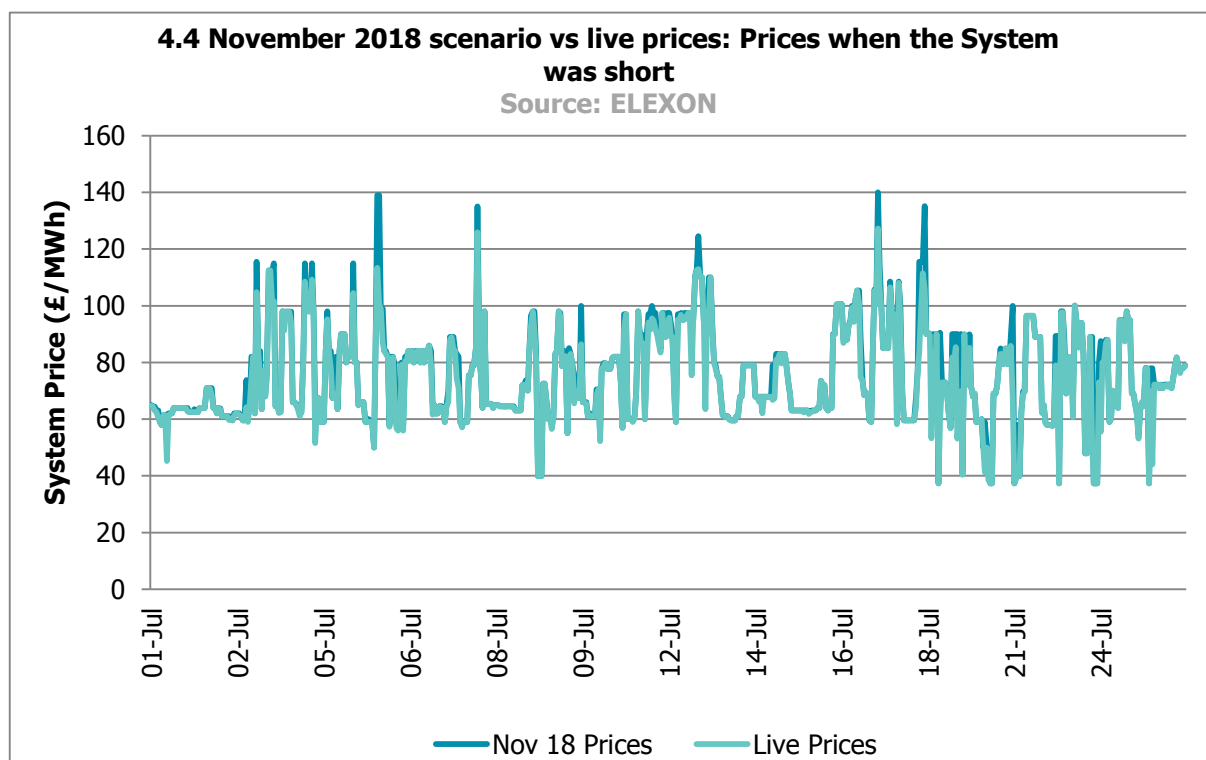


The average price differences across the month are relatively small under the November 2018 scenario. Prices were different in 40% of Settlement Periods, with 16% of these changes greater than £1/MWh. System Prices would be £0.48/MWh lower when the system was long, and £1.88/MWh higher when the system was short. When the system was long and System Prices changed, price changes were less than £1/MWh in 78% of Settlement Periods and greater than £5/MWh in 5% of Settlement Periods. The biggest shift in price was -£32.37/MWh (Settlement Period 15 on 17 July 2018), when the price would have been £0/MWh under the November 2018 scenario compared to the current live System Price of £32.37/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 37% of short Settlement Periods under the November 2018 scenario; 29% changed by more than £5/MWh and 18% by more than £10/MWh. The biggest difference in price was £38.56/MWh (Settlement Period 16 on 6 July); the price would have been £139/MWh under the November 2018 scenario, compared to the current live System Price of £100.44/MWh.

Under the November 2018 scenario, there would be 39 Settlement Periods in July 2018 with prices greater than £100/MWh, compared to 36 periods under the current live scenario.



There were no Demand Control actions taken during July 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 July.

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

Date	SP	DRM	LoLP	RSVP	RSVP Used	System Length	System Price
16/07/2018	38	2,562.05	0.0001	<b>0.76</b>	No	Long	44.99
16/07/2018	37	2,754.67	0.0000	<b>0.25</b>	No	Short	100.69
16/07/2018	36	3,829.88	0.0000	<b>0.00</b>	No	Short	105.34
12/07/2018	38	3,884.65	0.0000	<b>0.00</b>	No	Short	95.79
13/07/2018	37	3,990.74	0.0000	<b>0.00</b>	No	Short	94.50



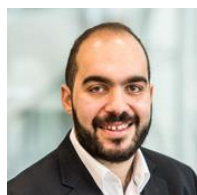
# SYSTEM PRICE ANALYSIS REPORT

## 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 – IMPACT OF TEMPERATURE ON IMBALANCE PRICES



This month Thomas Demetriades, a graduate who is with Market Analysis for his second rotation, looks at how the temperature influences the Imbalance Price.

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July 2018 was a particularly warm month, with the average GB noon temperature being 22°C. ELEXON source the GB average noon temperature, used for setting profile coefficients, from the Met Office.

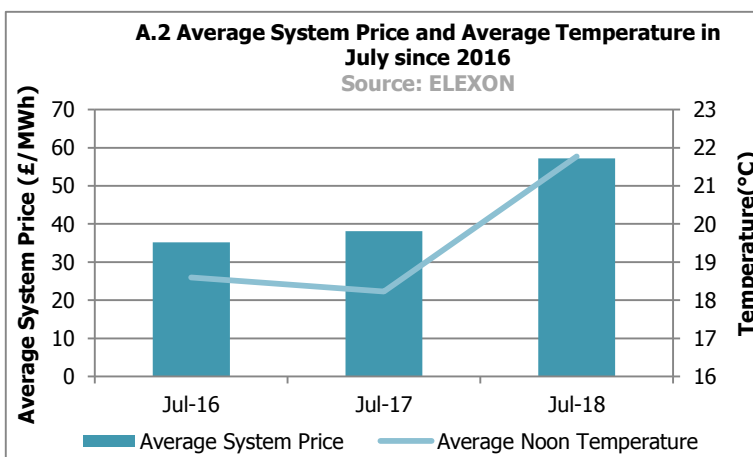
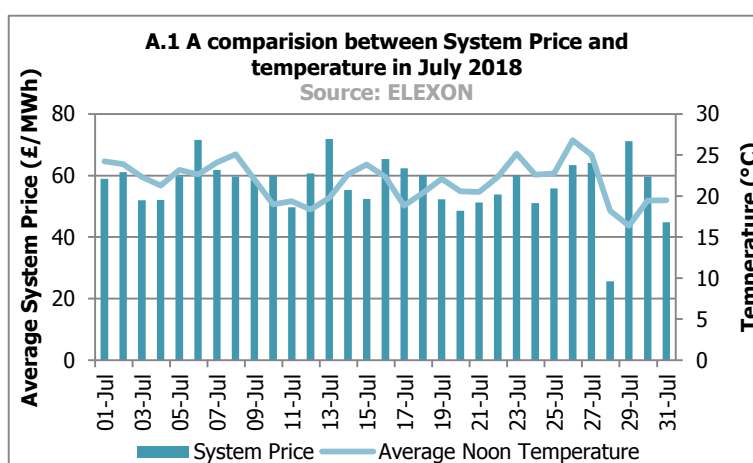
**Graph A.1** shows the GB average noon temperatures and daily average System Price in July 2018. The highest daily average System Price was £71.91/MWh on 13 July 2018, when noon temperature was 20°C. The lowest daily average System Price was £25.58/MWh on 28 July 2018, when the noon temperature was 18°C.

The lowest noon temperature recorded, 16°C, occurred on 29 July 2018 where the System Price was £71.20/MWh. In contrast, the highest noon temperature recorded, 27°C, occurred on 26 July 2018 where the System Price was £63.38/MWh.

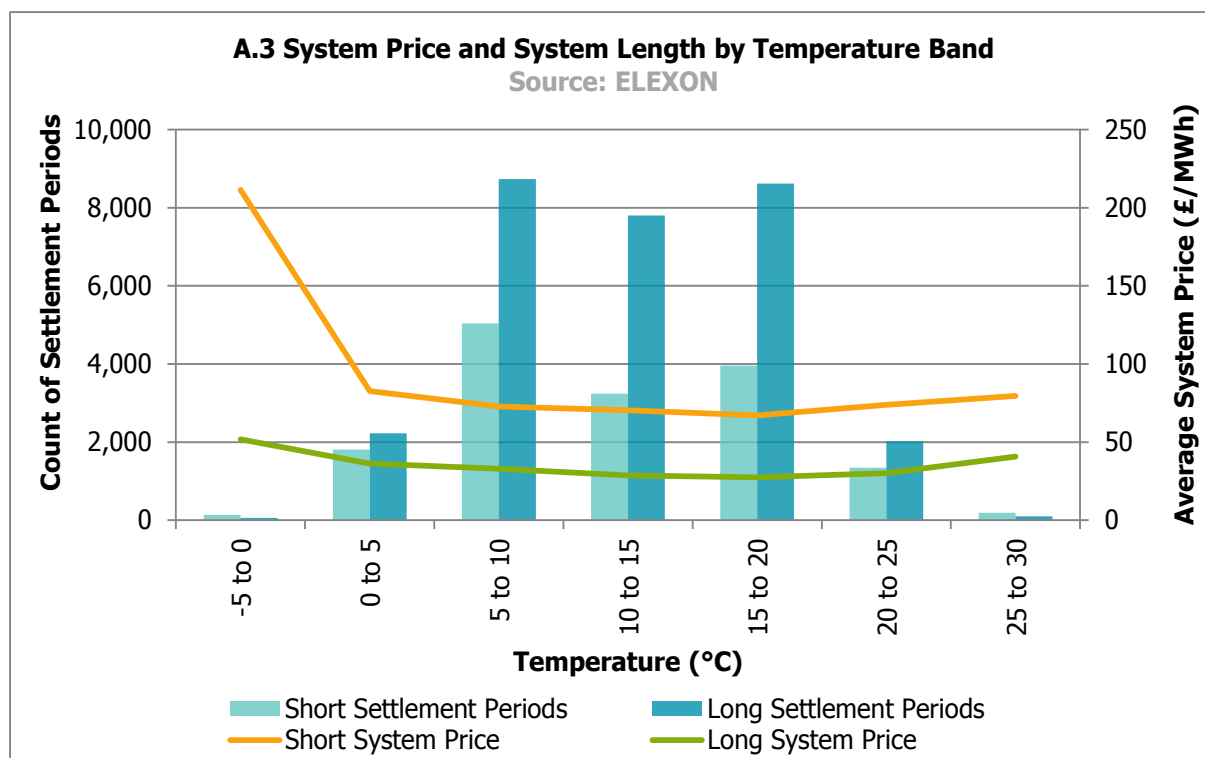
**Graph A.2** compares July temperatures and prices in 2016, 2017, and 2018. July 2018 was the warmest, with average noon temperature of 22°C; in both July 2016 and 2017, the average noon temperature was 18°C.

The average System Price increased between July 2016 and July 2017 by 8%. The average temperature in July 2017 was 0.4°C colder than in July 2016.

In July 2018, noon temperatures were higher than in previous years. The average System Price increased from £38.13/MWh in July 2017 to £57.25/MWh in July 2018; an annual increase of 50%.



# SYSTEM PRICE ANALYSIS REPORT

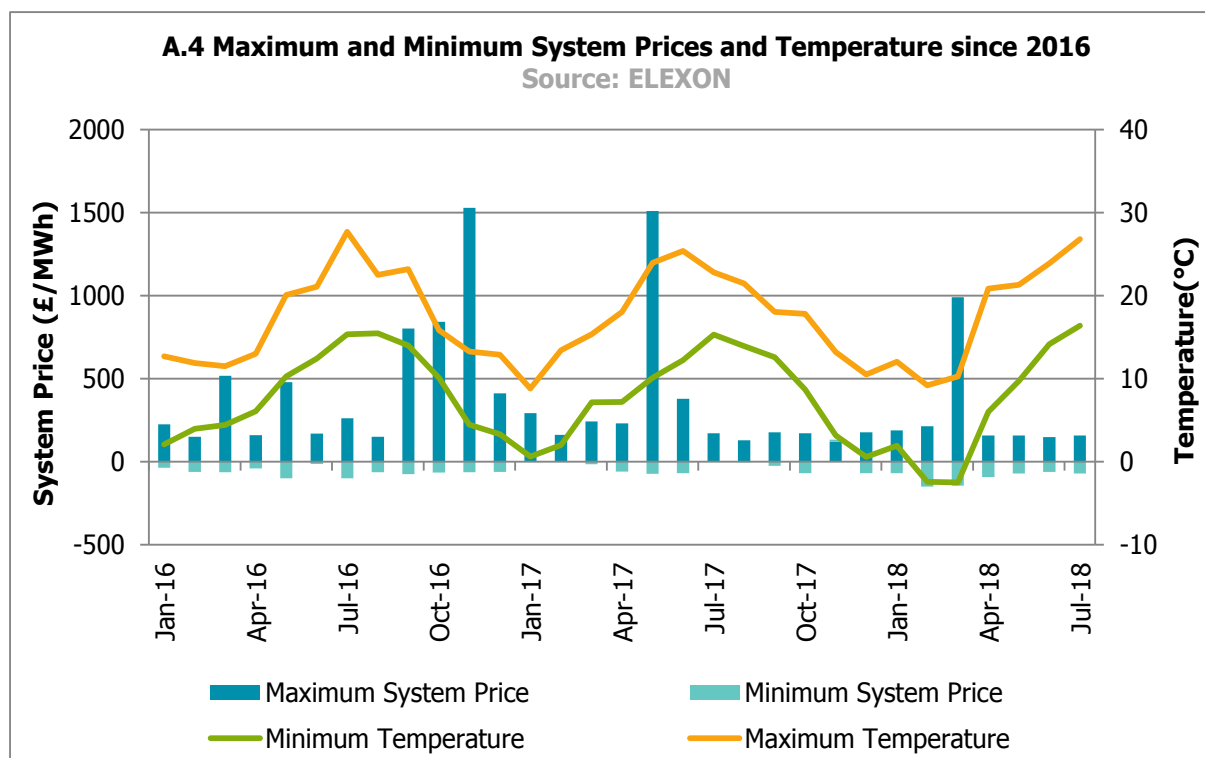


**Graph A.3** shows the system price and system length across different temperature bands, for all Settlement Periods since the start of 2016. The noon temperature ranges from 0°C and 25°C for 99% of Settlement Periods, and the system was long for 66% of all Settlement Periods in this temperature range.

For the 1% of Settlement Periods when noon temperatures are outside of this range (colder than 0°C or hotter than 25°C), 66% of Settlement Periods are short. The average short System Price was highest in the -5°C to 0°C temperature band at £211.44/MWh. The average short System Price at the 25°C to 30°C band was £79.48/MWh; this is less than the average short System Price when the temperature is between 0°C and 5°C.

Average System Prices are lowest when the temperature is between 15°C and 20°C; £67.18/MWh when the market is short and £27.46/MWh when the market is long. The temperature was in this range in 28% of Settlement Periods, whilst the majority of Settlement Periods fall in the temperature range 5°C to 10°C.

# SYSTEM PRICE ANALYSIS REPORT



**Graph A.4** shows the maximum and minimum System Prices and noon temperatures, between January 2016 and July 2018. System prices peaked during autumn months in 2016, as well as in May 2017 and March 2018.

In November 2016, the maximum and minimum System Prices were £1,528.72/MWh and -£62.55/MWh respectively. In the same month, the maximum temperature recorded was 13°C, and the minimum temperature was 4°C. As temperatures started to fall in September 2016, the maximum System Prices started to increase and kept rising up until November 2016, after which they fell to £411.91/MWh in December 2016.

The lowest minimum noon temperature since January 2016 was -2°C, recorded in both February and March 2018 (caused by the cold weather system referred to as "The Beast from the East"), although March 2018 temperatures did reach a high of 10°C. Both maximum and minimum System Prices for 2018 so far peaked during March, with a maximum System Price at £990/MWh and a minimum System Price at -£142.79/MWh.