

## P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

The P371 workgroup requested ELEXON undertake analysis to highlight the potential impact the inclusion of non-BM Fast Reserve (NBMFR) actions as Balancing Services Adjustment Actions (BSAA) could have on the Imbalance Price.

This analysis shows that 0.6% of all buy balancing volume was NBMFR between January 2017 and October 2018, and 35% of NBMFR actions had a duration of less than 15 minutes. NBMFR was utilised in 14.2% of Settlement Periods.

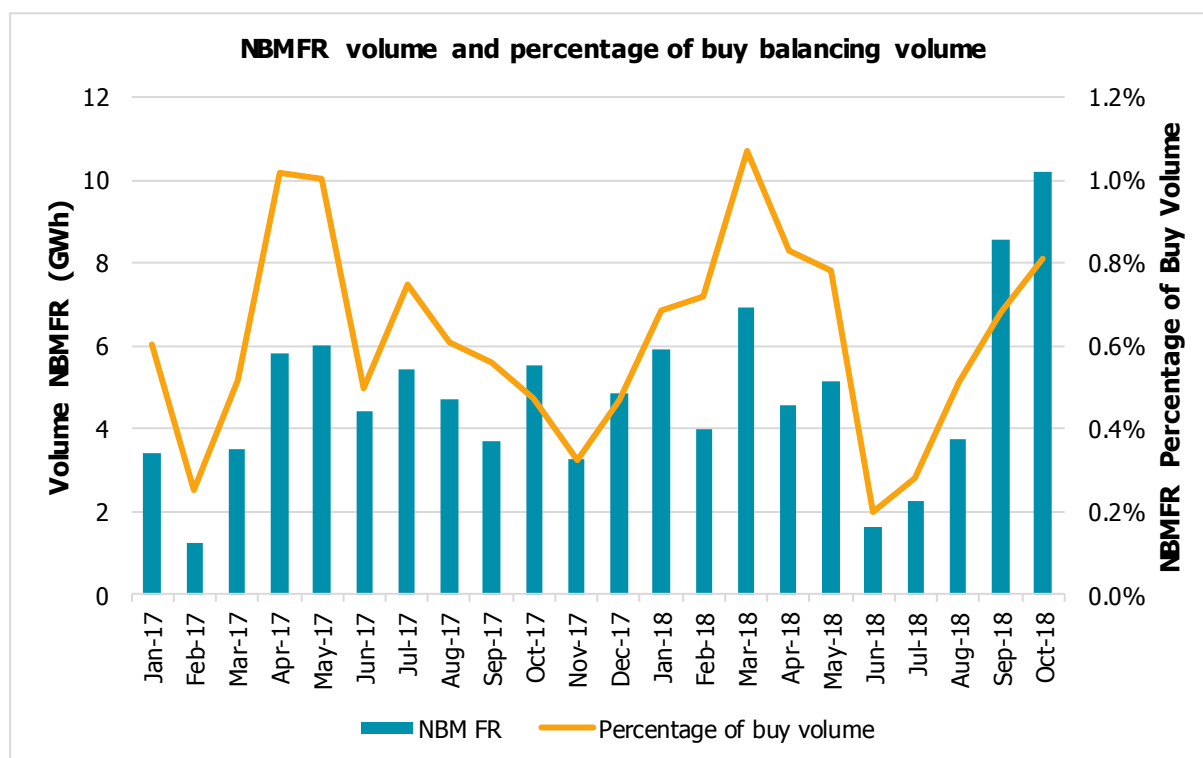
Including NBMFR in the stack causes the NIV to flip from long to short in 2.77% of Settlement Periods where NBMFR was utilised. The Imbalance Price changed in 17% of Settlement Periods where NBMFR was utilised.

### USE OF NON-BALANCING MECHANISM FAST RESERVE

National Grid provided ELEXON with volumes and durations of Fast Reserve actions taken outside of the Balancing Mechanism between January 2017 and October 2018.

NBMFR was utilised in 14.2% of Settlement Periods in the assessed period.

**Graph 1** shows the volume of NBMFR dispatched in each month. 105GWh of NBMFR was used over the period, this represents 0.6% of all buy balancing volume (Offers, buy BSAA and NBMFR) utilised.



**Graph 1. Volumes and percentage of Non Balancing Mechanism Fast Reserve (NBMFR) actions between January 2017 and October 2018**

The highest volume of NBMFR was dispatched in October 2018 when 10GWh was utilised; this was equivalent to 0.8% of all buy balancing volume in the month. The highest volume of NBMFR utilised in a Settlement Period was 142MWh on 23 December 2017 Settlement Period 37, this represented 8% of utilised buy volume for that Settlement Period.

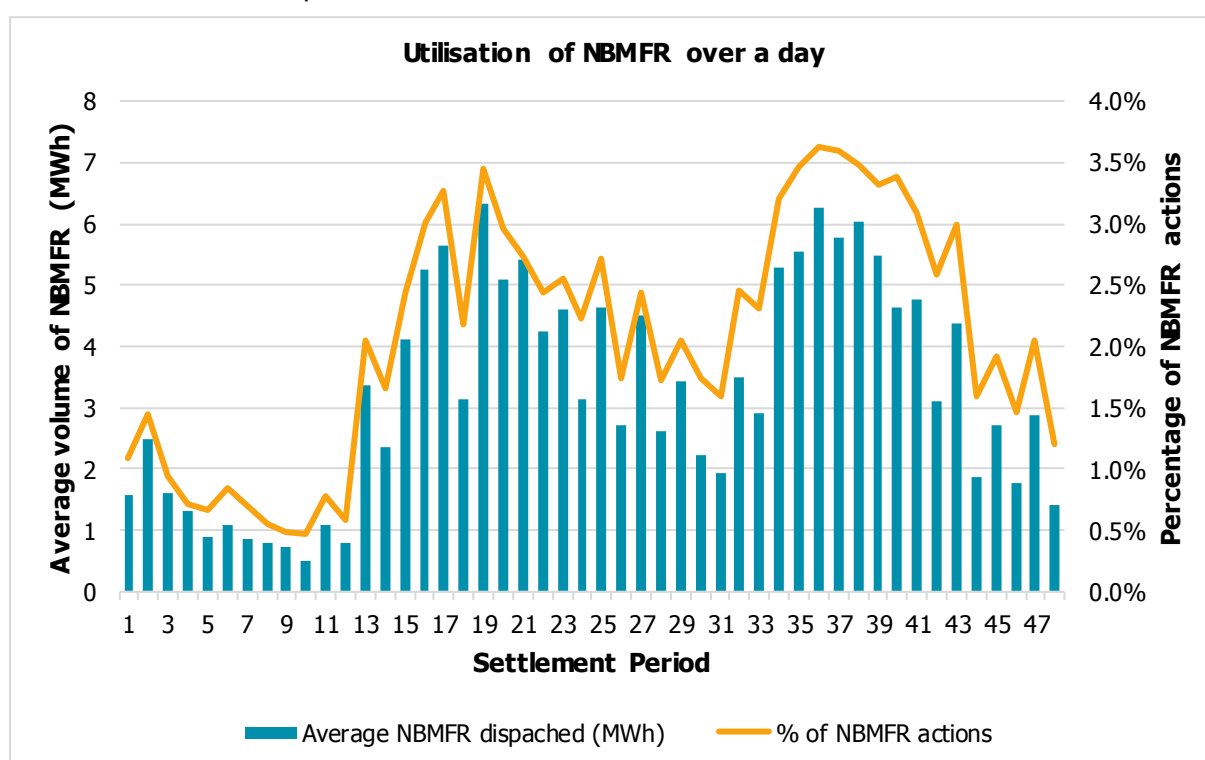
## P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

**Graph 2** shows the average volume of NBMFR dispatched in each Settlement Period and the percentage of NBMFR actions dispatched in each Settlement Period.

Between January 2017 and October 2018 the average volume of NBMFR utilised per Settlement Period was 3.27MWh. The Settlement Period with the highest average volume of NBMFR utilised was Settlement Period 19 when an average of 6.33MWh was utilised.

A total of 7,921 NBMFR actions were dispatched in the assessed period. We can see the majority of actions are dispatched over morning and afternoon peaks:

- 30% of actions are dispatched in Settlement Periods 15 to 25 (between 7:00 and 12:30),
- 33% of actions are dispatched in Settlement Periods 34 to 43 (between 16:30 and 21:30),
- 37% of actions are dispatched outside of these Settlement Periods.



**Graph 2. Average volume of NBMFR dispatched by Settlement Period and the percentage of NBMFR actions in each Settlement Period.**

# P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

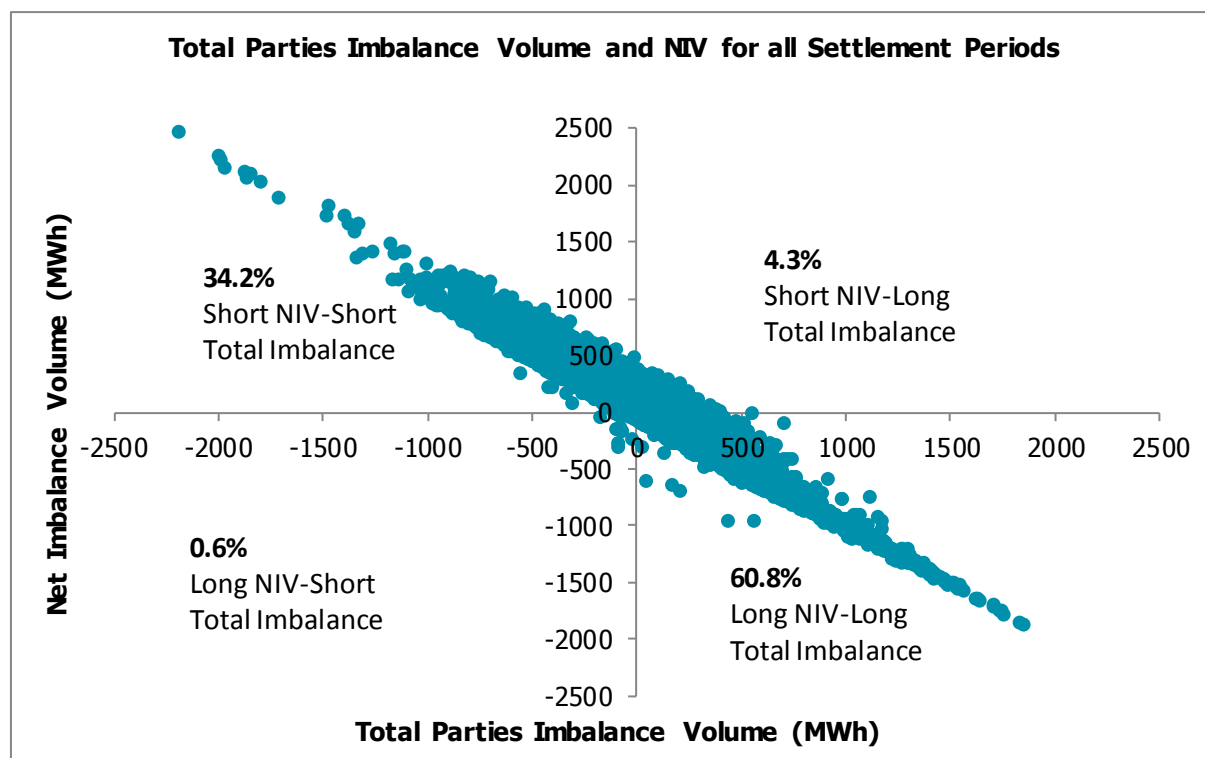
## NET IMBALANCE VOLUME ANALYSIS

We have compared the sum of BSC Parties Energy Imbalance Volumes to Net Imbalance Volume (NIV) between January 2017 and October 2018. We have also investigated the impact of NIV changes when the NBMFR volumes are added to the Energy Imbalance Price Calculation stack.

### 1. NIV Correlation

The correlation coefficient between the NIV and the sum of BSC Parties Energy Imbalance Volumes between January 2017 and October 2018 is -0.982. This indicates strong negative correlation between the two variables, shown in **graph 3**.

When the sum of BSC Parties Energy Imbalance Volumes is more negative, there is a greater volume of BSC Parties with a short Energy Imbalance Volume. When the NIV is more positive, National Grid have taken more buy actions to increase the volume of energy on the system to offset BSC Parties short Energy Imbalances. Hence, the relationship between NIV and the sum of BSC Parties Energy Imbalance Volumes is negative.



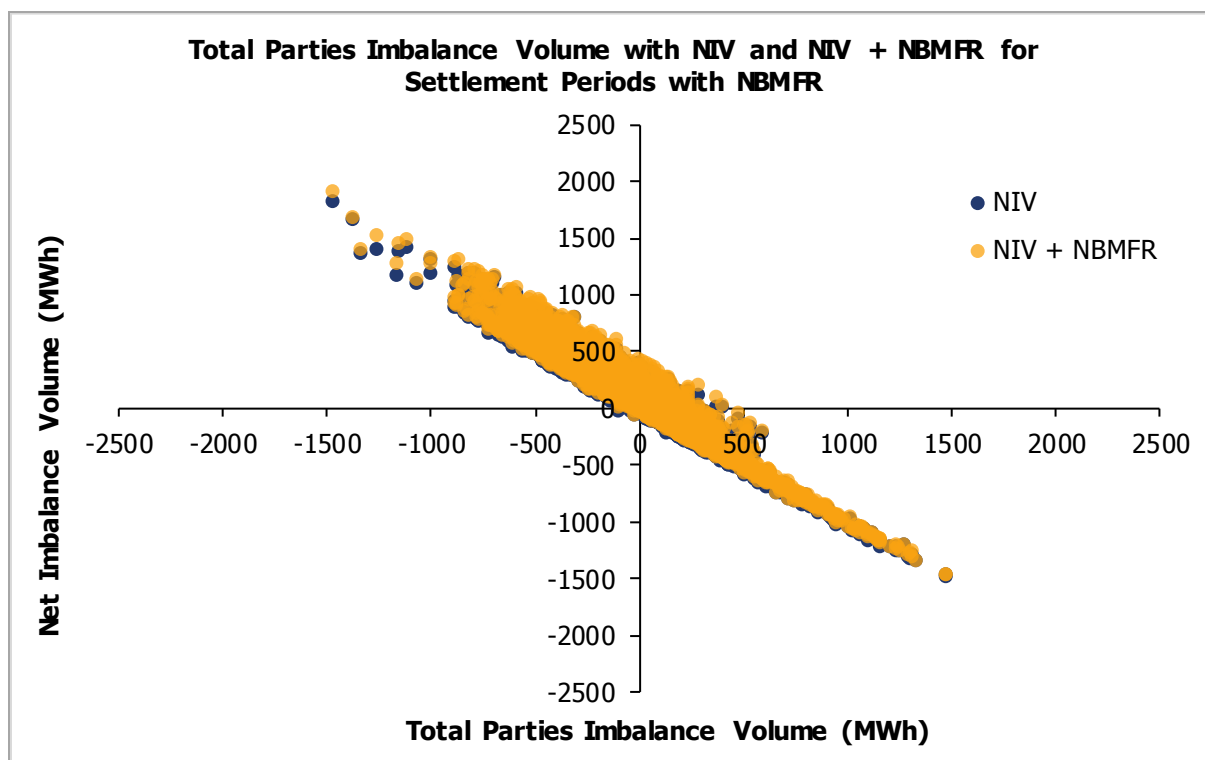
**Graph 3. The total sum of BSC Parties Energy Imbalance Volume compared to the NIV between January 2017 and October 2018**

**Graph 3** also shows that the direction of the NIV matches the net direction of the sum of BSC Parties Energy Imbalance Volumes in 95% of Settlement Periods.

When we calculate the NIV with NBMFR actions included, the correlation for all Settlement Periods in the date range is -0.981. This value is very similar to the correlation coefficient for NIV without NBMFR.

## P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

NBMFR was utilised in 14.2% percent of Settlement Periods; **graph 4** shows only Settlement Periods where NBMFR was utilised. The NIV and the NIV+NBMFR are both included, with the corresponding sum of BSC Parties Energy Imbalance volumes for that Settlement Period.



**Graph 4. BSC Parties Energy Imbalance Volume compared to the NIV and NIV with NBMFR actions included for Settlement Periods where NBMFR was utilised**

The two distributions are very similar, with the NIV + NBMFR data points overlaying the NIV data points. The inclusion of NBMFR increases the NIV by an average of 23.1MWh. This inclusion effectively shifts the distribution by 23.1MWh towards the short NIV direction.

For the Settlement Periods where NBMFR was utilised, the correlation coefficient for NIV is -0.971 and for NIV + NBMFR is -0.969. These correlation coefficients both show strong negative correlation.

The NIV flipped from long to short in 126 Settlement Periods; this represents 2.77% of all Settlement Periods where NBMFR was utilised. The inclusion of NBMFR caused the direction flip to match the sum of BSC Parties Energy Imbalance Volumes direction for 30 of the 126 Settlement Periods.

Unlike Bids and Offers, the volumes of Balancing Services Adjustment Actions (BSAA) are not accounted for in Parties Energy Imbalance Volumes. Hence, a buy BSAA will contribute to more positive sum of BSC Parties Energy Imbalance Volume (market is long), while also contributing to a more positive NIV (NIV is short).

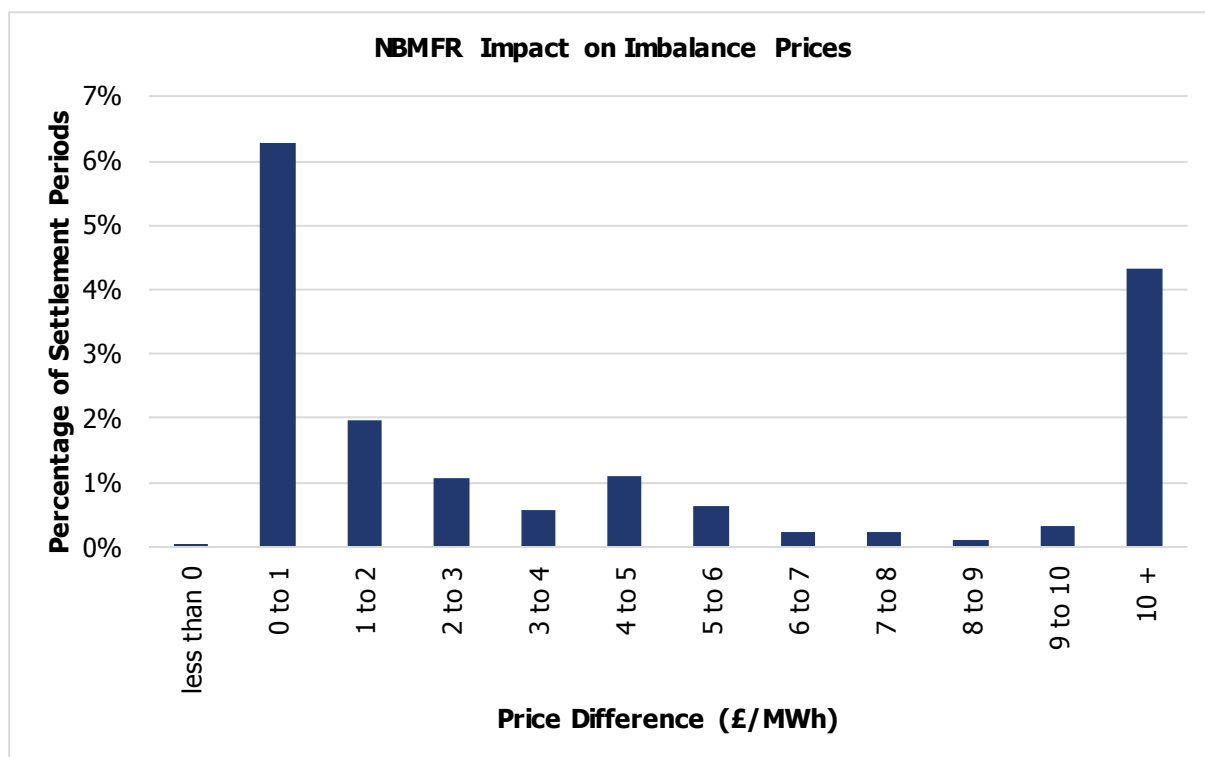
[BSC Modification P354 'Use of ABSVD for non-BM Balancing Services at the metered \(MPAN\) level'](#), due to be implemented in April 2020, will allow these volumes to be accounted for and reduce this asymmetry.

# P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

## IMPACT OF INCLUDING NBMFR ON IMBALANCE PRICE

We recalculated Imbalance Prices in 2,074 Settlement Periods between January 2018 and October 2018, where NBMFR was utilised, with a Price Average Reference (PAR) of 1MWh and Value of Lost Load (VoLL) of £6,000/MWh (to reflect Imbalance Prices calculated after 1 November 2018).

We have compared Imbalance Prices calculated with NBMFR actions included in the stack to those without NBMFR (graph 5).



**Graph 5. The percentage of Settlement Periods where the inclusion of NBMFR in the pricing stack causes a change in Imbalance Prices, by difference.**

Including NBMFR actions caused a change in Imbalance Price in 17% of Settlement Periods where NBMFR was utilised. NBMFR was utilised in 14% of Settlement Periods in the assessed period. The Imbalance Price would have changed by less than £1/MWh in 6% of Settlement Periods, and by more than £10/MWh in 4.3% of Settlement Periods.

The average Imbalance Price in the Settlement Periods assessed would have been £67.02/MWh; with NBMFR included in the stack, this would have been £68.47/MWh.

The biggest change to Imbalance Prices would have been £72.25/MWh on 24 March 2018 (Settlement Period 3). The Imbalance Price would have been £41.75/MWh without NBMFR, and £114/MWh with NBMFR. The inclusion of NBMFR actions caused the NIV change from -45.23MWh long to 70.22MWh short. This meant that the Imbalance Price in this Settlement Period was based on NBMFR action priced at £114/MWh instead of a Bid priced at £41.75/MWh.

The majority of Imbalance Prices were higher due to the inclusion of NBMFR, however in one Settlement Period the Imbalance Price was less.

## P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

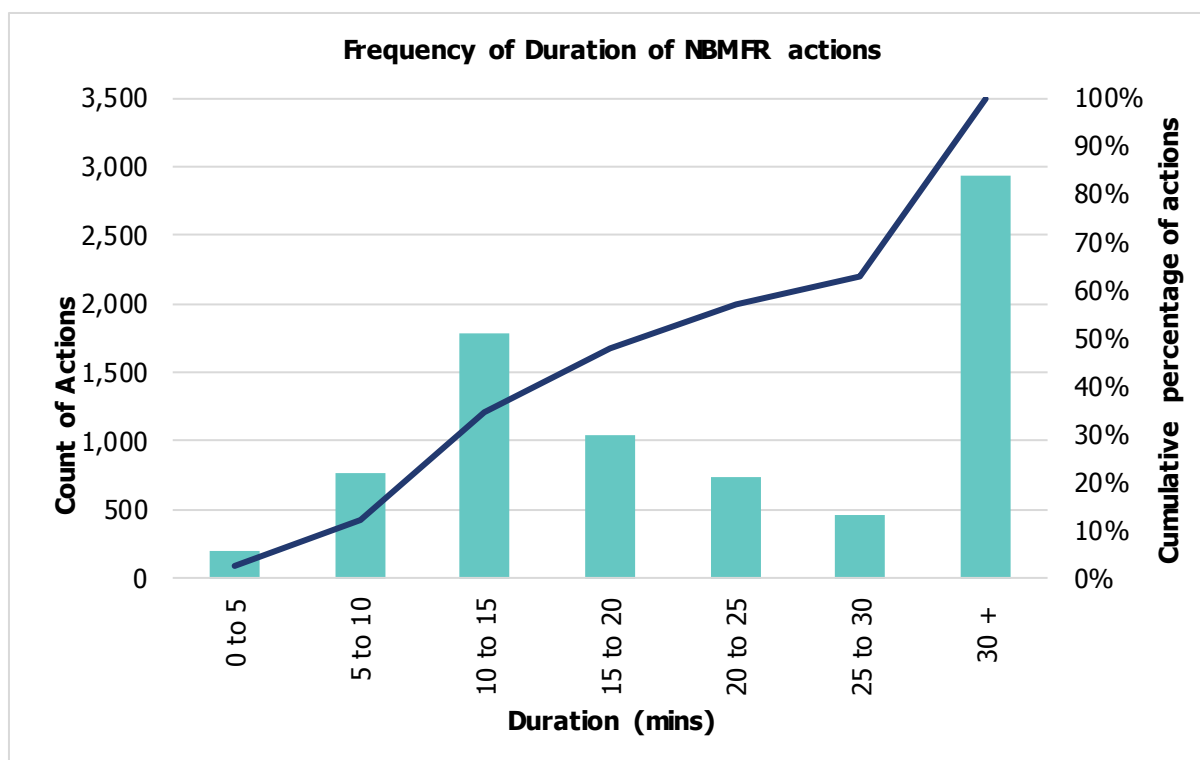
For Settlement Period 21 on 21 August 2018, the inclusion of NBMFR would have made the Imbalance Price lower by £1.46/MWh. Without NBMFR, there was one action remaining priced at £101/MWh with a volume of 0.635MWh after Net Imbalance Volume (NIV) Tagging. This is less than the PAR, and the volume-weighted average price was £101/MWh. A 14.47MWh NBMFR action, priced at £97/MWh, was taken in this Settlement Period. Including this action in the Imbalance Price Calculation meant that the PAR included two actions, and the volume-weighted average would have been £99.54/MWh.

### DURATION OF NBMFR ACTIONS AND IMPACT OF CADL

Balancing Services Adjustment Data (BSAD) does not currently include the action's duration. Hence, no BSAA can have a Continuous Acceptance Duration Limit (CADL) applied. We received duration information from National Grid with details of the NBMFR actions, and so were able to analyse these action's durations.

Any Bid or Offer with a duration less than CADL would have a CADL Flag applied, and become First Staged Flagged in the Imbalance Price Calculation.

The CADL is currently set to 15 minutes, and on 1 April 2019 will reduce to 10 minutes.



**Graph 6. The frequency of NBMFR actions in each duration band.**

**Graph 6** shows the frequency NBMFR actions in each 5 minute duration band between January 2017 and October 2018, as well as the cumulative percentage of actions by duration.

- 35% of NBMFR actions are less than 15 minutes and hence have a duration less than the current CADL.
- 12% of NBMFR actions are less than 10 minutes and hence have a duration less than the future CADL.

## P371 ANALYSIS ON INCLUSION OF NON BM FAST RESERVE

---

Please note that if NBMFR instruction has a duration longer than the duration of a Settlement Period it will be counted as a separate action for each Settlement Period it appears in. Hence, we would consider an instruction lasting 35 minutes and running across two Settlement Periods as two actions. This is consistent with how Bids, Offers and BSAA are currently considered.

There were 995 NBMFR instructions longer than 30 minutes (22% of NBMFR instructions); this corresponded to 2,931 NBMFR actions (37% of NBMFR actions).