ELEXON

CONTINUOUS ACCEPTANCE DURATION LIMIT (CADL) REVIEW

Imbalance Settlement Group (ISG)

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Owner/author	**Mehdi Jafari**	Purpose of paper	**Decision**
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Summary

The Continuous Acceptance Duration Limit (CADL) is a pricing parameter used to identify short duration Bid-Offer Acceptances (BOAs). These are likely to be associated with system balancing actions, and may be repriced in the Imbalance Price calculation.

When CADL was introduced in 2001, it was set at 15 minutes duration. It was changed to 10 minutes duration follow a parameter review in 2018, becoming effective 1 April 2019.

This review covers the period 1 August 2020 to 31 July 2022, using the analysis provided by National Grid Electricity System Operator (NGESO). It is our view that the analysis suggests that the current 10 minute CADL remains suitable.

The Imbalance Settlement Group (ISG) is invited to note the analysis, recommend CADL does not change, and agree that Elexon will conduct the next scheduled review in two years' time.

1. Background

1.1 The Continuous Acceptance Duration Limit (CADL) flags Bid-Offer Acceptances (BOAs) with a duration of 10 minutes or less, as these actions tend to be associated with system balancing actions. The Replacement Price may then reprice these CADL flagged actions during the Imbalance Price calculation. When CADL was introduced in 2001, it was set at 15 minutes duration. It was changed to 10 minutes duration follow a parameter review in 2018, becoming effective 1 April 2019.

1.2 The Balancing and Settlement Code (BSC), Section T 1.9 states that:

> 1.9.1 For the purposes of the Code, the "Continuous Acceptance Duration Limit" (CADL) shall be 15 minutes or such other amount (in minutes) determined by the Panel and approved by the Authority.
>
> 1.9.2 The Panel may revise such amount from time to time subject to the approval of the Authority.
>
> 1.9.3 In revising the amount of the Continuous Acceptance Duration Limit from time to time, the Panel shall consult with Parties and consider the views expressed in the course of such consultation prior to making its determination (and shall provide a detailed summary of such views to the Authority)

1.3 Modification P217 'Revised Tagging Process and Calculation of Cash Out Prices', implemented in November 2009, altered the operation of CADL in the Imbalance Price calculation. Prior to November 2009, tagged CADL actions were excluded from the Imbalance Price calculation. Since November 2009, CADL actions are flagged and may be repriced using the Replacement Price.

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1.4 NGESO's analysis splits all BOAs into two groups; actions from specific Fast Reserve plants, and actions from all other plants (Non-Fast Reserve). Details of the number and volume of Fast Reserve and Non-Fast Reserve flagged BOAs used in this review covered the period 1 August 2020 to 31 July 2022 (referred to as the review period).

2. NGESO analysis of CADL (August 2020 – July 2022)

2.1 When reviewing the CADL, Elexon request NGESO to provide detailed analysis of energy and system balancing actions for the previous two years.

2.2 Their methodology defines plants that offer Fast Reserve actions as those which match, individually or as a group, the following minimum criteria:

a) Initial ramp rate is greater than or equal to 25 MW/min; and

b) BOA size is greater than or equal to 25MW; and

c) Start point is greater than or equal to the unit's Stable Export Limit (SEL), unless it's a hydro or battery or open cycle gas turbine (OCGT) station.

2.3 The NGESO provided analysis on the volume flagged by CADL in the Energy Imbalance Price calculation, defining if it was considered as either Fast BOA volume or Non-Fast BOA volumes.

2.4 During the first review period, 1 August 2020 to 31 July 2021, five hydro power stations accounted for 88.1% of Fast Reserve BOAs, with 21 gas power stations, 2 aggregated stations, a coal station, a wind station and a battery station accounting for the remaining 11.9%.

2.5 Over the second review period, 1 August 2021 to 31 July 2022, five hydro power stations accounted for 94.2% of Fast Reserve BOA, and the remaining 5.8% was delivered by 14 Gas power stations, a diesel station, and a battery station.

2.6 The analysis includes modelling the flagging of actions at various durations of CADL. The aim is to find the most appropriate level of CADL, where the largest numbers of Fast Reserve BOAs are flagged, whilst leaving other actions unflagged. NGESO's analysis is included as Attachment A (2020-21) and Attachment B (2021-2022).

2.7

2.8 , based on the analysis provided by NGESO, shows how the Fast and Non-Fast BOAs Reserve Volumes flagged differ across varying CADL time values for the period 1 August 2021 to 31 July 2022 (note that 1 August 2020 to 31 July 2021 is shown in Attachment A).

2.9

2.10 shows that at the current 10-minute CADL, 43.1% of CADL flagged actions are Fast Reserve, with 56.9% classed as Non-Fast Reserve.

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Table 1: Volume of 'Fast' and 'Non-Fast Reserve' BOAs flagged (duration from 5-20 minutes)

CADL FLAGGED BOAs vs TOTAL BOAs (1 Aug 2021 to 31 Jul 2022)						
Duration (min) (cumulative) (a)	Fast BOAs (MWh) (b)	All BOAs flagged (MWh) (c)	Fast BOAs as % of All BOAs flagged (b)/(c)	All BOAs flagged as % of All BOAs (d)=(e)+(f)	Fast BOAs flagged as % of All BOAs flagged (e)	Non Fast BOAs flagged as % of All BOAs flagged (f)
5	14,887	34,421	43.3%	0.2%	0.1%	0.1%
6	25,333	54,484	46.5%	0.3%	0.1%	0.2%
7	42,571	108,834	39.1%	0.6%	0.2%	0.4%
8	54,519	130,706	41.7%	0.7%	0.3%	0.4%
9	68,570	162,323	42.2%	0.9%	0.4%	0.5%
10	81,001	187,783	43.1%	1.0%	0.4%	0.6%
11	94,670	226,413	41.8%	1.2%	0.5%	0.7%
12	108,665	257,084	42.3%	1.4%	0.6%	0.8%
13	121,145	292,428	41.4%	1.6%	0.7%	0.9%
14	133,113	323,208	41.2%	1.8%	0.7%	1.0%
15	144,845	356,759	40.6%	2.0%	0.8%	1.2%
16	157,064	393,073	40.0%	2.2%	0.9%	1.3%
17	168,227	425,849	39.5%	2.3%	0.9%	1.4%
18	177,507	461,843	38.4%	2.5%	1.0%	1.6%
19	187,064	493,538	37.9%	2.7%	1.0%	1.7%
20	197,227	533,729	37.0%	2.9%	1.1%	1.8%

2.11 NGESO also plotted the count of Fast and Non-Fast BOAs, and showed these as cumulative percentages by time band (**Graph 1**). Above the previous 15-minute CADL, the cumulative percentage curve, shown on the graph as the blue line, flattens (for Fast BOAs), capturing lower numbers of Fast actions. The cumulative percentage of non-Fast BOAs, shown on the graph as the green line, continues to increase above the 15 minute CADL.

2.12 From **Graph 1**, we can conclude:

- The count of 'Fast Reserve' BOAs peaked at 4026 in the interval 6 – 10 minutes, with the count of Non-Fast Reserve BOAs peaking at the same interval (11,789).
- With the current CADL of 10 minutes, 47% of Fast BOAs are correctly flagged, and 19% of Non-Fast BOAs are incorrectly flagged.
- Although at 11-15 minutes, the percentage of correctly flagged Fast Reserve BOAs rises to 65%, the percentage of Non-Fast BOAs incorrectly flagged would rise to 28%.
- The number of 'Fast Reserve' BOAs decreases rapidly when CADL rises above 10 minutes.
- When CADL increases above 10 minutes, a much higher number of 'Non-Fast' actions are flagged, compared with number of 'Fast' actions.

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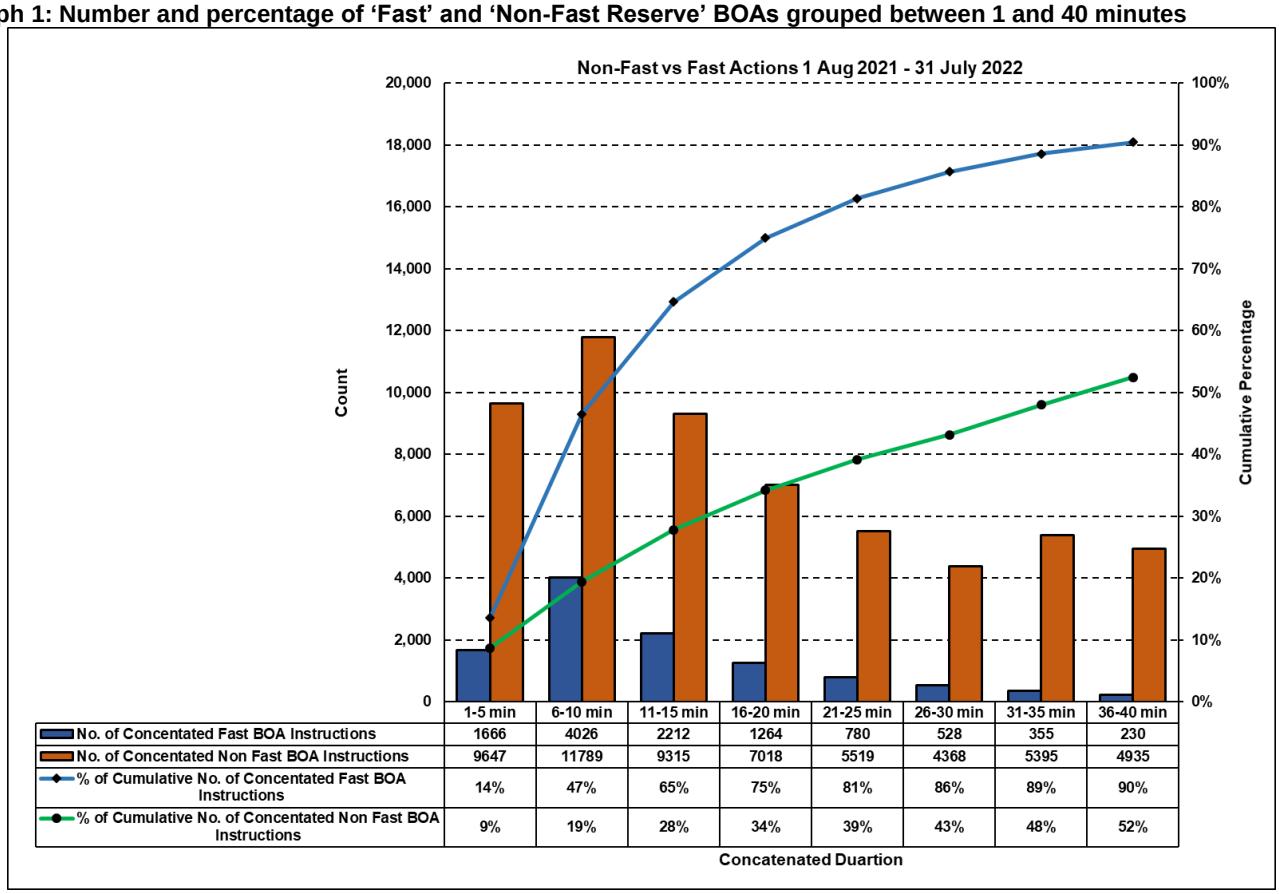
Graph 1: Number and percentage of 'Fast' and 'Non-Fast Reserve' BOAs grouped between 1 and 40 minutes



	1-5 min	6-10 min	11-15 min	16-20 min	21-25 min	26-30 min	31-35 min	36-40 min
No. of Concentated Fast BOA Instructions	1666	4026	2212	1264	780	528	355	230
No. of Concentated Non Fast BOA Instructions	9647	11789	9315	7018	5519	4368	5395	4935
% of Cumulative No. of Concentated Fast BOA Instructions	14%	47%	65%	75%	81%	86%	89%	90%
% of Cumulative No. of Concentated Non Fast BOA Instructions	9%	19%	28%	34%	39%	43%	48%	52%

3. Elexon analysis of CADL

3.1 Our analysis shows that CADL flagging occurs in 15.64% of all Settlement Periods, with an average of 0.48% of balancing volumes per Settlement Period being CADL flagged between 1 August 2020 and 31 July 2022. Given the importance of CADL impact on imbalance pricing, Elexon undertook further analysis of the CADL, using 1 August 2020 to 31 July 2022 data (analysis is shown in Appendix 1). Our main findings were:

- The percentage of CADL flagged actions, as a proportion of total actions, has been higher for Buy actions than Sell actions except for the period August to October 2021, where the percentage of CADL flagged Sell actions was higher.
- On average, 0.53% of total Buy actions and 0.43% of total Sell actions were CADL flagged over the whole review period (see **Graph 2** in the appendix).
- Both Buy and Sell CADL flagged actions peaked in April 2022 with 1.12% of Buy actions and 0.65% of Sell actions being CADL flagged respectively.
- The percentage of CADL flagged actions have increased for both Buy and Sell actions from 0.47% and 0.37% respectively in the first review period (August 2020 to July 2021) to 0.62% and 0.49% respectively in the second review period (August 2021 to July 2022) – as shown in **Graph 3**.
- In total, the percentage of all CADL flagged actions increased from 0.42% in the first review period to 0.55% in the second review period.
- When comparing the Cumulative Fast and Non-Fast Reserve actions per different CADL durations, the volume of Non-Fast BOAs flagged actions are almost the same as the volume of Fast BOAs flagged actions for a CADL duration of up to above 6 minutes (**Graph 4**). The difference between the volume of Non-Fast and Fast BOAs flagged actions remain roughly the same between 7 to 10

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minutes i.e. the growth rate for both Fast and Non-Fast Reserve actions are almost equal up to 10 minutes, where the Non-Fast Reserve actions starts to grow at a higher rate. This supports the view that CADL values above 10 minutes decrease the effectiveness of this parameter.

- We have also looked at the volume of BOAs that would have been flagged for a CADL duration of 5 to 20 minutes. The differences between the flagged volumes in this review and those of the previous 2020 review are shown in **Graph 5.** The volume of flagged Fast Reserve BOAs has decreased from the last parameter review, whereas the volume of Flagged Non-Fast Reserve BOAs has increased.

4. The impact of CADL on TERRE and Project MARI

4.1 Following the end of the Brexit Implementation Period on 31 December 2020 there is no longer an obligation to comply with Article 20 of the EBGL as this particular article was not retained into UK law. Similarly, there is nothing in the UK/EU Trade and Cooperation Agreement (TCA) that allows for GB's participation. As a result, unless a new agreement is reached between the UK and the EU, participation in TERRE and Project MARI will not be possible. Following discussion with Ofgem, NGESO has therefore withdrawn support of P407.

5. Next step

5.1 Our analysis suggests that no change in the value of CADL is needed. Hence, we have not recommended a consultation to the industry. We invite you to provide comments on the analysis included in this paper, and make a recommendation to the BSC Panel for its November 2022 meeting.

6. Recommendations

6.1 We invite you to:

a) **NOTE** the analysis presented in this paper, and provide comments;

b) **RECOMMEND** to the BSC Panel that no change is made to the CADL; and

c) **AGREE** that Elexon conduct the next scheduled review in two years' time.

Appendices

Appendix 1 - Elexon CADL analysis

Attachments

Attachment A – National Grid Electricity System Operator – 2020/21 CADL Review

Attachment B – National Grid Electricity System Operator – 2021/22 CADL Review

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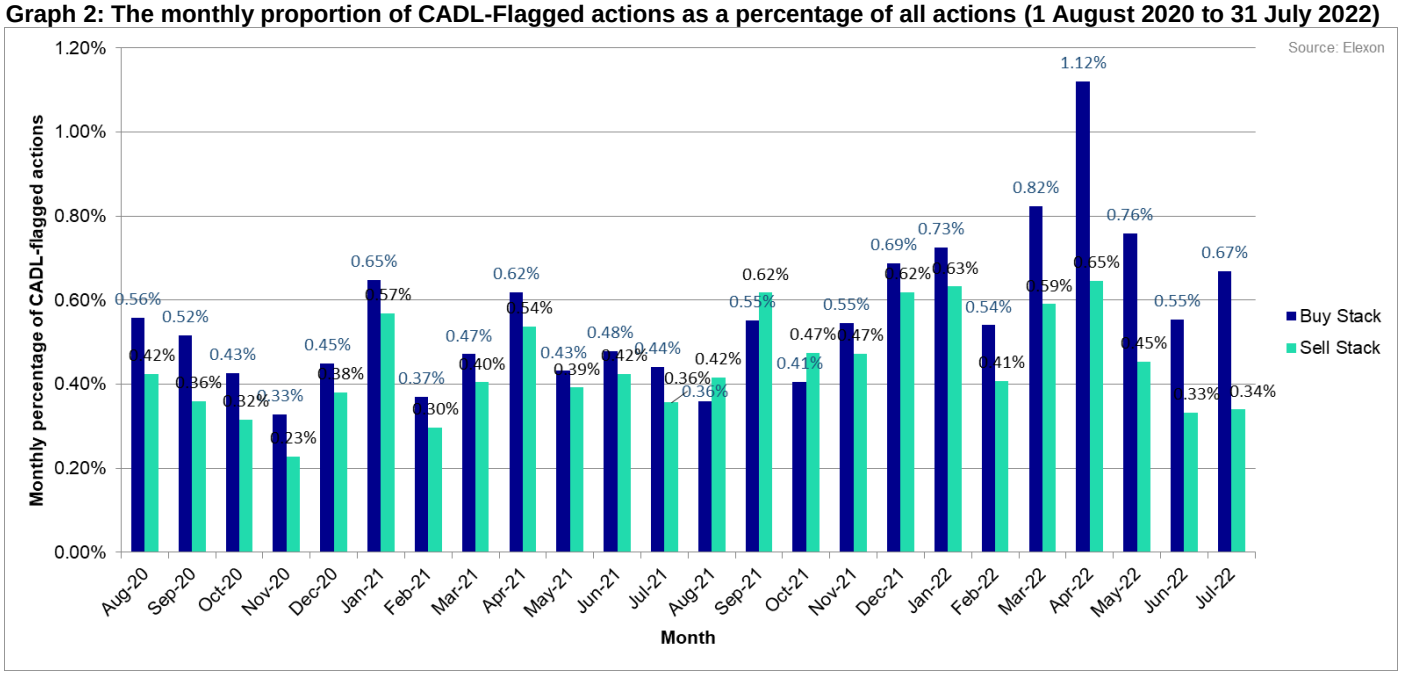
Appendix 1 - Elexon analysis of CADL (1 August 2020 to 31 July 2022)

Historic Data

We have looked at the Buy and Sell CADL-Flagged actions as a proportion of all actions (CADL-Flagged, CADL-Unflagged, SO-Flagged, and SO-Unflagged actions) for the period August 2020 to July 2022, in order to gain some appreciation for the amount of CADL-Flagged actions. This is shown in **Graph 2** and summarised in **Graph 3** below:

Graph 2: The monthly proportion of CADL-Flagged actions as a percentage of all actions (1 August 2020 to 31 July 2022)



As the graph shows the proportion of both Buy and Sell stacks peaked in April 2022 with 1.12% and 0.65% respectively. The proportion stayed relatively constant since August 2019 The above data are also summarised in **Graph 3**.

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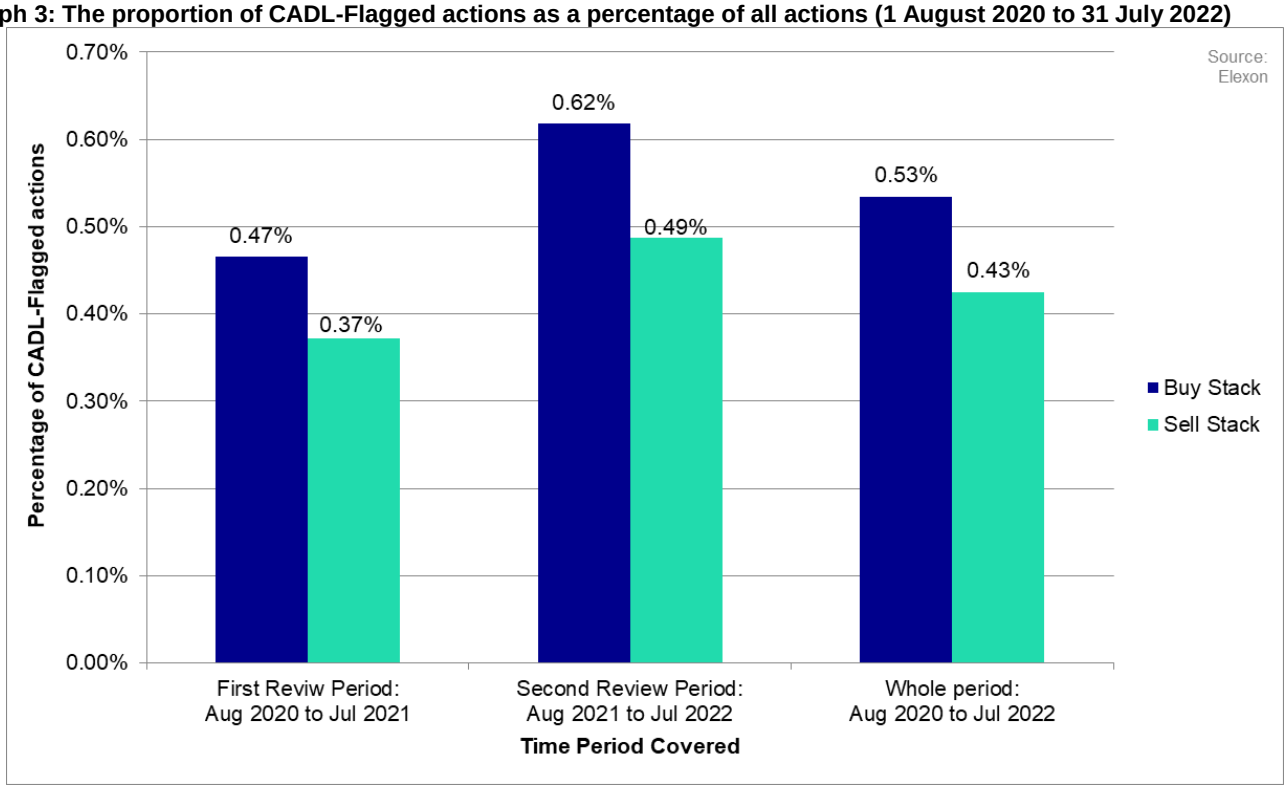
Graph 3: The proportion of CADL-Flagged actions as a percentage of all actions (1 August 2020 to 31 July 2022)



The proportion of both Buy and Sell stacks have increased in the second review period from an average proportion of 0.47% and 0.37%, to 0.62% and 0.49%, respectively. On average, 0.53% of Buy actions and 0.43% of Sell actions per each Settlement Period were CADL flagged over the period from 1 August 2020 to 31 July 2022.

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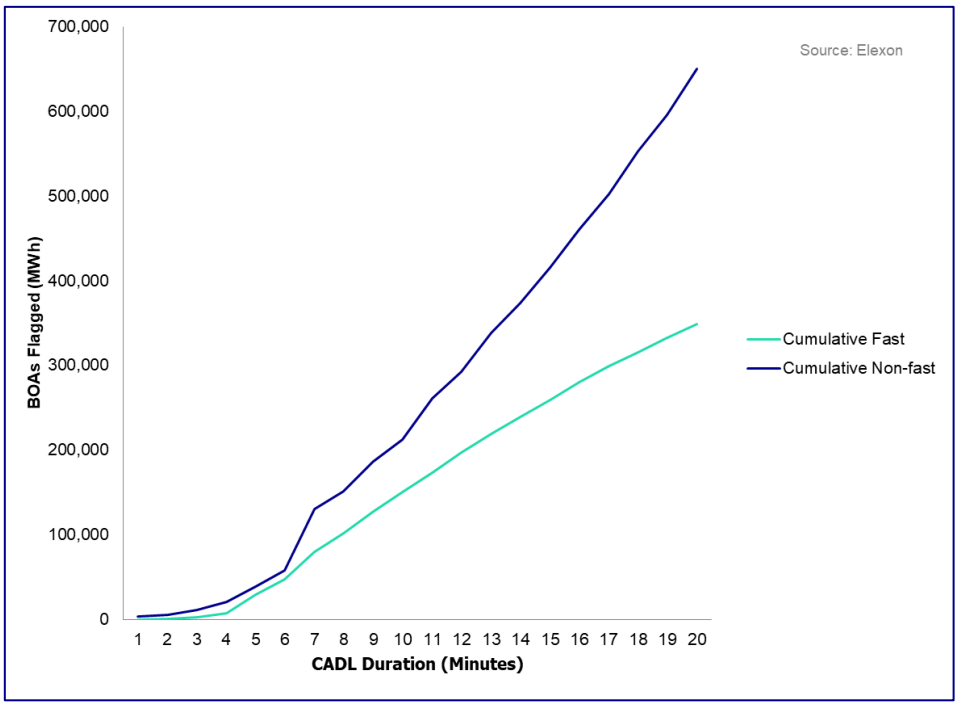
Elexon analysis using National Grid data

Using the data from

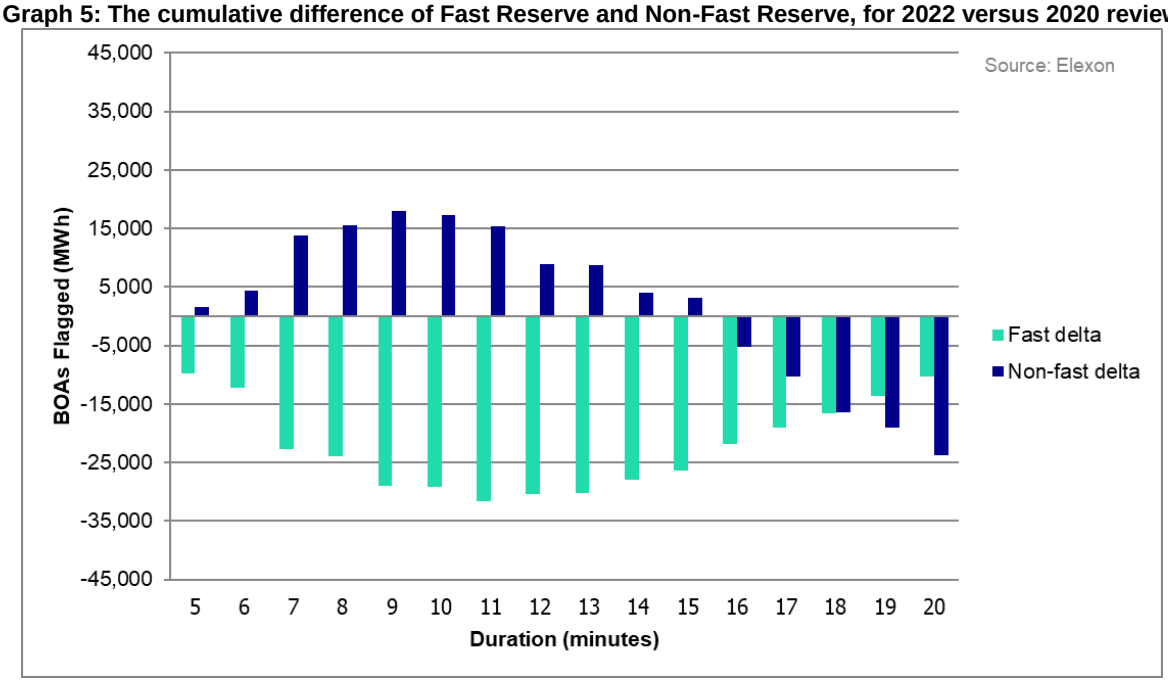
, a graphical representation of the Cumulative Fast and Non-Fast Reserve actions has been created (**Graph 4**). This shows that up to a CADL of 6 minutes, the volume of Non-Fast BOAs flagged actions is almost the same as the volume of fast flagged BOAs actions. Once the CADL duration increases above 6 minutes, the volume of Non-Fast flagged is higher than the volume of Fast BOAs flagged. However the difference is still not considerable, and the rate of increase between CADLs of 7 to 10 minutes remains almost the same until the CADL goes above 10 minutes, where the volume of Non-Fast BOAs increases at a greater rate than that of Fast BOAs thereafter.

Graph 4: Volume of 'Fast' and 'Non-Fast Reserve' BOAs between 10 and 20 minutes duration (1 Aug 2020 – 31 Jul 2021)



Graph 5 shows the difference between the volumes of actions that would have been flagged for CADL duration of 5 to 20 minutes for this review period, versus the 2020 parameter review (based on data 1 August 2018 – 31 July 2020).

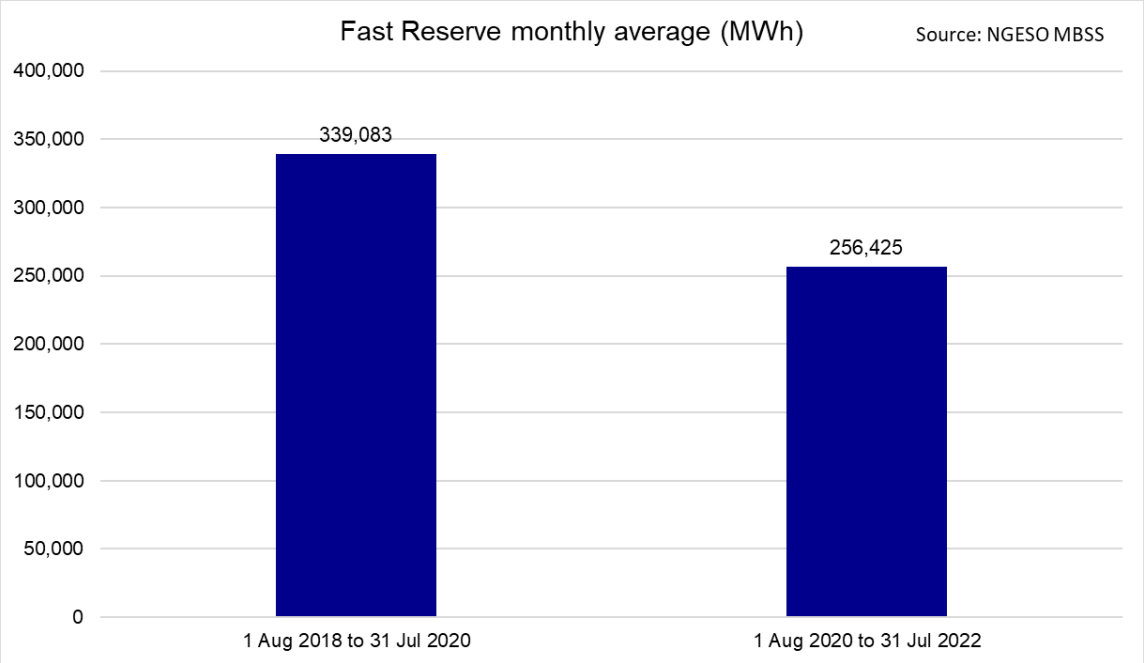
Graph 5: The cumulative difference of Fast Reserve and Non-Fast Reserve, for 2022 versus 2020 review



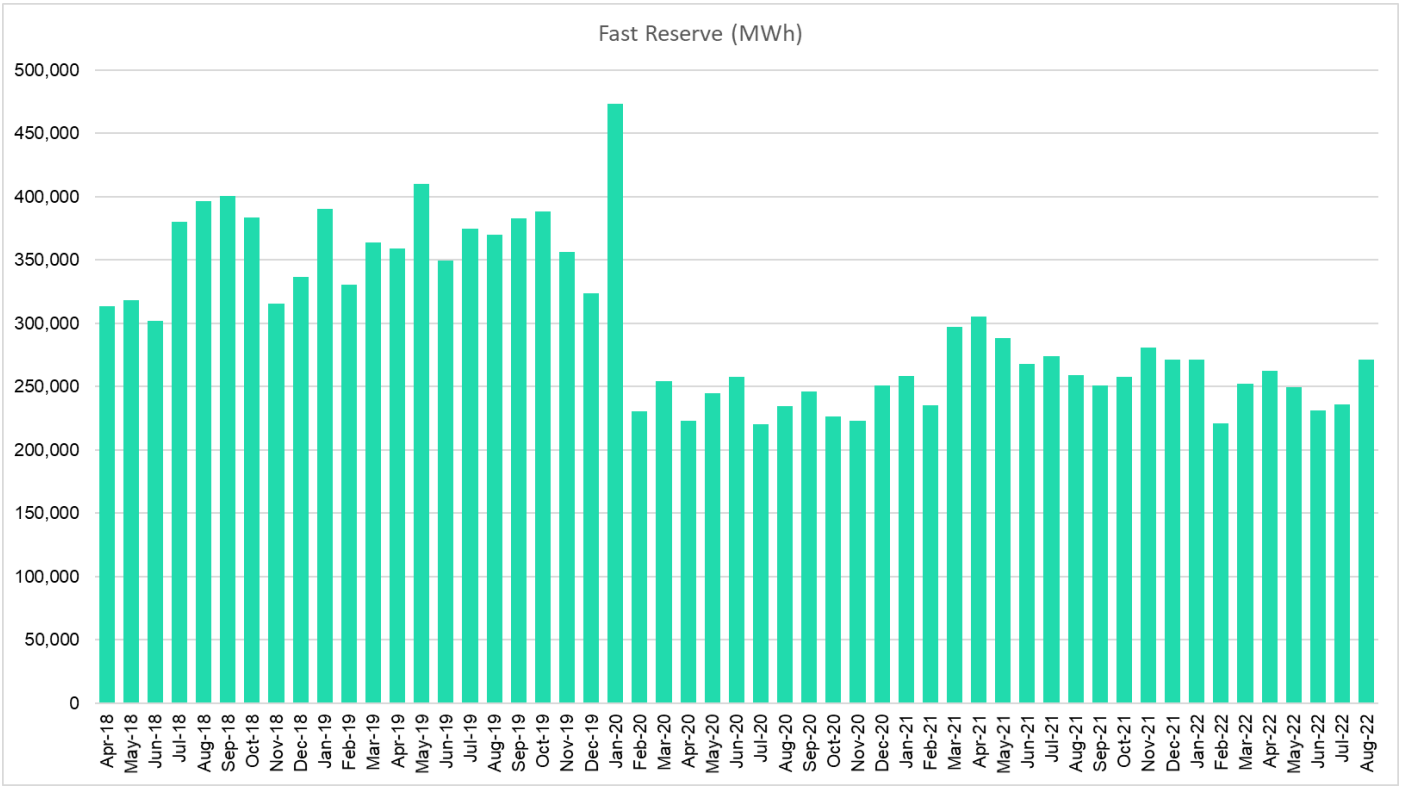
This analysis shows that whilst the flagged volume of Fast Reserve BOAs has decreased from the review in 2020, the volume of Flagged Non-Fast Reserve BOAs has increased. At the current 10-minute CADL level, there are 17,329 more flagged Non-Fast BOAs in the 2022 review than there was in the 2020 review, whilst the volume of Fast BOAs has fallen by 29,245 MWh.

Using data provided by National Grid and their Monthly Balancing Services Summary (MBSS) documents for the periods 2018/2020 to 2020/2022, we also looked at the volume of Fast Reserve deployed by NGESO in the 2022 review period and compared it with the 2020 review. Graph 6 shows there has been a decrease in the Fest Reserve actions taken in the second review period.

Graph 6: The monthly average of Fast Reserve (MWh) deployed by the NGESO



Looking at the monthly usage of Fast Reserve shown in the Graph 7, there is a drop in the monthly volume from February 2020. This could potentially be associated with Covid-19 and “lockdown” impacts.



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