

CADL Review, 01 August 2016 – 31 July 2017 (24/07/2018)

Objective

National Grid has been asked by the BSC panel, through its proxy the Imbalance Settlement Group (ISG), to provide analysis to the ISG to allow it to draw conclusions as to the appropriate level with which to set the Continuous Acceptance Duration Limit otherwise known as CADL.

Introduction

The CADL methodology aims to identify, and exclude from the imbalance price calculation, those Bid Offer Acceptance (BOA) actions deemed as taken for fast reserve. These actions may require above average ramping ability in order to fulfil their task of managing intra half hour energy imbalance. Given that these actions may require dynamic characteristics beyond those available to the majority of generation Balancing Mechanism Units (BMUs), there is the possibility that these actions may be taken out of cost merit.

The CADL function does not explicitly tag which actions should be classified as fast reserve. It employs a pragmatic solution to removing these actions from the imbalance price. It is assumed that the duration of the BOA instruction or set of concatenated instructions utilised to resolve intra half hour issues will be shorter than the average BOA duration.

Methodology

1. Defining fast reserve actions

For the purpose of this analysis, BMUs delivering fast reserve actions are deemed those that fulfil the following conditions, individually or in groups:

- Initial ramp rate is greater than or equal to 25 MW/min; and
- BOA size is greater than or equal to 50 MW; and
- Start point is greater than or equal to the unit's Stable Export Limit (SEL), unless it's a hydro or OCGT station.

This definition of fast reserve is the minimum dynamic characteristics required by National Grid in order for BMUs to be eligible to enter our fast reserve tender. Please note fast reserve is utilised on both contracted and non contracted units.

<https://www.nationalgrid.com/uk/electricity/balancing-services/reserve-services/fast-reserve>

This methodology by assessing the BOA dynamics provides an accurate view of the fast reserve actions employed by National Grid. This paper does not provide a view on the relative merit order of fast reserve BOAs as compared

to non-fast reserve BOAs. However, since the introduction of P217A (5th November 2009) the imbalance price mechanism now utilises a pragmatic approach of determining whether CADL actions were in merit order. Elexon, when considering P217A, will examine the impact of fast reserve actions upon cash out.

2. Concatenating acceptances

All instructions in this analysis have been concatenated. If a BMU receives a number of Bid Offer Acceptances (BOA) that either overlap or immediately follow each other, then this is classed as one instruction and will be counted only once in the duration of instruction analysis. The duration will be deemed the length of all the concatenated instructions.

Results

Overview

The above methodology has been used to assess all BOA instructions over approximately a 12 month period, from 01 August 2016 to 31 July 2017.

The analysis has focused on 3 sections. Specifically:

- 1) Fast Reserve and Plant Type
- 2) Energy Volumes discarded by CADL
- 3) Number of Fast Reserve and Non Fast Reserve BOAs

1. Fast Reserve and Plant Type

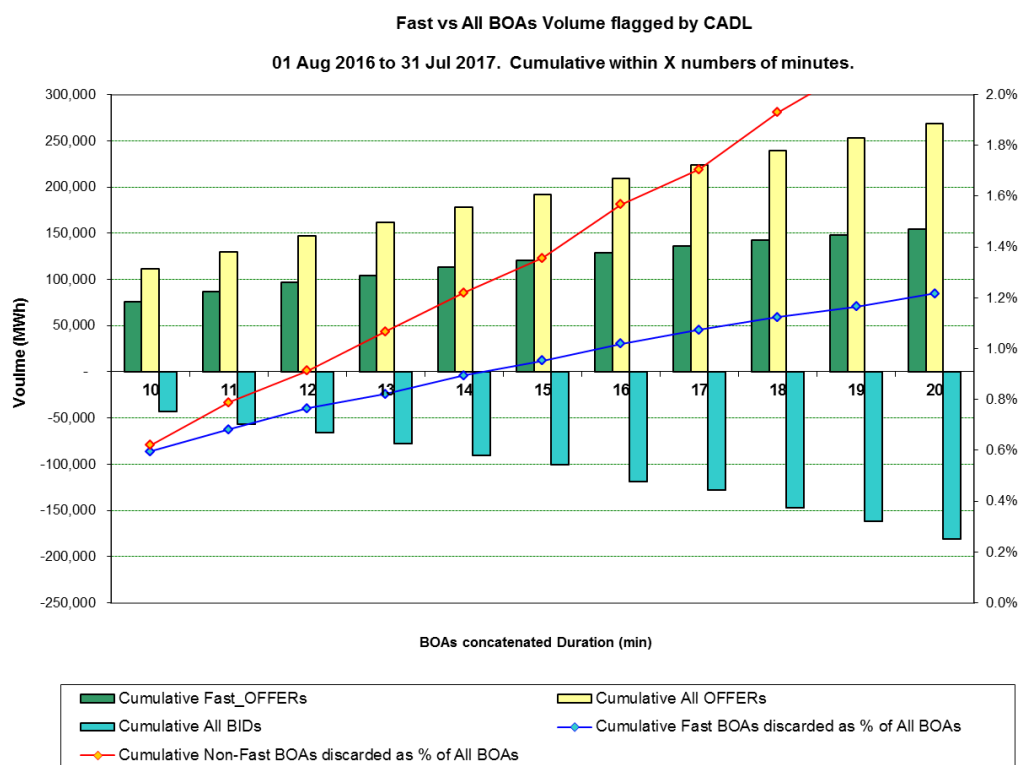
Applying the described methodology, as well as 5 hydro stations delivering fast reserve, 9 gas stations also delivered fast reserve over the assessment period. It should be noted that 90% of all fast reserve BOAs were delivered by the 5 hydro stations.

NOTE: There is an ongoing investigation into the data behind this calculation; however it is not expected to have a material impact on the figure. For the avoidance of doubt, the data issue only affects this figure.

2. Energy Volumes flagged by CADL

Volumes flagged by the CADL process have been analysed in regard to the current CADL rules, in summary any BOA or concatenated BOA has been assessed against the duration of the instruction. Energy volumes have been defined as either fast BOAs volumes or non fast BOAs volumes.

The following chart shows the volume of actions flagged by the CADL process in relation to a CADL limit set between 10 – 20 minutes. Also the chart illustrates the volume of fast reserve BOAs and non fast reserve BOAs as a percentage of the total BOA volume, at each CADL limit.



The table below summarises the information displayed in the previous chart.

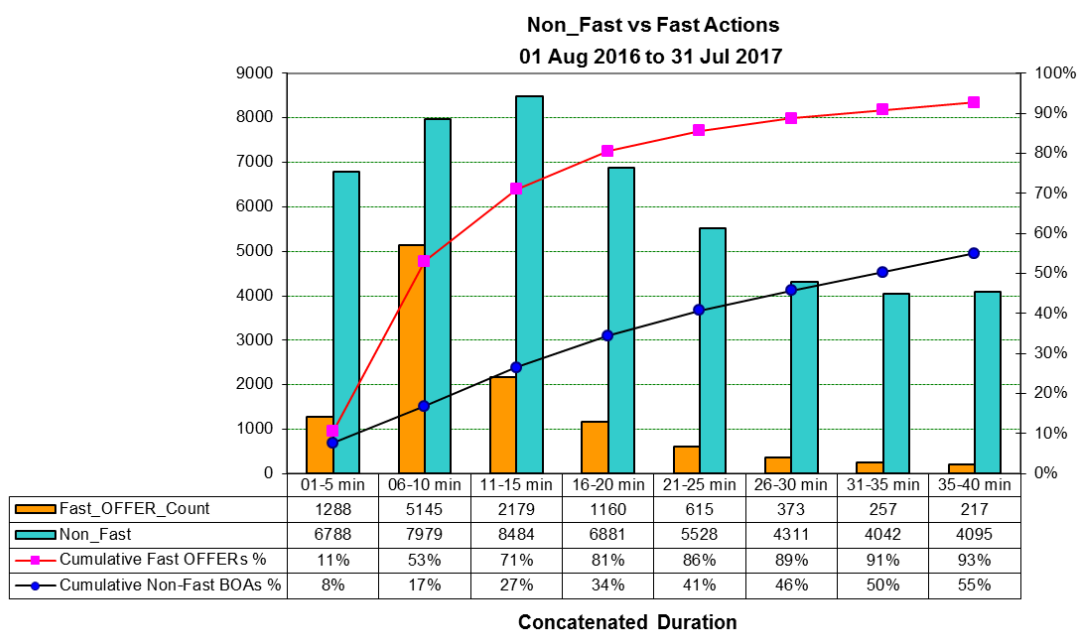
| Duration (min) (cumulative) | Volume flagged by CADL (01 Aug 2016 to 31 Jul 2017) | | | | | |
|-----------------------------|---|------------------------|------------------------------------|-----------------------------------|------------------------------------|--|
| | Fast BOAs (MWh) | All BOAs flagged (MWh) | Fast BOAs as % of All BOAs flagged | All BOAs flagged as % of All BOAs | Fast BOAs flagged as % of All BOAs | Non Fast BOAs flagged as % of All BOAs |
| 10 | 75,522 | 154,259 | 49.0% | 1.1% | 0.5% | 0.6% |
| 11 | 86,391 | 186,232 | 46.4% | 1.3% | 0.6% | 0.7% |
| 12 | 96,975 | 212,700 | 45.6% | 1.5% | 0.7% | 0.8% |
| 13 | 104,042 | 239,321 | 43.5% | 1.7% | 0.7% | 1.0% |
| 14 | 113,432 | 268,071 | 42.3% | 1.9% | 0.8% | 1.1% |
| 15 | 120,709 | 292,597 | 41.3% | 2.1% | 0.9% | 1.2% |
| 16 | 129,075 | 327,735 | 39.4% | 2.3% | 0.9% | 1.4% |
| 17 | 136,103 | 352,138 | 38.7% | 2.5% | 1.0% | 1.5% |
| 18 | 142,482 | 387,010 | 36.8% | 2.8% | 1.0% | 1.7% |
| 19 | 147,688 | 414,602 | 35.6% | 2.9% | 1.1% | 1.9% |
| 20 | 154,254 | 448,812 | 34.4% | 3.2% | 1.1% | 2.1% |

- From the total volume flagged by the current CADL limit of 15 minutes, 41.3% were fast reserve BOAs
- The current CADL limit of 15 minutes flagged 2.1% of all BOAs instructed by National Grid, of which 0.9% of all BOAs were related to fast reserve.

3. Number of Fast Reserve and Non Fast Reserve BOAs

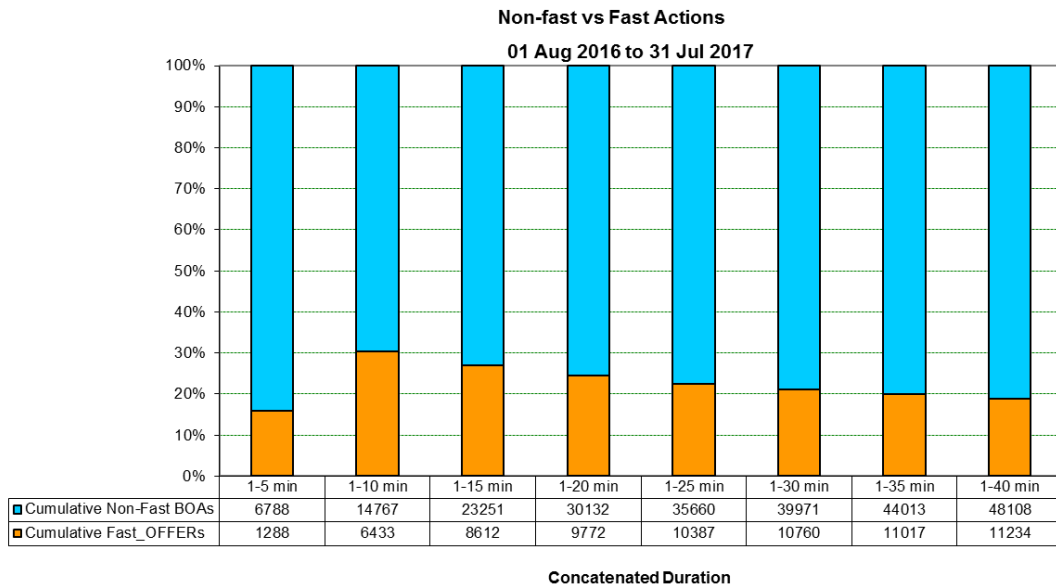
As well as examining the volume flagged by CADL, the number of BOAs has also been assessed. As such all instructions taken over the assessment period have been categorised as either fast reserve BOAs or non fast reserve BOAs in regards to the outlined methodology. The table and graph below illustrates the number of BOAs, categorised by BOA duration.

- The bar chart is a histogram of the number of BOAs split by their duration (0 to 5 minutes, 5 to 10 minutes, 10 to 15 minutes, etc).
- The line chart shows the cumulative distribution of both fast reserve and non fast reserve BOAs, e.g. 11% of the fast reserve BOAs lasted for 5 minutes or less, 53% of the fast reserve BOAs lasted for 10 minutes or less, 71% of the fast reserve BOAs lasted for 15 minutes or less, etc.



- The number of fast reserve BOAs peaked in the 5 to 10 minute duration category
- The number of non fast reserve BOAs peaked in the 10 to 15 minute duration category
- The current CADL limit of 15 minutes captured 71% of fast reserve BOAs over the assessment period
- The current CADL limit of 15 minutes captured 27% of non fast reserve BOAs over the assessment period

The following chart shows the proportion of fast reserve / non fast reserve BOAs, grouped by their duration.



- The proportion of fast reserve BOAs compared to non fast reserve BOAs peaks in the 1-10 min interval.