

Dispatch Transparency Methodology

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Introduction

In the Forward Plan 2020-21, we committed to increasing transparency through providing greater clarity of our operational decision making¹. As shown in our ENCC Transparency Roadmap², one of the ways we look to achieve this is through the development of a Dispatch Transparency tool and methodology to publish information about the actions taken in the Balancing Mechanism and the reasons for them.

This document aims to unlock the methodology of the tools that have been created for publication of data in 2020/21 Q4.

Please note: We are considering the relative benefits of investing time to move the production of this data and publication closer to real-time as part of our wider transparency work. This is beyond the scope of this methodology document and the current tool.

Overview

A tool has been created in Python code that completes the actions described within this document. The tool collates, analyses and presents the Bid Offer Data for the previous day, and this will be published on the Data Portal.



1. Data Retrieval & Data Set Build

The Python code utilises a number of scripts to collate data from two internal system. The data is limited to the date being analysed and includes information core to the Bid Offer Data.

Once the data is retrieved, the following actions are completed to improve the quality and reduce the volume of data.

BMU labels are corrected to Elexon's published list: new BMU sites will have a temporary identifier on our internal system, this step changes this temporary ID into the industry recognised label

Bid Offer Data without range is deleted: where both the minimum and maximum Bid Offer Limit is equal to 0MW there is no practical offer of a service, these entries are deleted from the data set for processing speed purposes.

Unique Identifier added: each BOA is assigned a unique identifier to aid data handling

Further data fields are then added:

- Bid or Offer

¹ Forward Plan 2020-21 <https://www.nationalgrideso.com/document/166441/download>

² ENCC Transparency Roadmap <https://www.nationalgrideso.com/our-strategy>

- ESO BMU Identifier, using the BMRA mapping
- Accepting party of the BOA unit
- BMR zone
- Main settlement period of BOA. If the BOA spans multiple settlement periods, this is broken into sections and the largest absolute volume is taken as the main settlement period.
- BOA notice time in minutes
- BOA time to target, acceptance time to start time of the BOA spot target.
- BOA target duration in minutes
- BOA total duration in minutes
- Peak change, peak difference between the BOA target level and the amended FPN profile.

2. Stage 1: Categorisation

The commonly used flags for system and energy actions are a starting point for the categorisation within this process. System flags carry through, but the energy flagged actions are broken down further. Bid Offer Acceptances are assessed to categorise actions where there is a clear engineering requirement to be met, actions that are taken in pure economic order and actions where, at a first pass, alternative options may have been able to be taken. The categories are:

Category	Description
System	Actions taken to satisfy thermal, voltage, RoCoF / inertia or stability limits on the system. These are actions that have a system flag in the BMRA data flows.
Geometry	Actions taken where previous actions might lead to an unacceptable shape for a BMU to follow, or an unacceptable shape for frequency management, so a BOA is issued to achieve an acceptable shape in order to give the most economic solution when considering the holistic view across all settlement periods. In this instance, one settlement period may look funny but it will look correct over the whole day. Identified by the BOA profile being a flat line
Loss Risk	Actions needed to keep potential loss groups of generation within limits. Identified by the sum of Final Physical Notification of a loss group being greater than secured Low Frequency loss risk minus a 50MW tolerance, or less than the secured High Frequency loss risk minus a 50MW tolerance
Unit Commitment	Previous actions that need to be continued due to minimum non-zero times and minimum zero time (if BOA'd off). Identified by Offers to Stable Export Limit, or Bids to Stable Import Limit.
Response	Action where the BMU is providing or being positioned to provide response in the Settlement Period or across settlement periods if positioning/ returns abridge the adjacent settlement period.
Merit	Actions that don't fall into the above categories, and don't have cheaper price alternative BOAs
Actions to be assessed in stage 2	Actions that do not fall into the categories above and will therefore undergo further assessment in Stage 2

3. Stage 2: Reason Codes Applied to Alternative Actions Not Taken

Bid Offer Data (BOD) for potential actions which meet any of the following conditions are excluded from further analysis.

- The BMU has received a BOA in the same settlement period
- There is no bid/offer volume available
- Higher bid offer pairs with their ID <-1, or >+1
- Wind units from offer pairs, where ID >0
- BMU where Final Physical Notifications equal zero **and** Notice to Deviate from Zero is greater than 89 minutes
- BMU where Notice to Offer/Notice to Bid > 80 Minutes

The actions to be assessed in Stage 2 are then compared to the Bid or Offer Stack for the settlement period with the greatest proportion of the BOA's net volume. Alternative Bid or Offers with a better average price are allocated against the action taken once assessed for suitability to replace the BOA, based upon the following criteria:

- Exclude volume that would oppose system actions in the same GSP group.
 - System tagged offer above SEL, exclude bid volume in same group.
 - System tagged bid, exclude offer volume in same group.
- Exclude alternative BODs that have received a BOA.
- Exclude alternative BODs that have already been marked as an alternative BMU in the same settlement period.
- Exclude alternative BODs with insufficient performance on the following attributes:
 - Speed [1]: the time (notice + ramp) to reach the target level is greater than the BOA.
 - Notice time = NDZ + ramp time (if FPN = 0), otherwise NTO or NTB + ramp time.
 - Ramp time is calculated from RURE/RURI/RDRE/RDRI as appropriate.
 - Minimum change [2]: the change in target level is sufficient not to violate SEL/SIL parameters.
 - Commitment [4]: the duration of the BOA would not violate MNZT/MZT parameters.

In order to understand the trends and themes, reasons are applied to the Potential Alternatives data. The list is not exhaustive and is reflective of our best view given the data available.

Frequency

Decisions made to manage frequency in the control room are made in a time pressured environment. Time is needed for the engineer to process the requirement and take the decision in addition to the execution of the action on the internal systems. The effect of this is that some actions must be taken on fast acting units in order to meet the requirement. BOAs that satisfy all three of the parameters below will be marked with the reason 'Frequency Action':

- Time to target level \leq 5 minutes
- Time at target level \leq 5 minutes
- Absolute change to target level $>$ 30MW

Flexibility

Management of the system in operational timescales relies on the constant assessment of data. Much of this data is uncertain in short timescales with demand, PV output, wind output and other generation output all changing significantly in all timescales. The control room balances the system using forecasts, live metering and submitted data. Because of the uncertainties and variability of this data there is often a requirement to make decisions that can be quickly changed.

During these periods of uncertainty and generation variability, flexible BMUs which are faster both in RUR and RDR will be used to meet an energy requirement knowing that they can be quickly repositioned. Conversely if there is a requirement for a base volume of MWs, some BMUs with slower RUR and RDR will be positioned to meet an energy requirement leaving faster BMUs available to "fine tune" meeting the requirement in shorter timescales.

The requirement to either position slower moving units at certain part load points or utilise faster units is dependent on the short term positive and negative margins, the availability of short notice plant, the variability of generation and the levels of certainties regarding our short-term Demand, PV and wind forecasts.

Incomplete

This reason group captures where alternative actions would be unable to solely meet the requirement volume. If the sum of the alternative volumes available, is less than the capacity of the action taken than the alternative actions are marked with the reason 'Incomplete'. There is a subcategory which can also be applied here. 'BOA unit below SEL' will be applied, in addition to 'Incomplete' for instances where having assumed all alternative actions taken first the original unit taken would be below their SEL indicated additional volume would need to be taken.

Zonal Management

Within the ESO control room, the dispatch of units is split across several roles and associated user interfaces. This gives efficiencies in speed of decision making and encourages deep knowledge capability while overall management of frequency is monitored and managed at a National level. The resulting benefits of enhanced frequency and system control from independent responsible zonal decision making is traded off against the occasional higher priced BOA selections made from zonal optimisations rather than national optimisations. Whilst National optimisations are made, these optimisations are generally adjusted at longer time periods than zonal optimisations. Furthermore, National optimisations must consider where national reserve levels are held, in what direction National demand is heading relative to the zonal programs, and the levels of workload the zonal dispatchers have whilst each is usually in a different control room for contingency planning reasons.

If the desk allocation of the Alternative BOD is different to the BOA desk allocation, then it will be marked with the reason code 'Zonal Management'.

Whilst the current architecture of our systems does not allow for idealised economic dispatch. There are processes and communication methods in place between the engineers of different desks to maximise dispatch efficiency. The robustness of this can suffer during busy and challenging periods of system operation as system security is the priority for dispatch engineers.

No Reason

Remaining BOAs with alternative BODs are presented as "No Reason". These remain unexplained via the process but could be valid actions taken for reasons not visible from the data available post event. For example this could include actions taken to avoid constraints becoming active. In this situation we have avoided moving out of operational limits but there is no data to create this insight. Likewise, we may avoid taking certain units at certain times so as not to sterilise their headroom or footroom when it may be required. For example avoiding taking a unit off prior to the peak if their dynamic data would prevent them returning.

Our aim going forward will be to add reasons into the process to minimise this reason group.

4. Stage 3: Update of Categorisation of Actions Taken to Reflect Stage 2 Output

The final stage prior to publication is to take the results from Stage 2 and apply them to the Stage 1 output to create the trend chart.

This will create a stack of categories for each day and split the 'Actions to be assessed in Stage 2' into:

- Investigated BOAs reason outstanding
- Investigated BOAs with reason

5. Outputs & Trending

The outputs will be presented in two parts.

The first output will be the data files. There will be 2 data files in .csv format.

- All BOAs – a list of all BOAs for the settlement day, which includes:
 - Categories for BOAs not being assessed for an alternative (system, response, etc.)
 - A summary of bid-offer data (BOD) that was rejected as an economic alternative to a BOA due to failing on one of the three performance criteria (speed/min change/commitment)
 - A summary of any alternative BOAs
- Potential Alternatives – a list of BOAs for which potential alternatives were found and the reason group assigned.

The second output will be a trend chart of the number of BOAs in each category per day.

Feedback

We would welcome your feedback on the methodology we are presenting. Please contact us at box.balancing.costs@nationalgrideso.com.

Through this work, the focus is to increase the transparency of our operational decision making. There is a secondary advantage of grouping the Potential Alternatives into reason groups so that ongoing operational improvements can be targeted to derive the most benefit. Looking ahead we expect this output to form part of a cycle of continuous improvement with more reason groups emerging to allow us to group limitations and then identify and prioritise improvement activities.

Glossary

Abbreviation	Definition
BMR Zone	Balancing Mechanism Registration Zone
BMRA	Balancing Mechanism Reporting Agent

BMU	Balancing Mechanism Unit
BOA	Bid Offer Acceptance
FPN	Final Physical Notification
GSP	Grid Supply Point
MNZT	Minimum Non-Zero Time
MZT	Minimum Zero Time
NDZ	Notice to Deviate from Zero
NTB	Notice to Bid
NTO	Notice to Offer
RDRE	Run Down Rate Export
RDRI	Run Down Rate Import
RoCoF	Rate of Change of Frequency
RURE	Run Up Rate Export
RURI	Run Up Rate Import
SEL	Stable Export Limit
