

Optimisation Stakeholder Focus Group

23 June 2026

14:30 – 16:00

Manos Loukarakis, Optimisation Manager

Nicolas Melchor, Optimisation SME

Scott Bannister, Power System Engineer

Agenda

Time	Agenda Item	Details	Presenters
14:30	Welcome & Introductions		
14:40	MDO/B logic (old & new)	<ul style="list-style-type: none"> • Old logic considerations (as in last webinar) • New logic 	Manos Loukarakis , Optimisation Manager
14:50	Q&A		
15:00	MDO/B details & examples	<ul style="list-style-type: none"> • Examples with updated logic • End-to-end considerations 	Nicolas Melchor , Optimisation SME
15:15	Q&A		
15:25	Best practice guide v2	<ul style="list-style-type: none"> • Changes in the document • Transition plan 	Scott Bannister , Power System Engineer
15:40	Q&A		
16:00	Meeting Close		

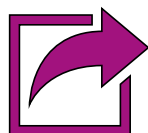
Audience Participation



There is time allocated to Q&A **after each section** – we will take questions during these parts of the agenda to ensure we get through all pre-prepared content.



Please post any questions you have for our speakers in the Microsoft Teams Q&A ensuring to list both your **full name and organisation** – this will enable us to follow up with you after the webinar if necessary. During the Q&A sections, you can also use the ‘raise hand’ function and come off mute to ask your question.



Out of scope questions will be forwarded on to the appropriate NESO team or expert for a direct response. We may ask you to contact us by email to ensure we have the correct contact details for the response.



We welcome your feedback & questions

For general queries Box.balancingprogramme@neso.energy

For GC0166 related queries box.obp_edt.edl@neso.energy

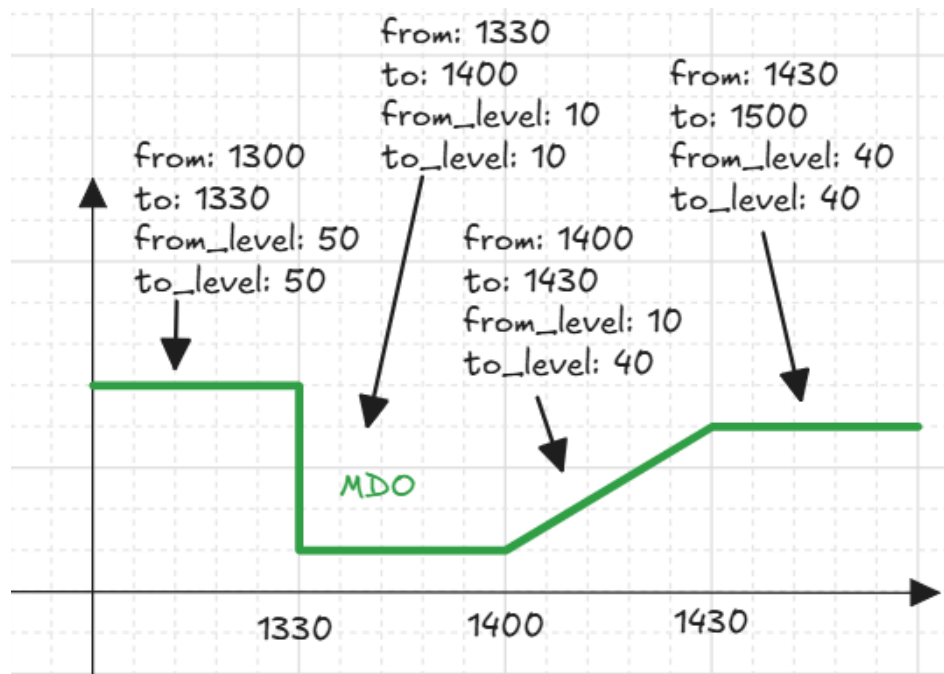


Today’s Optimisation Focus Group will be **recorded and published online** after the session, along with the slide pack.

MDO/B logic (old & new)



MDO/B as a Time-Series



Data are used to create an MDO MWh time-series, each point in time indicating energy available for BOAs.

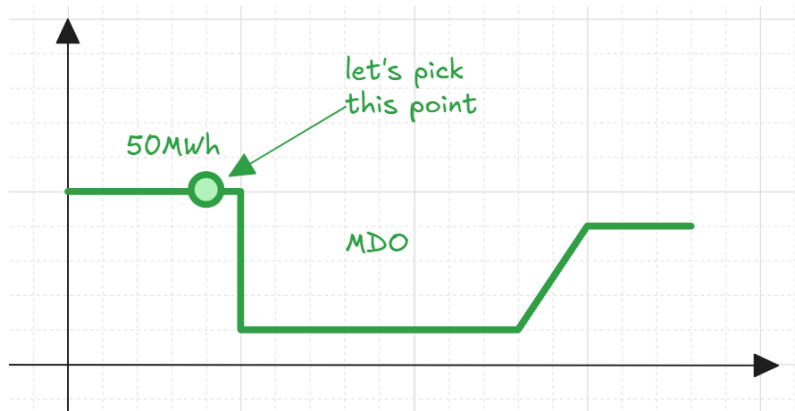
The submitted times do NOT indicate periods of volume availability (e.g. 1st data submission does not mean that there 50MWh available that may only be used in the period between 1300-1330, or that between 1330-1400 there are additionally 10MWh available for use in that period of time -> for a total of 60MWh).

Otherwise

... a different submissions logic would be needed
 ... or we would need a different data submission /
 payload structure

- Submitted data are a time-series of available MWh.

Integration Rules



- To be able to use a point in the data we need to integrate $\{\text{BOA MW level} - \text{CL}\}$ over time to calculate MWh, and compare to submitted value.

There is nothing in the data submission or in the Grid Code that indicates how this should be done.

Options

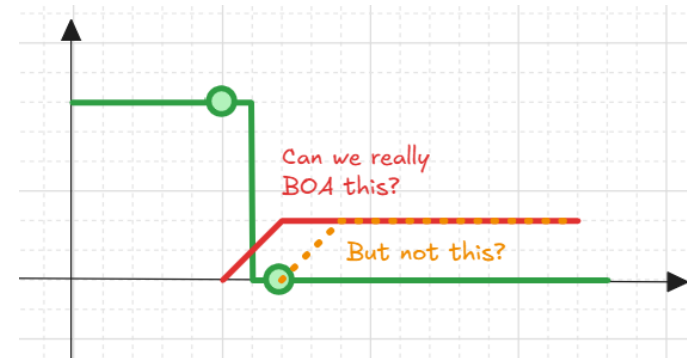
[1] Integrate forward from given point, only if a BOA starts there and to the end of that BOA – definition is incomplete and assumes a single BOA, would not work well with SoE models without a significant performance impact

[2] Integrate from current time to given point – **this is what we presented previously**

[3] Integrate from given point to end of the BM window (or other defined period) – equivalent to the above as it would restrict volume if MDO was increasing, with a slightly more complex definition

[4] Integrating over various periods, e.g. each settlement period OR individual BOAs – significant complexity for implementation, multiple rules required

[5] Relates to our recent change – to be discussed in a later slide



Integration Rule Implications

(note this approach has now changed – changes described in slides 9-10)

Following rule [2], we apply the integration logic to all data points in the time-series, so

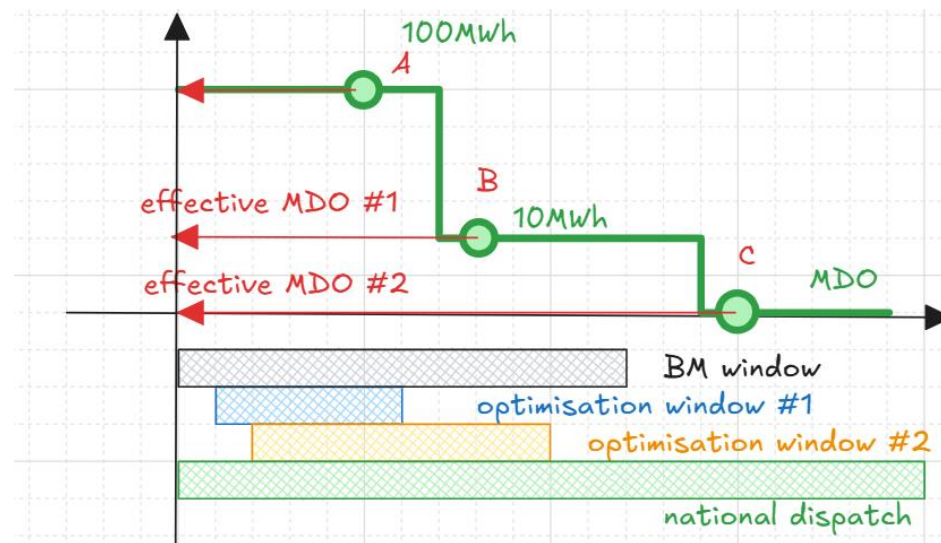
- offer volume up to point A \leq 100MWh
- offer volume up to point B \leq 10MWh
- offer volume up to point C \leq 0MWh

► We use all relevant data as they are provided.

“Effective” values are a consequence of the integration rule applied to each data point.

If the period covered by the data is too long, some 0 MDO value is bound to appear, so we wouldn't be able to dispatch anything.

► We limit the use of MDO/B to a period no longer than the BM window.



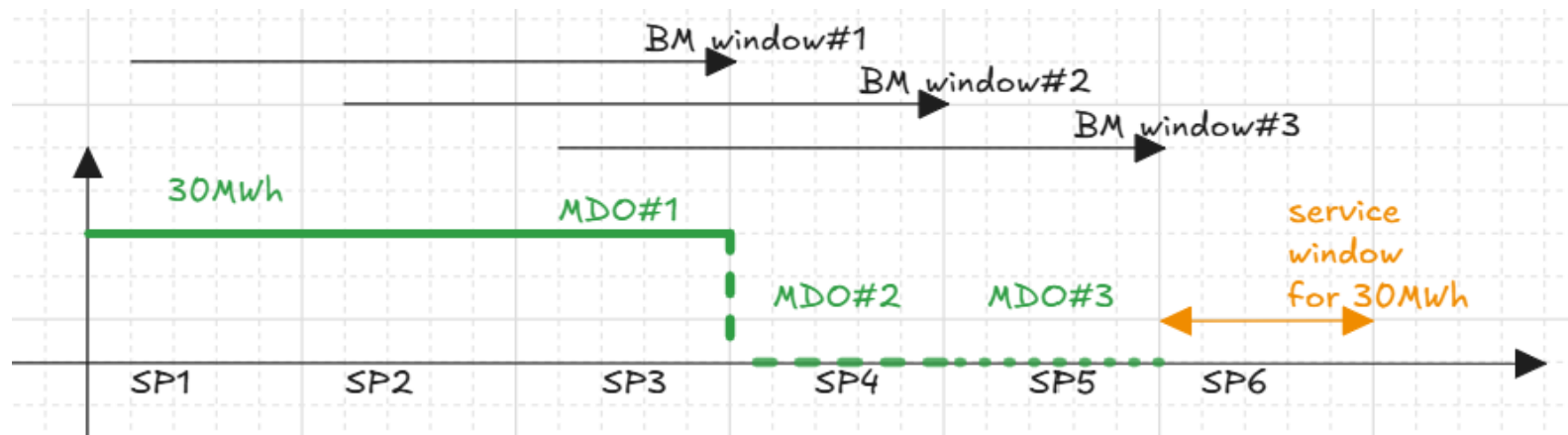
BOAs possible when running Target/Fast dispatch or instructing manually over a period, should still be possible when running the National Dispatch (or longer) optimisation window – otherwise it introduces inconsistencies in dispatch and makes results very hard to audit.

► We cannot use the optimisation window as a mechanism to select what data are being used.

In summary – As of Last Webinar

(note this approach has now changed – further details slides 9-10)

- ▶ Submitted data are a time-series of available MWh.
- ▶ To be able to use a point in the data we need to integrate {BOA MW level – CL} over time to calculate MWh. For each time point we integrate from current time to that point, AND require that the total offer/bid volume is lower/higher than the submitted value.
- ▶ We use all data provided within the BM window, considering “effective” values as needed when looking at shorter optimization windows.



Assuming a 60MW/30MWh battery

- If BOAed early in window #1 :: recover in SP4 or SP5
- If BOAed on window move from #1 to #2 :: recover in SP5
- Cannot be BOAed in window #2 or #3 as there might not be any time to recover.
- That is why with this approach only 2 SPs protection was needed – **this was in v1 of the Best Practice Guide, but it is clear this was not made explicit.**

Feedback & Changes

Concerns for the given approach

- Volume perceived as available is otherwise unused.
- Not compatible with reserve protection guidance.
- May require significant rework on market participant processes.

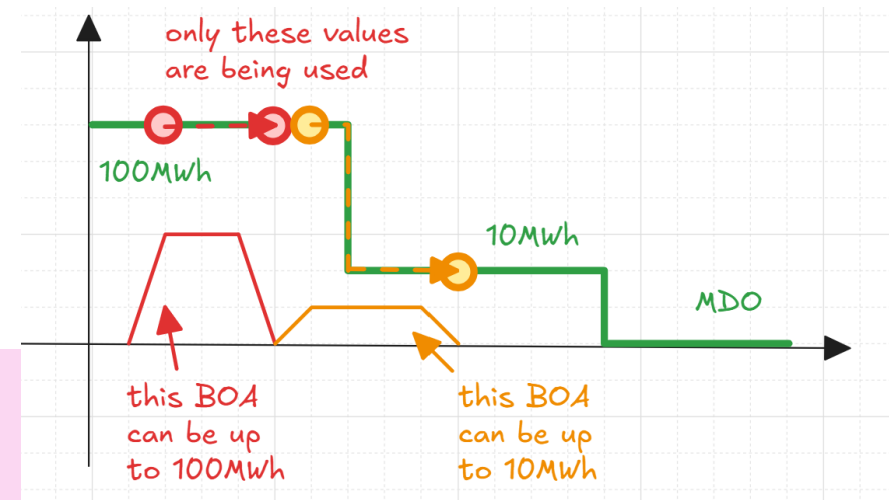
A different integration rule

[5] Integrate from start of BM window to given point (as before), only if that point is part of a potential BOA.

Calculations / maths / validation-logic across any process for BOA creation remain largely the same

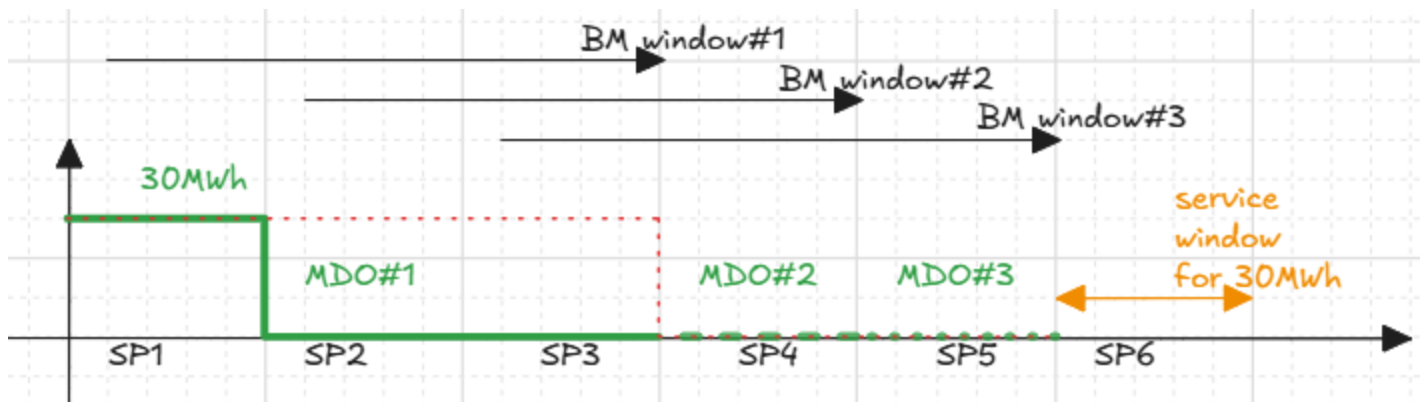
For a unit “u” at time “t” with a target MW level “P”

$$\sum_{i=0}^t \{0.5 \cdot \Delta t_{i-1} \cdot (P_{u,i} - CL_{u,i} + P_{u,i-1} - CL_{u,i-1})\} \leq MDO_{u,t} \text{ if } P_{u,t-1} \neq CL_{u,t-1}$$



In Summary - Updated Approach

- ▶ Submitted data are a time-series of available MWh.
- ▶ To be able to use a point in the data we need to integrate {BOA MW level – CL} over time to calculate MWh. For each time point we integrate from current time to that point, AND require that the total offer/bid volume is lower/higher than the submitted value, **ONLY IF the unit would be issued a BOA at that point in time.**
- ▶ We use all data provided within the BM window, considering “effective” values as needed even when looking at shorter optimization windows.



- If BOAed in SP1 :: recover in SP4 or SP5.
- Cannot be BOAed in window #2 or #3 as there might not be any time to recover.
- Cannot be BOAed in window #1 in SP2-3 (as the volume there has to be 0 when window moves)
- 4 SPs protection needed.

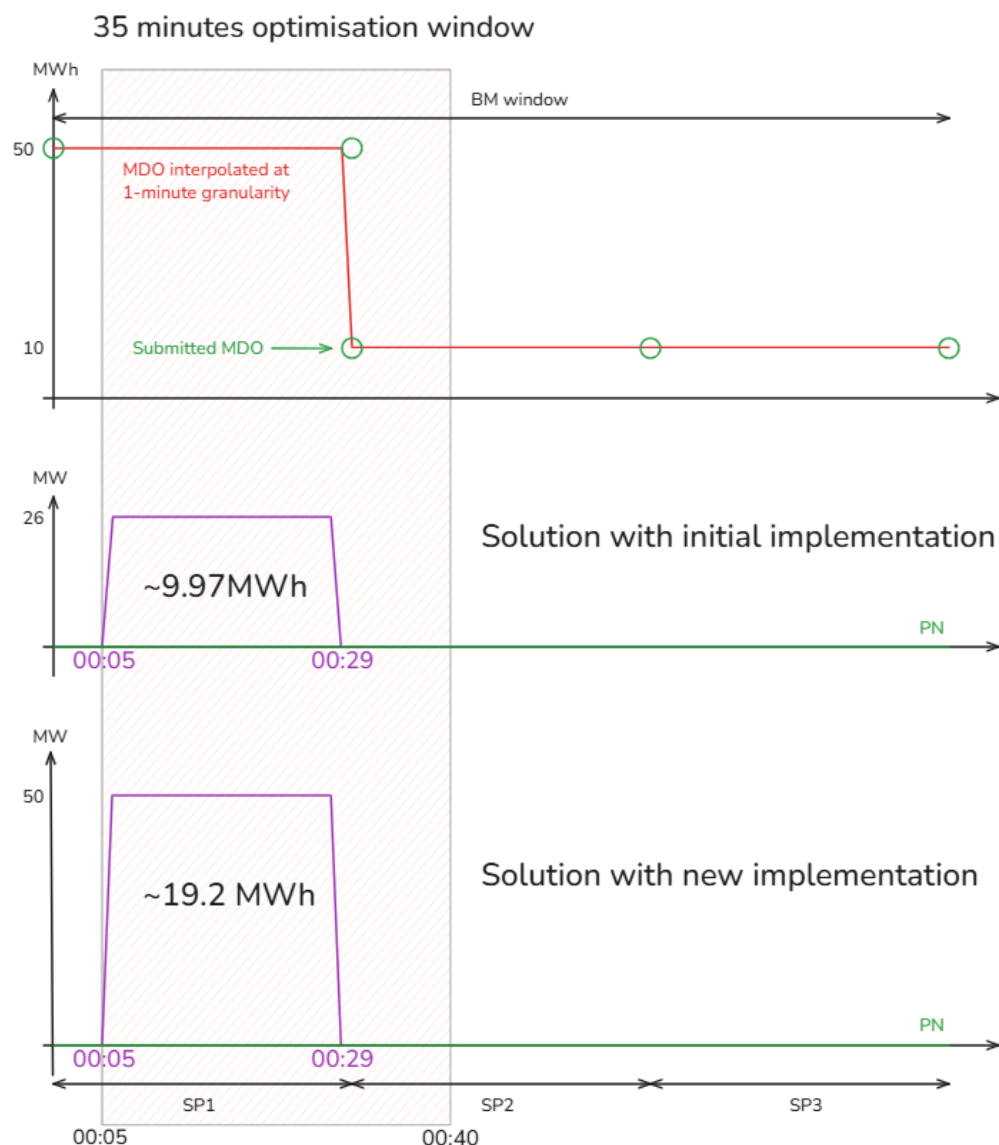
▶ Rules around use of MDO/B data have to be taken into consideration, alongside the best practice guide principles, to determine appropriate data submissions.

Q&A

MDO/B Logic Update: Details & Examples



Visualising New Approach



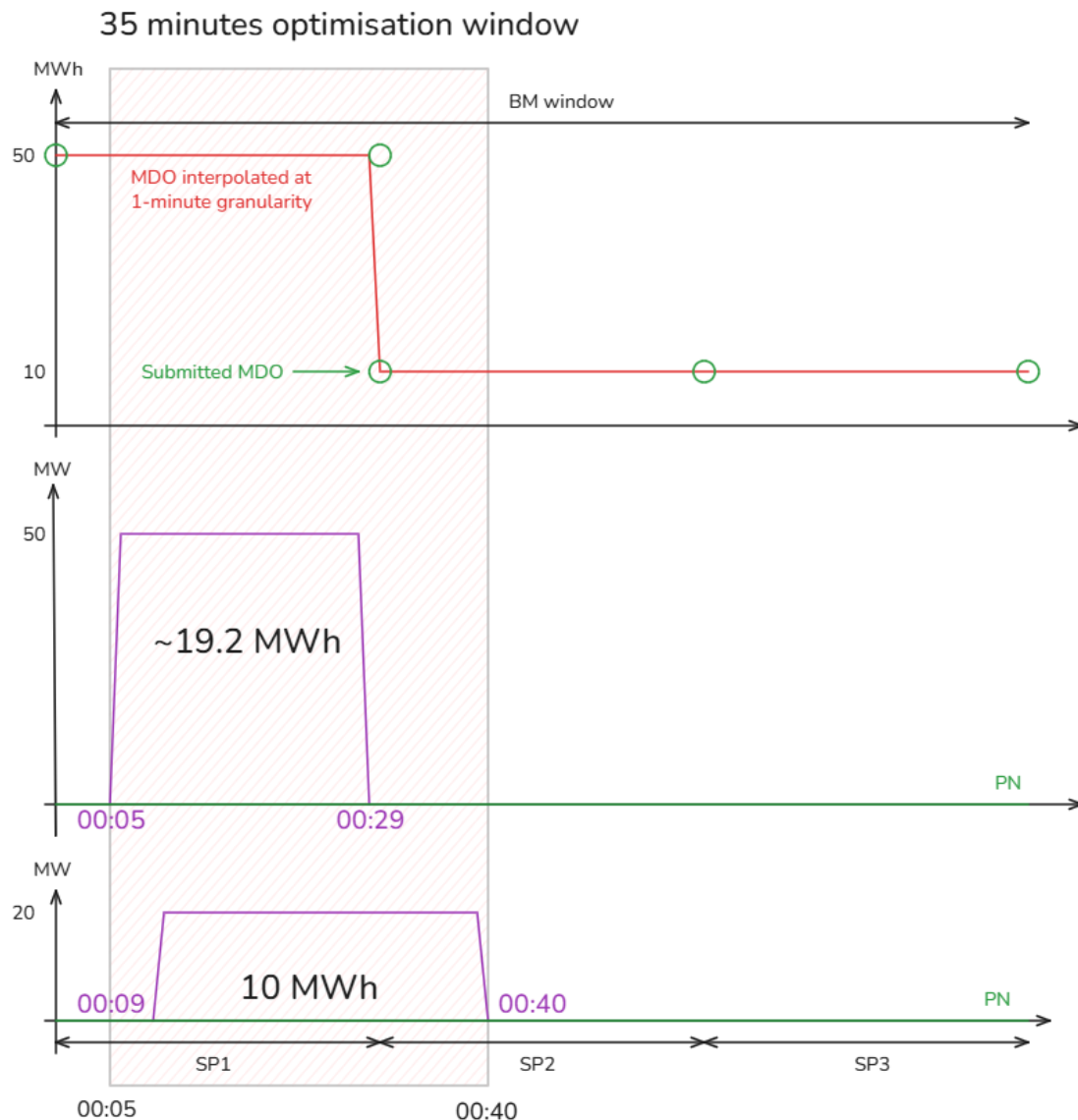
- The figure on the left shows a hypothetical unit that has a downward step change in their MDO values.
- Its rated values are 50MW/50MWh and ramp rates are 999 MW/min.

- The initial implementation that selected the lowest value within the BM window would only allow the creation of an instruction up to that lowest value.
- If the lowest value was zero, then no instruction would be created.

- The new implementation maximises the use of energy for any instruction sent to a limited duration asset.
- This means that if MDO is available in the earlier part of the BM window and in subsequent settlement periods it gets reduced to even zero MWh, then we could still send an instruction in the period that has energy available.

A similar behaviour applies to MDB!

MDO and MDB in Instructions



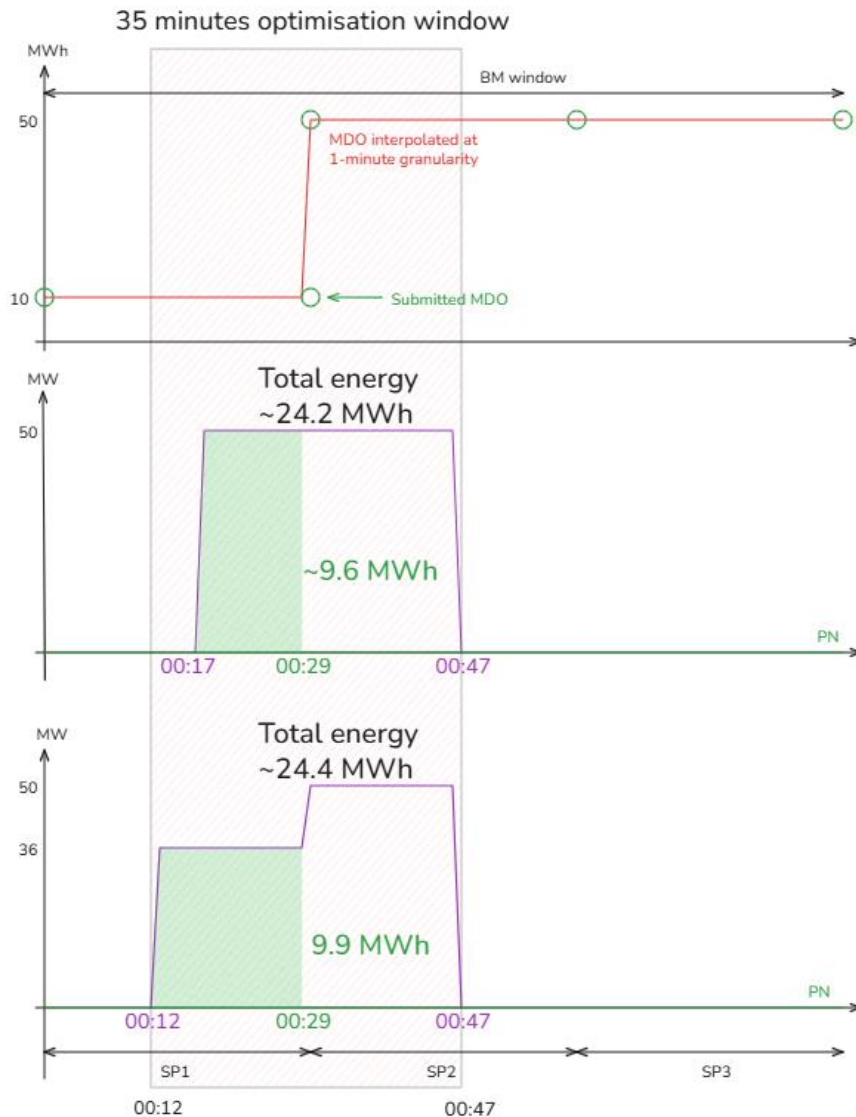
- This example shares the same characteristics of the previous example.

- Previously we had said MDO would have been the lowest value for the whole BM window, and in this example any instruction would need to be lower or equal to 10 MWh.
- The new approach, as outlined in the updated guidance, will however only use the lowest MDO value if an instruction were to cover the period where MDO is low.

- The example on the left shows 2 potential instructions.
- The first instruction can reach the limit of the capacity defined right before the step change.
- The second instruction is capped at the low energy value as it crosses a period where the limited duration asset operator has indicated that they have low energy availability and we therefore need to abide to the submitted values.
- The optimiser might choose one of two instructions depending on the requirement from the control room user and the unit's dynamic parameters.

A similar behaviour applies to MDB!

Behaviour if Energy Increases



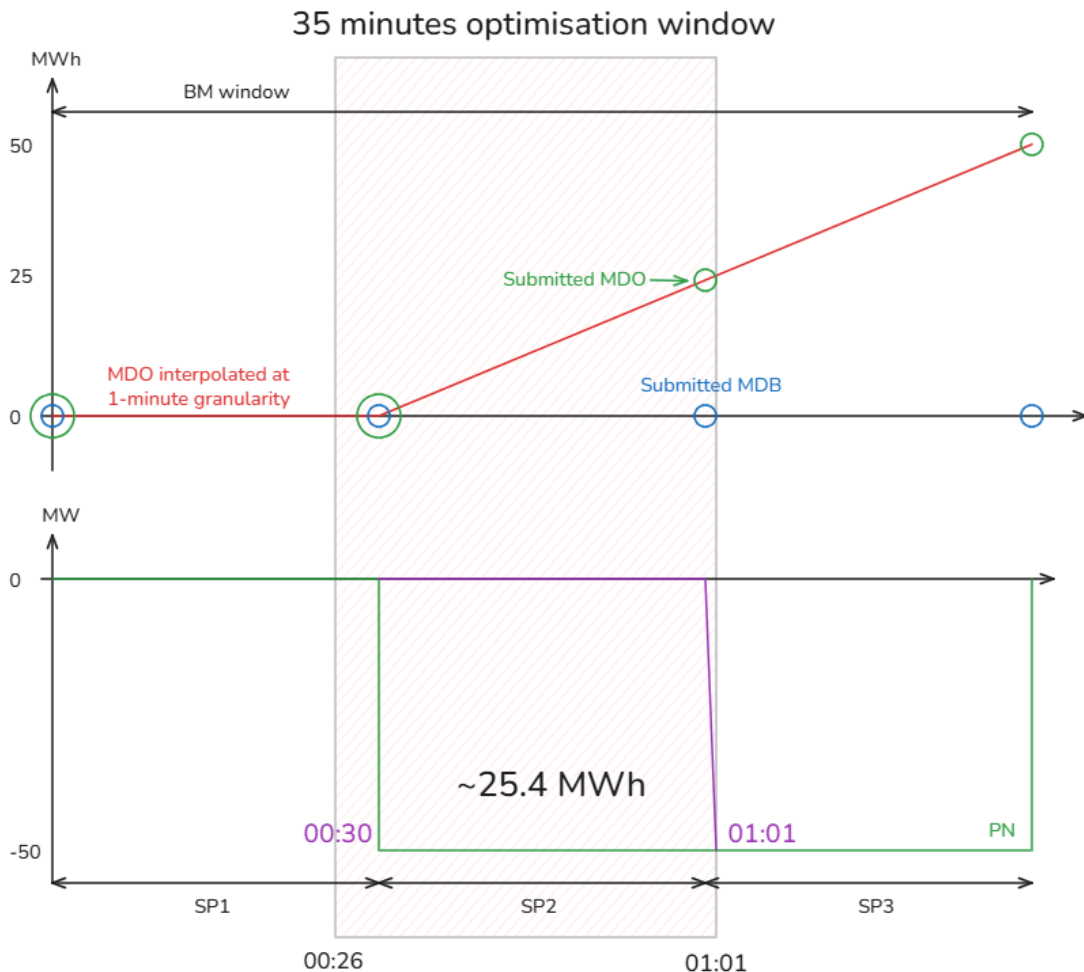
- The figure on the left shows a hypothetical unit that has an upward step change in their MDO values.
- Its rated values are 50MW/50MWh and ramp rates are 999 MW/min.

- For this case, both the initial implementation and new implementation would have achieved the same result, and the energy of any instruction will be maximised if the energy is needed.

- One important consideration is that any instruction generated will always respect the MDO and MDB limits defined by the limited duration asset. This would result in the instructions where part of the instruction will need to respect the lower value of MDO while the rest of the instruction needs to respect the higher MDO value as shown in the figure on the left.

A similar behaviour applies to MDB!

Instructions with non-zero PNs

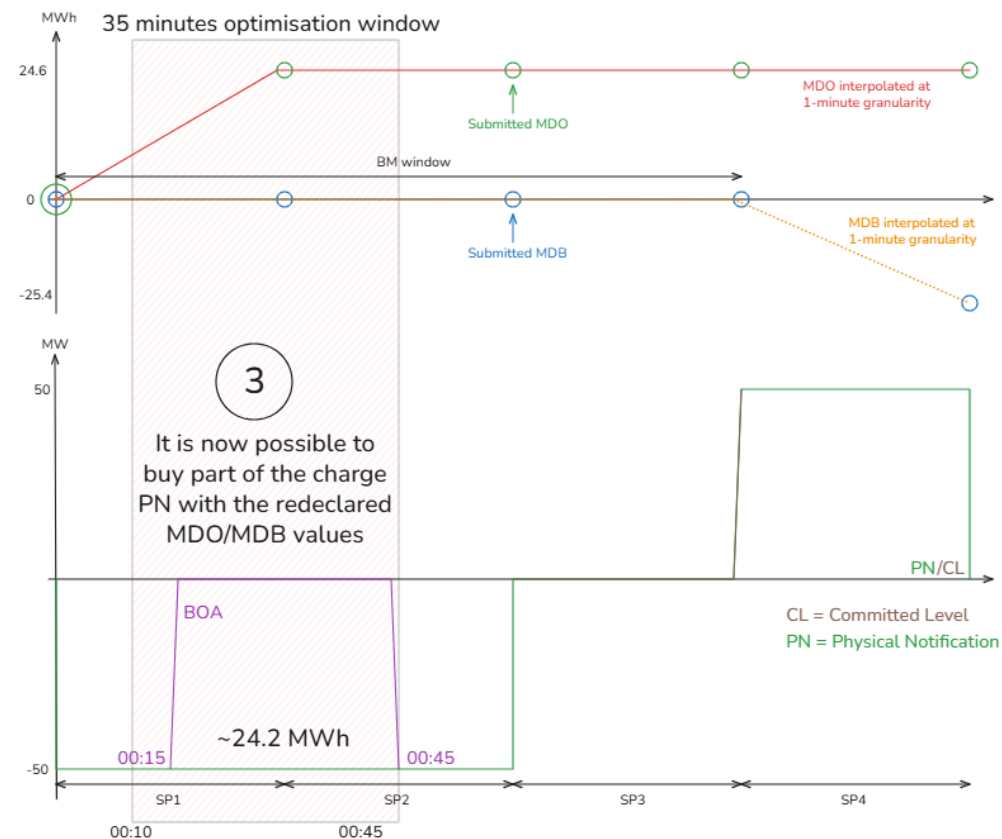
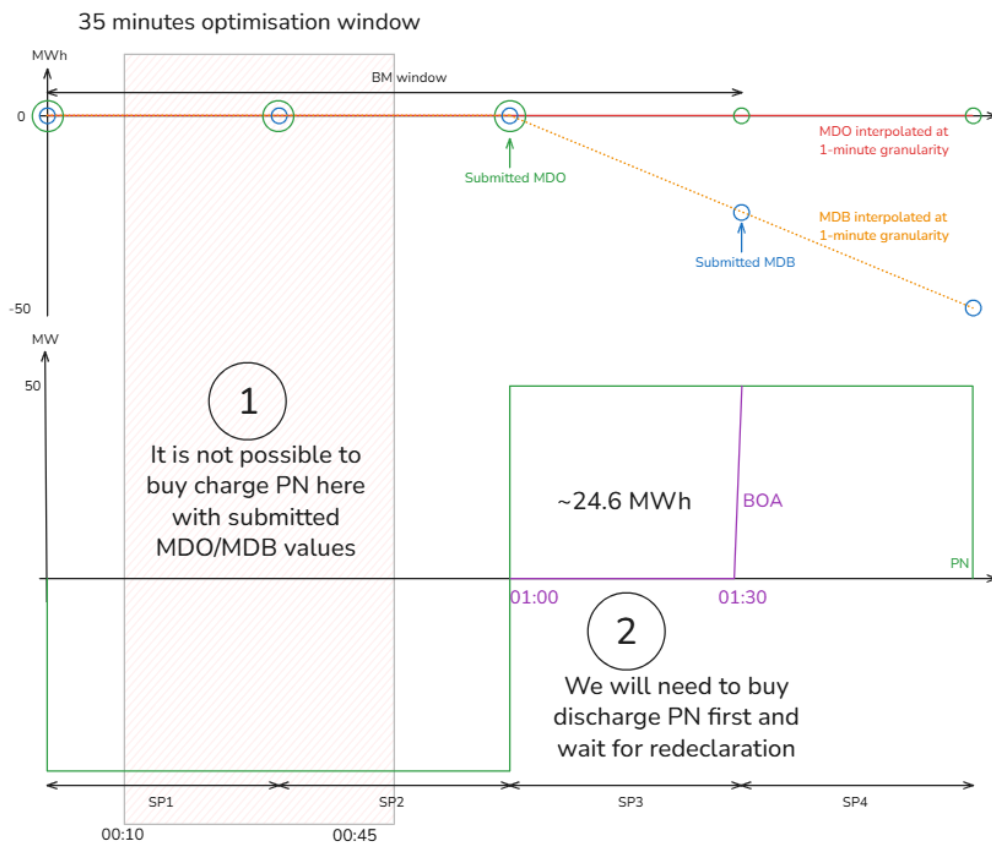


- The figure on the left shows a hypothetical unit that is fully discharged and has a charge PN.
- Its rated values are 50MW/50MWh and ramp rates are 999 MW/min.

- MDO in this case is indicating that there is growing energy availability for offer instructions as the charge PN gets delivered, which allows the optimiser to create the offer that cancels part of or the whole charging PN.

- A similar behaviour is expected with a discharge PN and with a growing MDB.

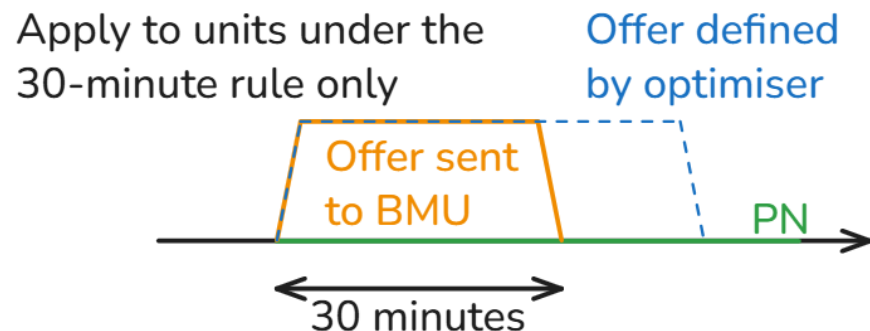
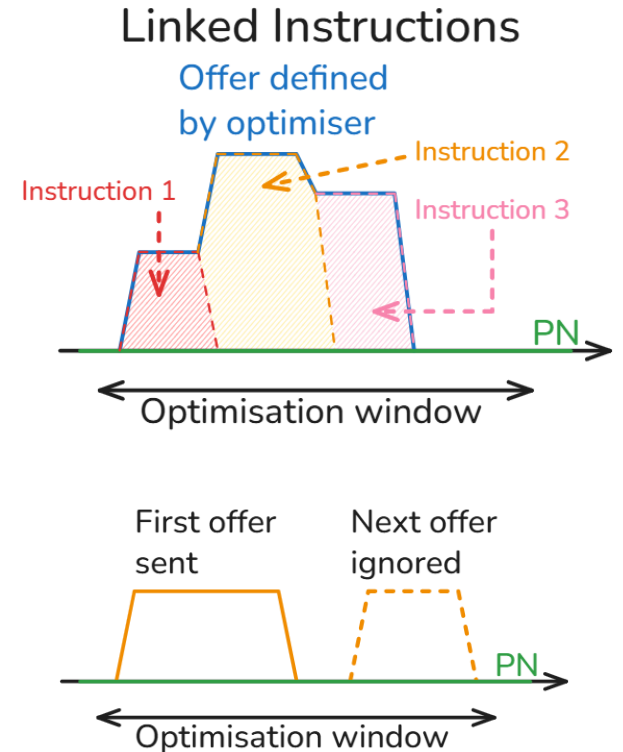
Consecutive Charge & Discharge



- The figures above show a case with a unit that has a consecutive charge and discharge PN, with the limited duration asset fully discharged at the start.
- Its rated values are 50MW/50MWh and ramp rates are 999 MW/min.
- Submitted MDO and MDB values only allow NESO to buy part of the discharge PN first and then buy part of the charge PN.

Post-Processing Optimiser Solution

- The optimiser may generate multiple BOAs in a single run.
- If the multiple BOAs are linked instructions, i.e., there is no separation in time between BOAs, then we will send the linked instructions to the asset operators as they are a single broken-down instruction, and the combined instructions would still adhere to submitted MDO and MDB.
- If the multiple BOAs are not linked instructions, then we will issue only the first instruction to allow asset operators to reflect any redeclaration of MDO or MDB values.
- The asset in OBP is restricted from further dispatch in the direction of the BOAs issued, until we receive an MDO/B redeclaration.
- Any additional BOAs will be issued through subsequent optimisation runs if required.



Some batteries will continue to operate under the existing 30-minute rule during the transition period and the optimiser will comply with current rules.

Q&A

Best Practice Guidance Update



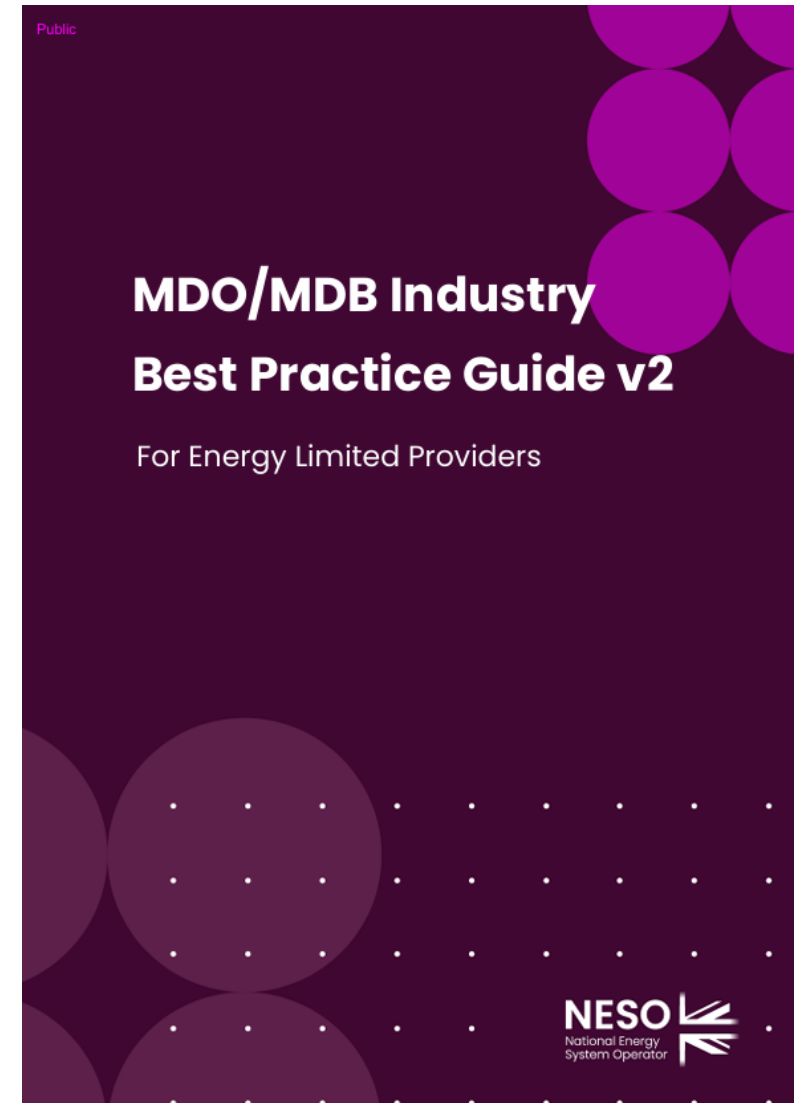
Best Practice Guidance Changes



V2 of the MDO/MDB Best Practice Guide was published on Friday 19th June – you can access it [here](#).

The key updates are as follows:

- How the optimiser uses MDO/MDB – (covered in earlier slides)
- Clarification on MEL/MIL arrangements before, during and after transition
- Performance monitoring arrangements
- Clarifications around releasing MDO/MDB for reserve/response
- Data submission timings
- Considerations for back-to-back reserve contracts



Best Practice Guidance Changes

Clarification on MEL/MIL arrangements before, during and after transition (Pg5)

3. MEL/MIL is to protect power range

- a. These values safeguard the operating power range for a unit.
- b. The MEL/MIL arrangements under the current '30-minute rule' will no longer be needed once a unit switches to submitting MDO/MDB values.
- c. MEL/MIL must continue to reflect reduced capability during periods where response contracts are held, as is done today. This ensures that NESO cannot issue any BOAs that would inadvertently sterilise response capability (described in more detail below).
- d. For the avoidance of doubt, where the **Committed Level** cannot be followed for any reason, a BMU should redeclare its MEL/MIL accordingly to reflect the expected output (as per Grid Code BC2.5 (Physical Operation of BM Units))

Best Practice Guidance Changes

Performance monitoring arrangements (Pg22)

Performance Monitoring

As providers transition to the new requirements, NESO will monitor whether Limited Duration BMUs have submitted and updated (as required) their MDO and MDB as part of their dynamic parameters and that the BMU has the capability to deliver their contracted reserve energy, relative to their associated Physical Notification.

There will be no changes for performance monitoring of DFR assets. These assets submit SoE data in their performance monitoring submissions. The SoE volume reported in the performance monitoring files should include the volume that is protected and thus not included in MDO/MDB. For the avoidance of doubt, the MDO/MDB submissions will not be used for DFR SoE monitoring.

Best Practice Guidance Changes

Clarifications around releasing MDO/MDB for reserve/response

- 1) From the concept of protecting volume for 2 SPs post-contract and then releasing as protected volume has not been fully utilised (Pg10)

*whilst there will be absolute certainty of any unused reserve volumes at the end of the relevant contracted SPs (i.e. SP39 and SP40), and thus how much volume (if any) can be released back to NESO, there may also be a period of time before this where the unused volume exceeds the volume that can physically be utilised in the time remaining in the contracted SP. Therefore if this occurs, this volume can be released earlier through submission of updated MDO/MDB values (as applicable) but only from the end of the contracted SP. As described further above, it would be prudent to make these updates to MDO/MDB every 10-minutes.

Best Practice Guidance Changes

Clarifications around releasing MDO/MDB for reserve/response

2) From the concept of managing MDO/MDB submissions during Dynamic Frequency Response draw (Pg11)

Additionally, where an asset is providing Dynamic Frequency Response (DFR) to meet the service terms you must protect the CREV in the MDO/MDB as described above. As this is already built into the MDO/MDB figure, the MDO/MDB would not be expected to change until the CREV had been fully utilised – at that point, providing further response is optional and a decision for you around whether the asset can be configured to this level of granularity and/or whether you would like to make that additional volume available in the BM.

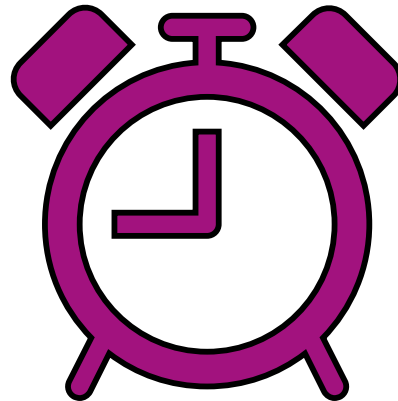
For the avoidance of doubt, where additional MDO/MDB volume exists above the CREV (i.e. for BM utilisation), NESO would expect that when DFR is activation occurs, that this energy volume is first drawn from the CREV rather than any residual MDO/MDB volumes (i.e. no change to MDO/MDB until the CREV is fully utilised).

If you have an LF and HF contract in the same period, activation of the LF contract can of course assist in returning an asset energy volume back to CREV for the HF contract (if required) and vice versa. The same applies if a BOA is issued, but because of the gate closure period it is not possible to account for either in any PN submissions that return you to CREV, however you might find that 'surplus' volume is available following the PN (which would be expected to be made available to NESO for BOAs via MDO/MDB).

Best Practice Guidance Changes

Data submission timings

Guidance added on updating MDO/MDB data due to frequency response draw or to release protected volume early to every 10-minutes to get a balance between materiality and unnecessary volumes of data redeclarations



Best Practice Guidance Changes

Considerations for multiple 'back-to-back' reserve contracts (Pg10)

Multiple 'back to back' reserve contracts

The full contracted reserve volume must be available for NESO to instruct via BOAs for each contracted period. Contracts are currently awarded on a per SP basis. Reserve can be met by volume between PN and MEL/MIL, and this full volume should be made available to NESO through MDO/MDB submissions, which means either the physical SoE volume or a PN in the opposite direction of zero allows a unit to meet the reserve contract.

It should be noted that the reserve Service Terms for multiple 'back to back' reserve contracts can be met with diligent PN submissions as utilisation occurs to alter the asset SoE and thus MDO/MDB values. However, the maximum volume that can be delivered whilst meeting the Service Terms for multiple 'back to back' reserve contracts will depend on the asset size, SoE and ability to submit timely PNs, as described below.

Examples for a 100MW/100MWh unit with a reserve contract in 48 consecutive SPs:

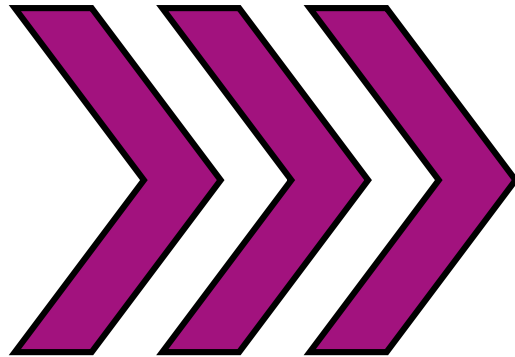
1. If the unit has a reserve contract for 50MWh in each SP. At the start of SP1, NESO issues a BOA to utilise the full volume for SP1, 2 and 3. The asset does not have sufficient SoE to deliver the contracted volume in SP3 and no opportunity to submit a charge PN in SP3 as the BM gate is closed. Therefore the Service Terms of the contract cannot be met.
2. If the unit has a reserve contract for 33MWh in each SP. At the start of SP1, NESO issues a BOA to utilise the full volume for SP1, 2 and 3. The asset can deliver this contracted volume and the SoE reduces to zero at the end of SP3. The BM gate covers SP1, 2 and 3 and therefore a charge PN (-33MWh) can be submitted in each of SP4, 5 and 6. This provides NESO with 33MWh of reserve (between PN and zero in this case) in SP4, 5 and 6 that can be instructed and thus meet the Service Terms.

Best Practice Guidance Changes

Customer feedback has been key in shaping Version 2 of the transition guidance.

Very likely that a Version 3 will follow, as we gain experience of MDO/MDB.

Please keep engaging with us to help make any necessary future changes and refinements.



Transition Plan



25th June 2026 – a week long Soak Test will start using a single BMU from each provider that has indicated they will be ready and available. The BMU will typically be one of the smaller assets in their portfolio, such that the total volume transitioning has minimal operational impact.



The purpose of the soak test is to check data flows correctly through our various systems and processes. We will conduct analysis of the MDO/MDB submissions to determine if they are as per our guidance. The soak test is scheduled to be a week but if issues are observed, this may be extended.

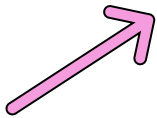


This approach has been shaped by stakeholder feedback, allowing Lead Parties to assess any potential impacts before confirming they are comfortable in transitioning all of their units.



If no issues are identified by either NESO or the respective Lead Parties participating in the soak test, we would look to include their remaining units in subsequent ~500MW randomised waves throughout July. Following their transition, we would look to move units from other Lead Parties in ~500MW waves from around August through to 5th November, with the sequencing based on the readiness status communicated to us – if more than 500MW are ready for a single wave, selection of units will be randomised by Lead Party.

Transition Plan



Any opportunity to increase this volume in a wave will be taken e.g. if an optimiser has already successfully transitioned BMUs then subsequent volumes can be considered less impactful and thus may be added to existing waves to expediate the transition.



The plan needs to remain flexible at this stage due to multiple dependencies, including the outcomes of the soak test and stakeholder readiness. As a result, only the soak test details have been agreed with impacted parties (but it is worth noting that the first wave, at least, will involve those who participated in the Soak Test, who are already fully aware of our intentions, and it will just be a case of agreeing BMUs / transition times for those subsequent waves)



We will continue to work with Lead Parties to agree an approximate transition date aligned to their readiness, ensuring a minimum of two weeks' notice is provided for anyone not involved in the Soak Test or early waves, ahead of the confirmed date for their respective transition wave.

Q&A

Closing Remarks



We welcome your feedback & questions

For general queries Box.balancingprogramme@neso.energy

For GC0166 related queries box.obp_edt.edl@neso.energy



The recording & slides from today's session will be published on our website and shared with stakeholders signed up to this Optimisation Focus Group.



Sign-up to our other Stakeholder Focus Groups for Technology & Forecasting to receive invites to these sessions – [Balancing Programme Stakeholder Focus Groups](#).



If you are interested in a regular meeting with a representative from the Balancing Programme and would like more information, please get in contact using the email address above.



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Thank you



Appendix:

Slides from the Optimisation Focus Group on 01.06.26, which are not impacted by the changes made in Version 2 of the MDO / MDB Best Practice Guidance.

Optimisation So Far



Focus group timeline & feedback

Past sessions⁽¹⁾

June 2023 (online)

- Target Dispatch intro

November 2023 (BP event)

- Control room processes structure
- Target Dispatch (further details)

February 2024 (online)

- Production issues (costs)
- Fast Dispatch

June 2024 (BP event)

- Fast Dispatch (demo)
- Instruction algorithm details

November 2024 (BP event)

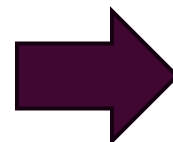
- National Dispatch intro
- GC0166, group constraints & wind intro

June 2025 (online)

- National Dispatch details
- Production examples (Target/Fast)

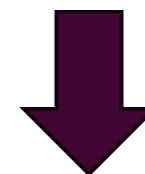
June 2025 (BP event)

- Constraint management



Today's session

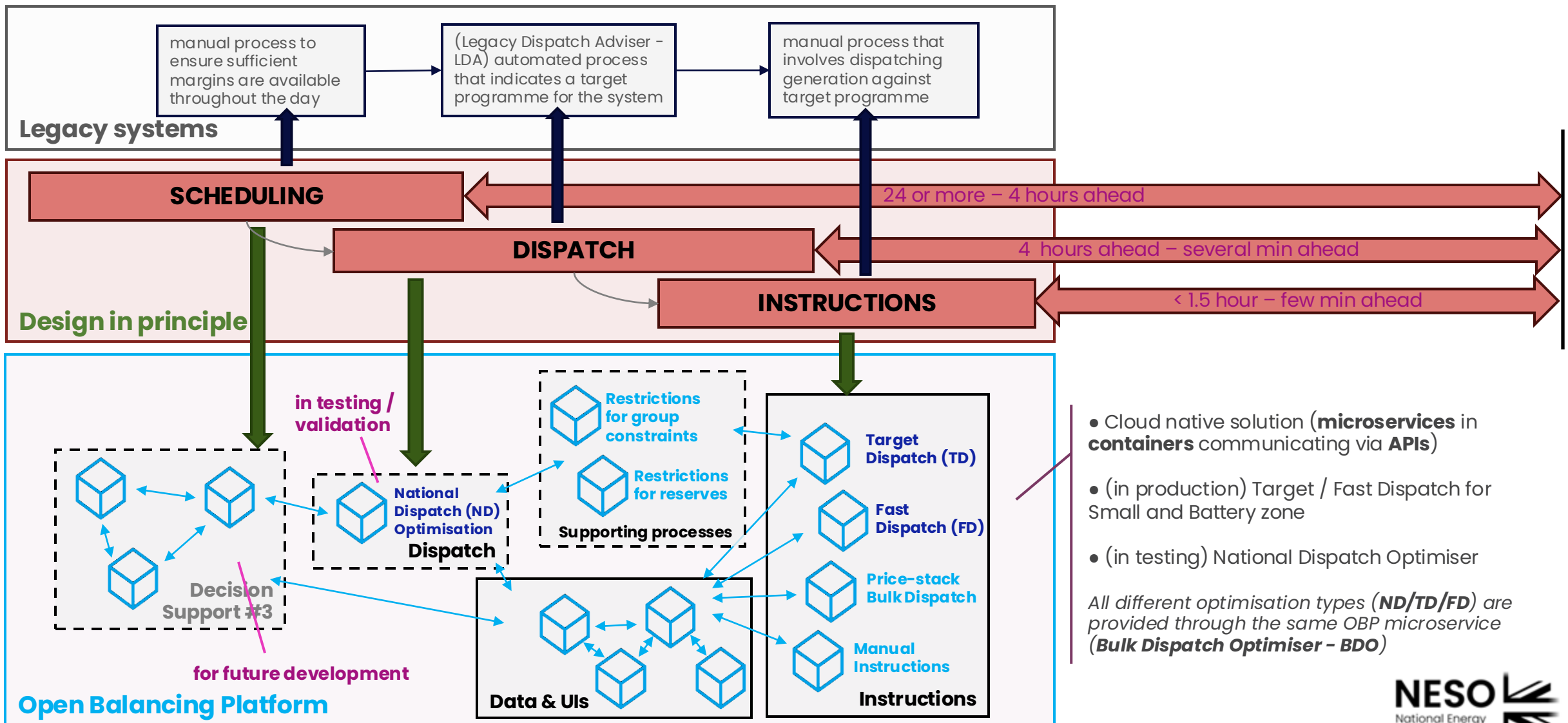
- GC0166
- ... parameters details
- ... trial data
- ... examples



Future questions

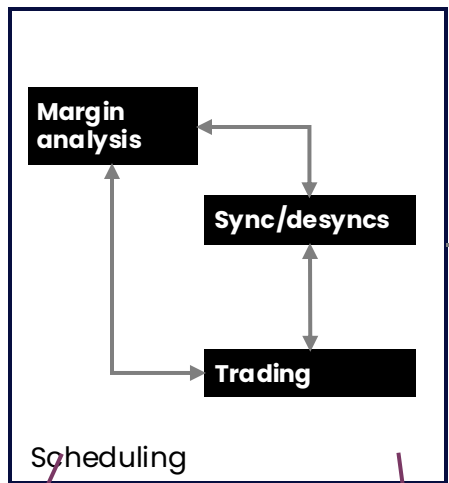
- Scheduling
- Reserves management
- Risk management in control
- More documentation
- More on future challenges/problems
- Comparison with other System Operators

Open Balancing Platform Overview

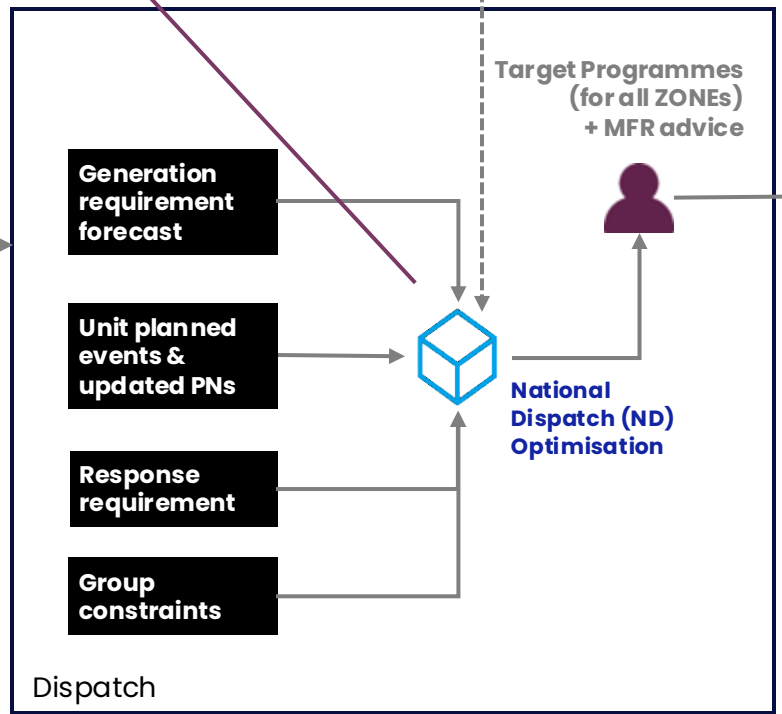


End to End User Journey

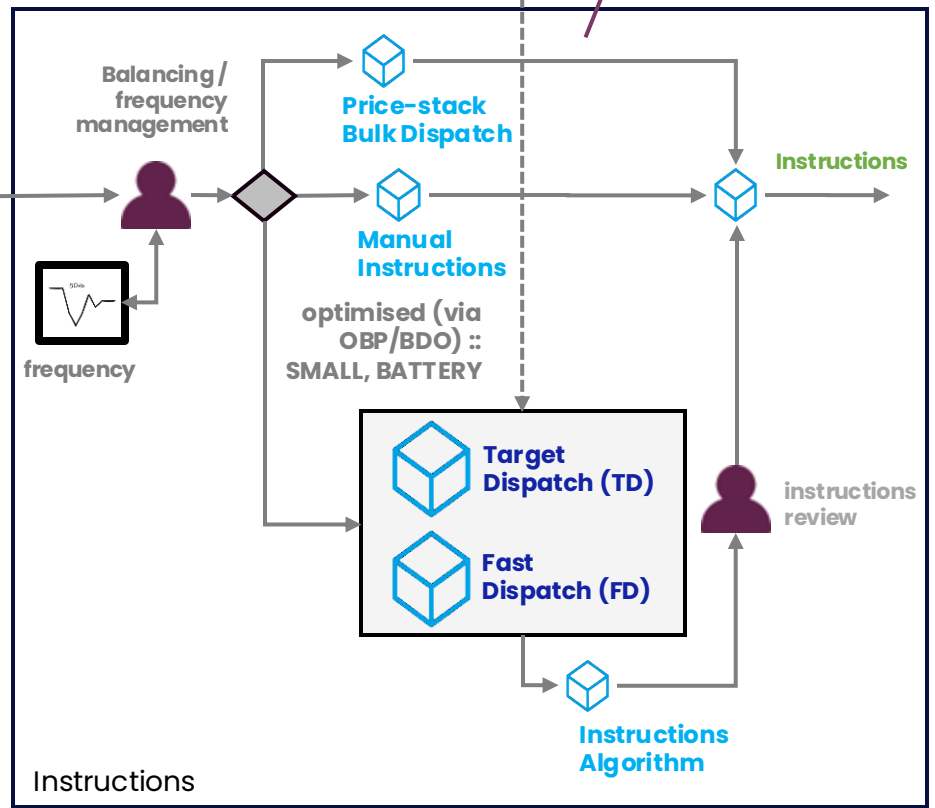
(2) MDO/B combined with an asset-type based FSoE model will impact target programmes here



(3) The same MDO/B + FSoE will apply in dispatch & scheduling



(1) MDO/B within the BM window will initially impact instruction creation



(!) While scheduling & FSoE models are being developed an approximate method (based on MDO/B submissions covering beyond the BM window) will be used to improve battery modelling in existing BM processes for dispatch/scheduling.

Abbreviations:
MDO: Maximum Delivery Offer
MDB: Maximum Delivery Bid
FSoE: Future State of Energy
BDO: Bulk Dispatch Optimiser

Optimisation-Based Processes Compared

	Scheduling	National	Target	Fast
Control process time				
... out of which solve time	<30min	<5min	60s	10s
Scope	system	system	zone/constraint	zone
... look-ahead	24+ hours	4-6 hours	30-90min	30min
... runs		every 5'	on demand	
Constraints				
... generation requirement	✓	✓	✓	✓
... response requirement	✓	✓	✗	✗
... ramp rates	✓ (simplified)	✓ (simplified)	✓	✓
... SEL/SIL	✓	✗	✓	✓
... MZT/MNZT	✓	✗	✓	✓
... MFT	✗	✗	✓	✓
... group constraints	✓	✓	✗	✗
... response capabilities	✗	✓	✗	✗
... margins & reserves	✓	✗	✗	✗
... inertia	✓	✗	✗	✗
... voltage	✓	✗	✗	✗
... GC0166 (MDO/B)	✓	✓	✓	✓
... GC0166 (FSOE models)	✓	✓	✗	✗

Abbreviations:

- **MFT:** Minimum Flat Time
- **MZT:** Minimum Zero Time
- **MNZT:** Minimum Non-Zero Time
- **SEL:** Stable Export Limit
- **SIL:** Stable Import Limit
- **MDO:** Maximum Delivery Offer
- **MDB:** Maximum Delivery Bid
- **FSOE:** Future State of Energy
- **TD:** Target Dispatch
- **FD:** Fast Dispatch

- All processes produce target MW profiles at unit level.
- TD/FD are enabled for BATTERY and SMALL zones (we are looking to enable them for other zones)
- TD is planned to be enabled for constraint optimisation (involving co-optimising units from different zones)
- Non-BMUs are not fully integrated into these processes yet

- MDO/B (within the BM window) would affect all types of runs
- FSOE models will largely affect longer term modelling for national dispatch / scheduling

GC0166 Parameters



30-Min Rule

Instructions

Manual instructions

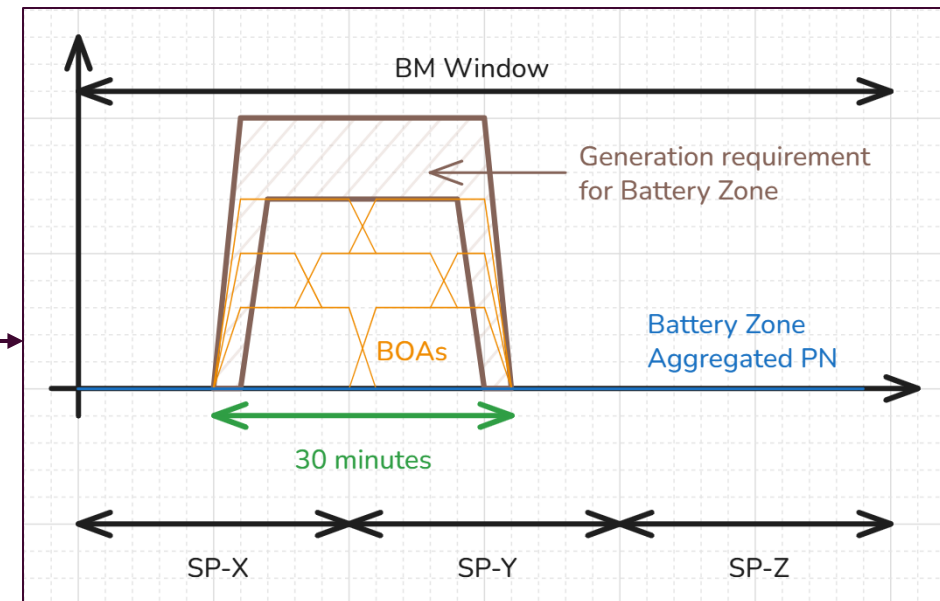
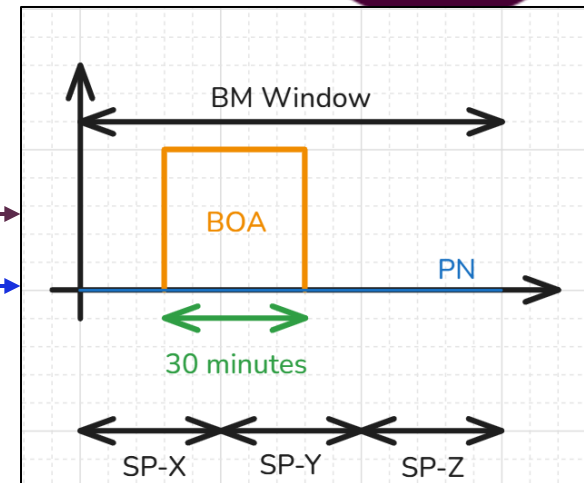
1. One BOA at a time following price stack
2. BOA cannot be longer than 30 minutes

Multi-dispatch from price stack

1. Multiple BOAs created at a time following price stack
2. BOAs cannot be longer than 30 minutes

Optimisation based dispatch

1. Multiple BOAs created at a time with the least cost solution and following shape of requirement from control room user
2. Optimisation window cannot be longer than 30 minutes



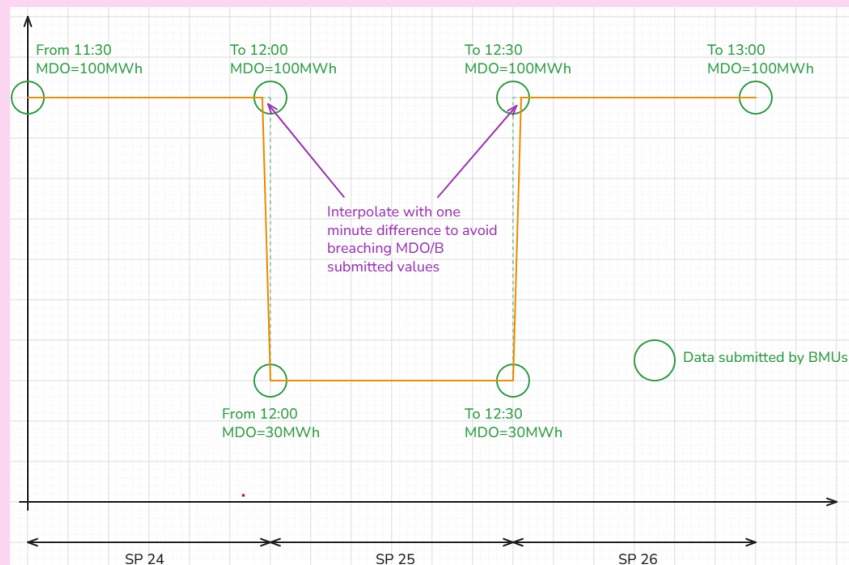
Abbreviations:

BOA: Bid Offer Acceptance
PN: Physical Notification
SP: Settlement Period

Rules for MDO/B for limited duration assets

Receiving and handling MDO and MDB in OBP*:

- MDO and MDB values are submitted as discrete points in time, each with an associated value and a defined "from" and "to" date/time.
- OBP interpolates the submitted values to a one-minute resolution for use by the optimiser.
- The interpolation process ensures that all minute-level values strictly respect the limits defined by the BMU.



General principles for MDO and MDB submissions:

1. Submitted MDO and MDB values must guarantee that any bid or offer send by NESO can be delivered.
2. Submitted MDO and MDB values must guarantee that any future reserve, response or any other service contracted with NESO can be delivered.

Rules for redeclaration of MDO and MDB inside the BM window:

1. A technical fault
2. NESO issues a BOA that is accepted
3. The BMU has fully utilised the energy reserved for an Ancillary Service
4. There is a PN change in the Settlement Period immediately after the BM window period

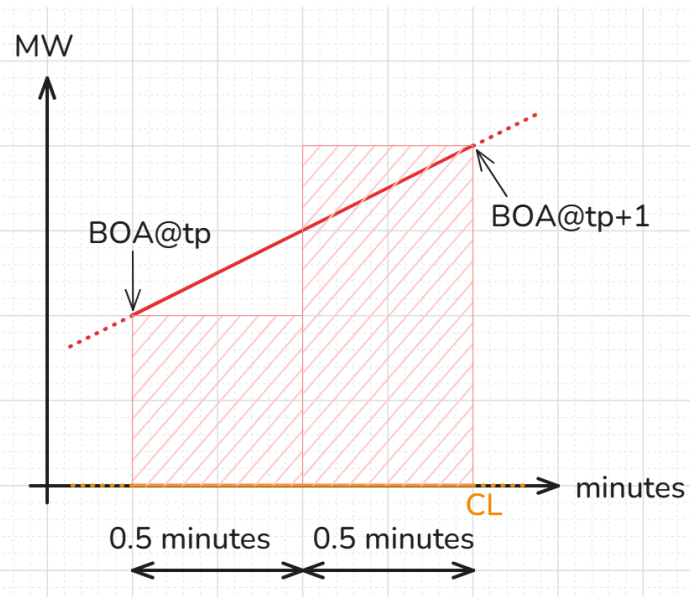
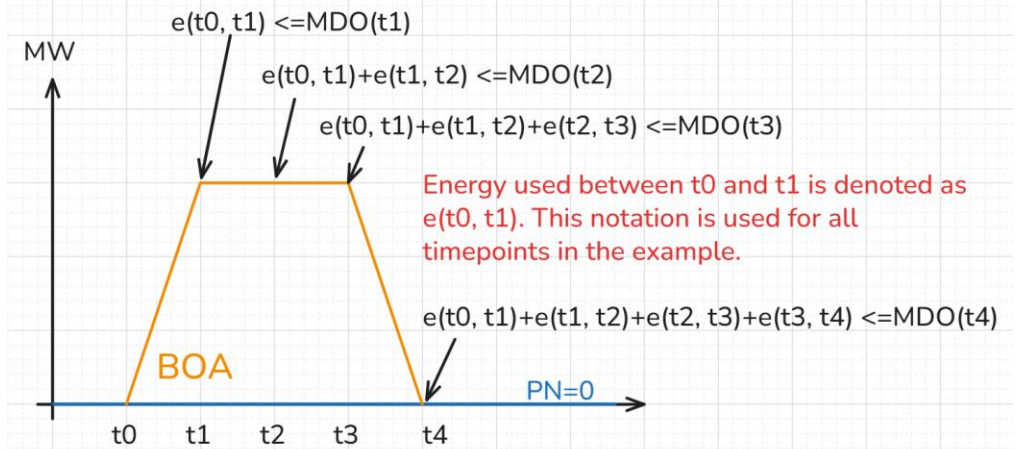
Additional redeclaration rules that are not explicitly said in the grid code are covered in the MDO/MDB Industry Best Practice Guide v1 *

- More information can be found in "MDO/MDB Industry Best Practice Guide v1" at <https://www.neso.energy/document/381741/download>

Application of MDO and MDB to Instructions

- At each minute, MDO and MDB define the energy available for Bid Offer Acceptances (BOAs) within the Balancing Mechanism window.
- Bids and offers are constrained so that their energy volumes do not exceed the applicable MDO or MDB at any minute during the BOA.

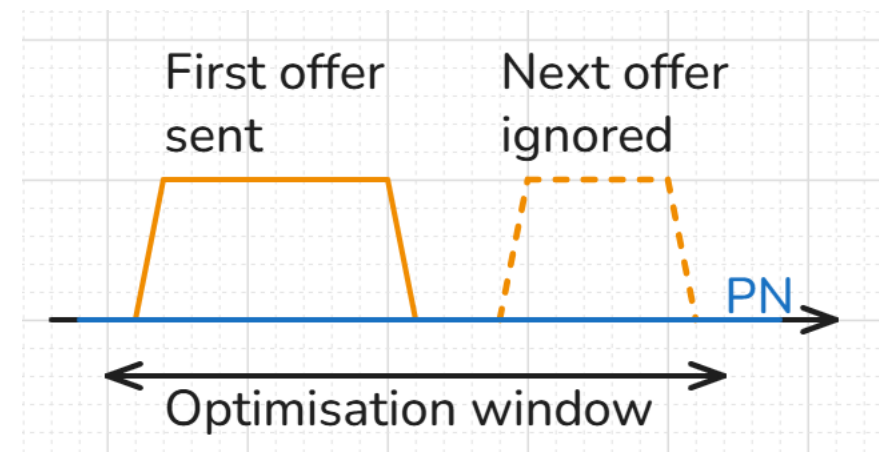
This definition will be used to create bids and offers in dispatch.



- A BOA can be visualised as a trapezoid.
- The energy used by a BOA is represented by the area of this trapezoid.
- Energy between two time points is calculated as half the sum of their contributions.
- The figure shows this visually using equivalent rectangular areas.

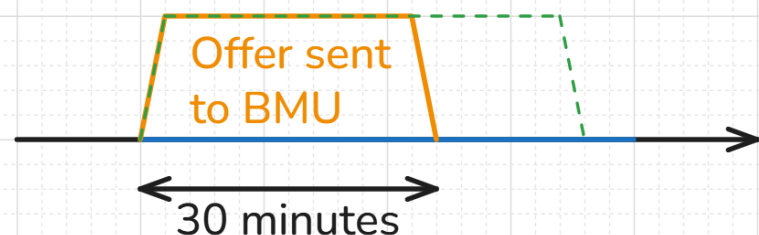
Postprocessing Optimiser Solution

- The optimiser may generate multiple BOAs in a single run.
- To allow asset operators to reflect any redeclaration of MDO or MDB values after the first BOA, NESO will issue only the first instruction.
- Any additional BOAs will be issued through subsequent optimisation runs if required.



Apply to units under the 30-minute rule only

Offer defined by optimiser



- During the transition period, some batteries will submit MDO and MDB values. The optimiser may generate bids or offers exceeding 30 minutes.
- Other batteries will continue to operate under the existing 30-minute rule.

GC0166 Trials & PoCs



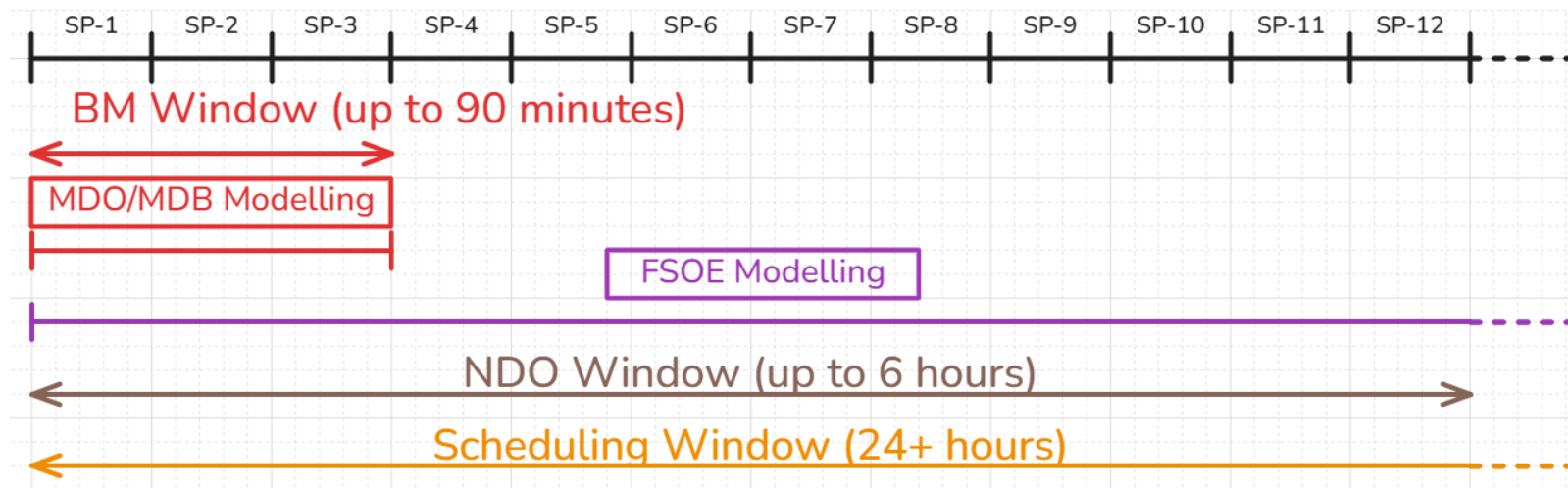
Trial Data

- NESO worked with battery participants as part of the GC0166 parameters POC trial.
- The trial focused on receiving additional operational parameters MDO/MDB into optimisation testing for the purpose of:
 - how these parameters behave in real operational scenarios,
 - the quality and volume of participant submissions,
 - the impact on balancing optimisation.

POC 1 and 2 (Initial submission)	POC 3 (Refined submission) - Ongoing
Identified coverage gaps	Updated and improved dataset following best practice guidance
Formatting and timestamp inconsistencies	More complete and consistent submissions
Used to validate data quality and structure	Ready for end-to-end optimisation testing
Used for optimisation testing examples	

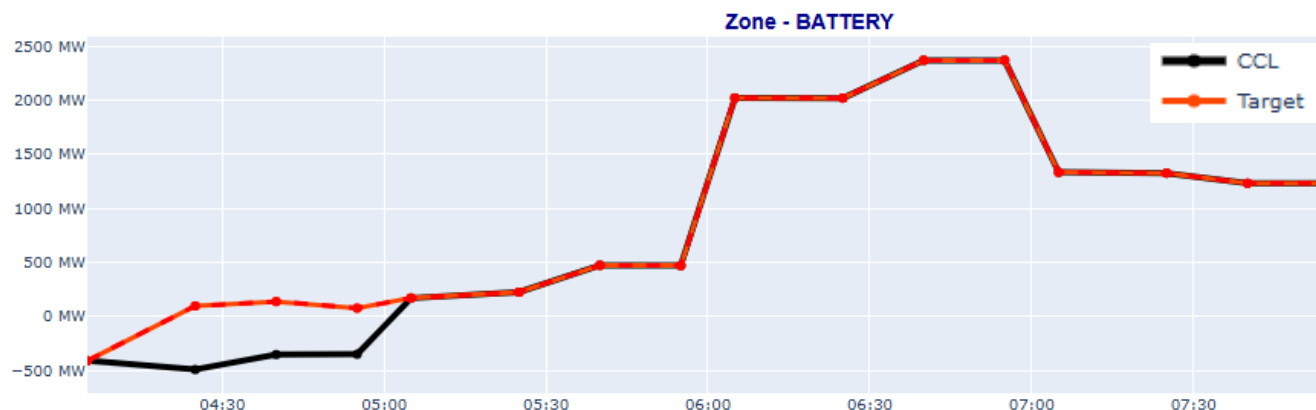
Modelling energy outside the BM window

- Future State of Energy (FSoE) and longer horizon battery optimisation
 - Currently SORT (BM dispatch system) dispatch applies 1 hour time-boxed window
 - FSoE enables more accurate modelling of limited duration assets over longer optimisation and scheduling horizons.

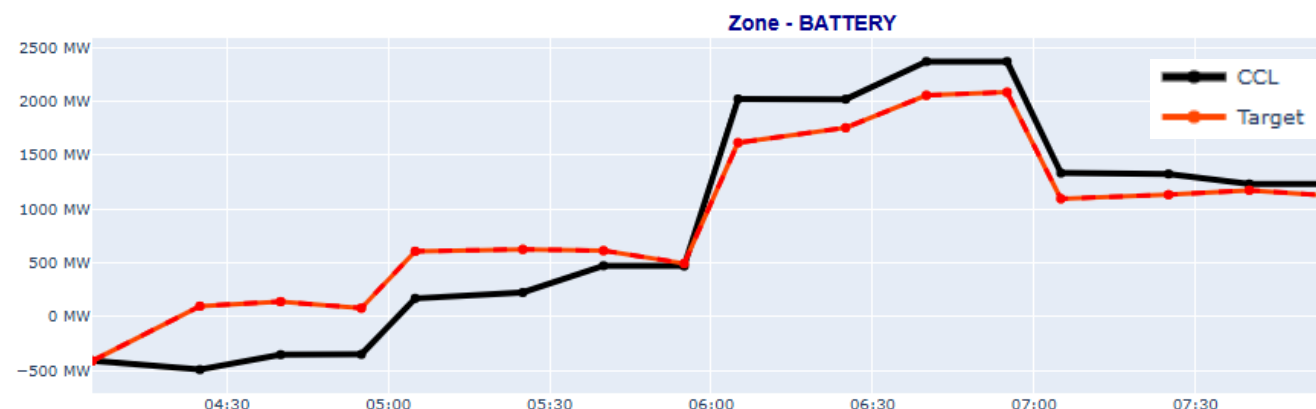


- FSoE will be implemented in the National Dispatch Optimiser (NDO), applying to optimisation horizons that include the BM window.
- This same FSoE representation is expected to be applied within scheduling capabilities over time.

FSoE Modelling – An Example



1-Hour Optimisation Window (Current approach)



Longer (> 1 hour) Optimisation Window (POC approach)

Input Params: $Initial_SoC_{(u)}$, $SoE_max_{(u,t)}$, $SoE_min_{(u,t)}$

$$SoE_{(u,t=0)} = Initial_SoC_{(u)} - Target_{(u,t=0)} \cdot \Delta T_{(t=0)}$$

$$SoE_{(u,t)} = SoE_{(u,t-1)} - Target_{(u,t)} \cdot \Delta T_{(t)}$$

$$SoE_{(u,t)} \leq SoE_max_{(u,t)}$$

$$SoE_{(u,t)} \geq SoE_min_{(u,t)}$$

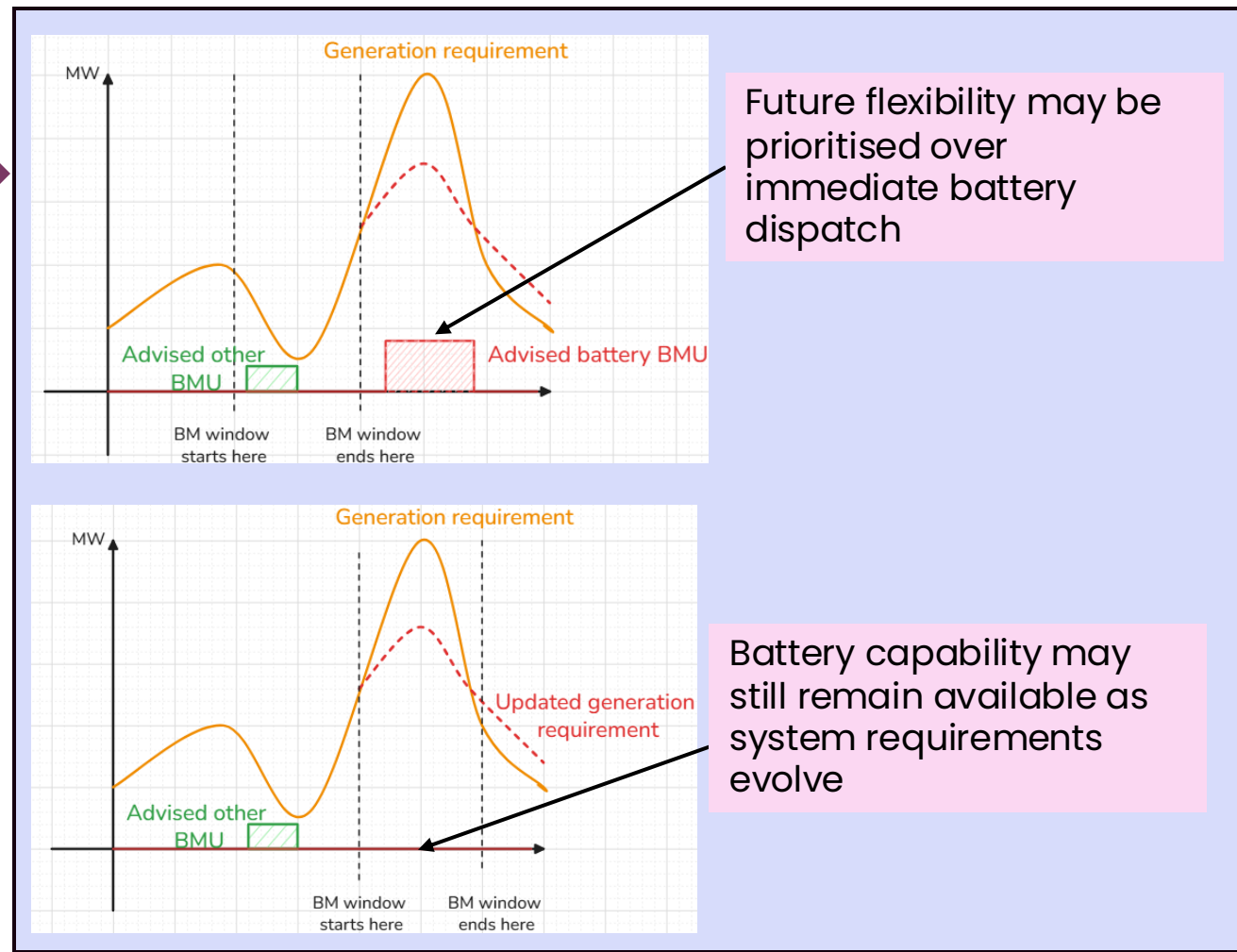
- Initial POC model uses a simplified lossless model.
- Future iterations will incorporate additional modelling complexity as more complete data become available.

Impacts:

- Potential for more accurate representation of limited duration assets
- Could support improved advice capability across longer periods
- Longer-horizon battery capability could influence zonal target programmes across BMU zones.

FSoE Modelling – Open Considerations

- Short-term vs long-term optimisation weighting
 - Balancing immediate system requirements against preserving future flexibility
- Utilisation assumptions around future contracts
- Moving BM window
 - Decision feasible now may become infeasible as the BM window advances
- Ensure FSoE does not limit instructions based on MDO/B inside BM window



Future Improvements



Interpreting Optimisation Output

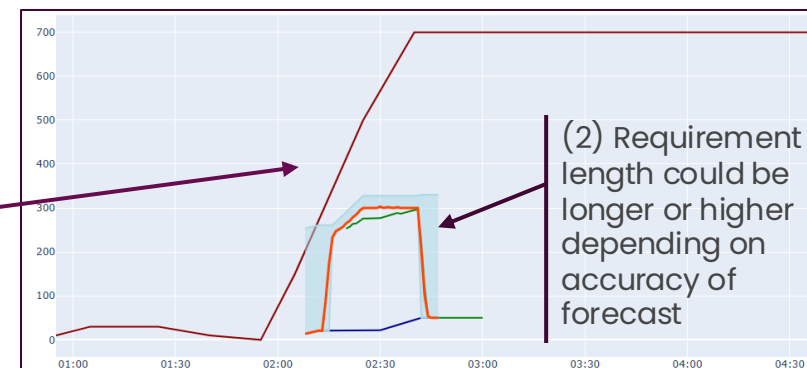
What?

► We instruct part of the optimisation output rather than all of it.

Why?

- Current practice is to issue shorter generation requirements due to uncertainty in forecasts but apply the full optimisation output
- Enable longer optimisation horizons (and potentially longer instructions)
- Effectively manage units with long time-constants
- Factor in the cost of future decisions, while managing risk of unwinding

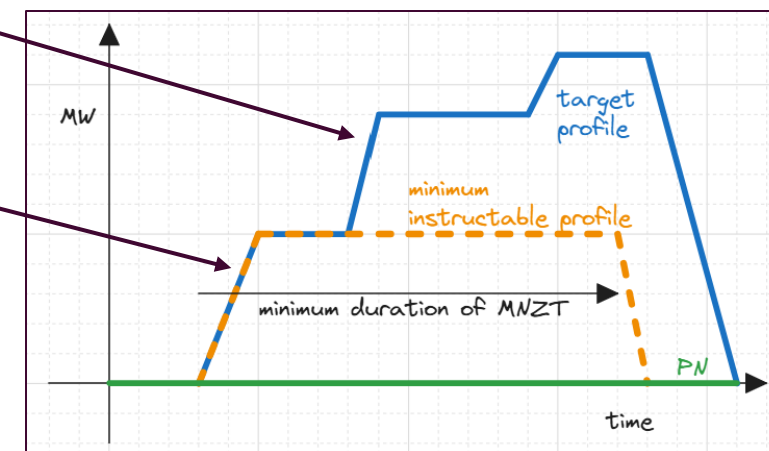
(1) Generation programme can change over time as new forecasts become available



(2) Requirement length could be longer or higher depending on accuracy of forecast

(3) Optimiser can create multiple instructions for the same BMU to meet the shape of the requirement

(4) instruct the minimum instructible profile for longer horizons as those instructions would be defined for a forecast that might change depending on the frequency of the system at that moment



Abbreviations:

- **MNZT:** Minimum Non-Zero Time

Optimisation for a Group Constraint

What?

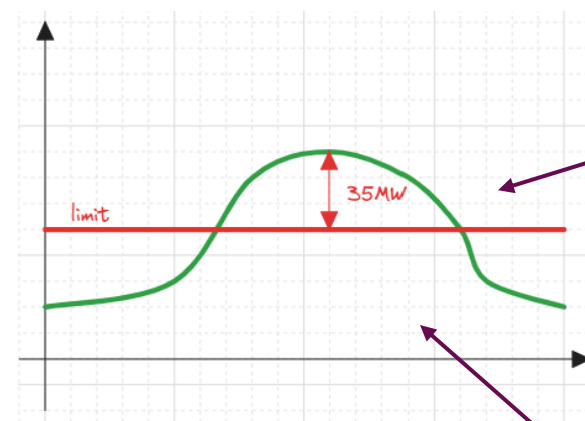
▶ Utilising the optimiser to dispatch units within a constraint

Why?

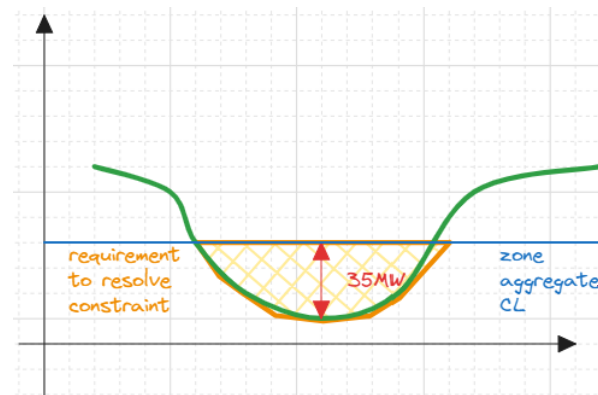
- ▶ Lowers costs by more effectively employing SMALL/BATTERY BMUs to address constraints, with potential application to NORTH and SOUTH zones.
- ▶ Manages more complex unit characteristics efficiently.
- ▶ Decreases workload in the control room.

Abbreviations:

- **CL:** Committed Level



(1) Solution applies when an issue is identified around constraints



(2) We setup Target Dispatch to work on units behind the constraint

(3) With a requirement based on constraint overload

Some coordination would still be expected among control room engineers as some zones are not solved via optimisation yet

Target/Fast Dispatch for Forecasted Units

Abbreviations:

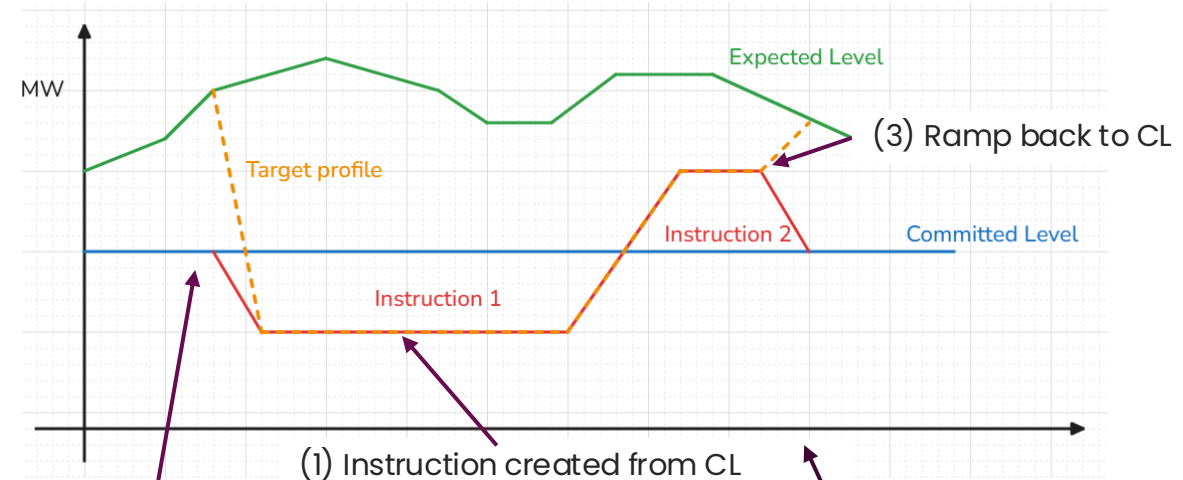
- **CL:** Committed Level

What?

- ▶ Optimisation for forecasted BMUs

Why?

- ▶ Forecasted BMUs, like WIND, can pose challenges because they may not adhere strictly to their PNs.
- ▶ Establish a standard modelling approach for assets with forecasts across instructions / dispatch / scheduling.



Cost-based minimisation for forecasted units like wind. Deviations from forecast levels affects cost modelling.