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Optimisation Stakeholder Focus Group

16 November 2026

12:30 – 14:00

Manos Loukarakis, Optimisation Manager

Joe Roman, Optimisation SME

Thathsara Herath, Optimisation SME

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Agenda

Time	Agenda Item	Details	Presenters
12:30	Welcome & Introductions	• Current state-of-play summary	**Manos Loukarakis**, Optimisation Manager
12:45	**Q&A**		
12:50	GC0166 ongoing developments	• MDO/B implementation so far • FSoE development plan	
13:05	**Q&A**		
13:10	Modelling approximations	• Adjustments in problem formulation • Impact on dispatch	**Joe Roman**, Optimisation SME
13:20	**Q&A**		
13:25	Optimisation within a constaint	• Current state-of-play • Ongoing developments	
13:35	**Q&A**		
13:40	Wind zone optimisation	• Modelling challenges and current solution	**Thathsara Herath**, Optimisation SME
13:55	**Q&A**		
14:00	**Meeting Close**		

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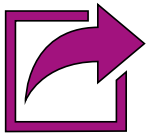
Audience Participation



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.



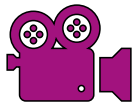
Please post any questions you have for our speakers in the Microsoft Teams Q&A ensuring to list both your **full name and organisation** **-** this will enable us to follow up with you after the webinar if necessary. During the Q&A sections, you can also use the 'raise hand' function and come off mute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

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Optimisation so far

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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
June 2026 (online)	• GC0166 details

Today's session

- GC0166 update
- Optimisation for Wind zones
- Optimisation within a Constraint

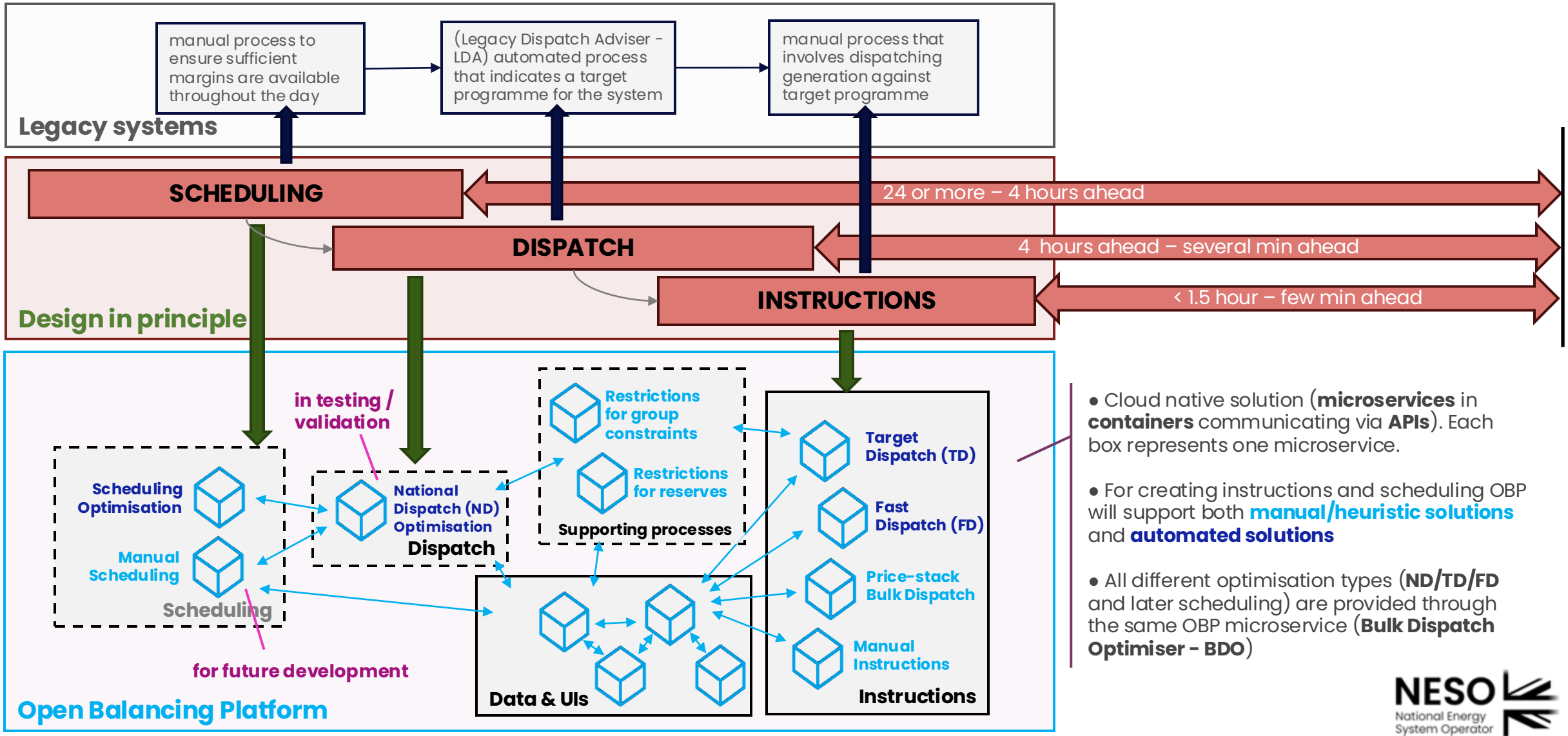
Future questions

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

(1) Past webinars available at https://www.neso.energy/what-we-do/systems-operations/balancing-programme#Stakeholder-focus-groups

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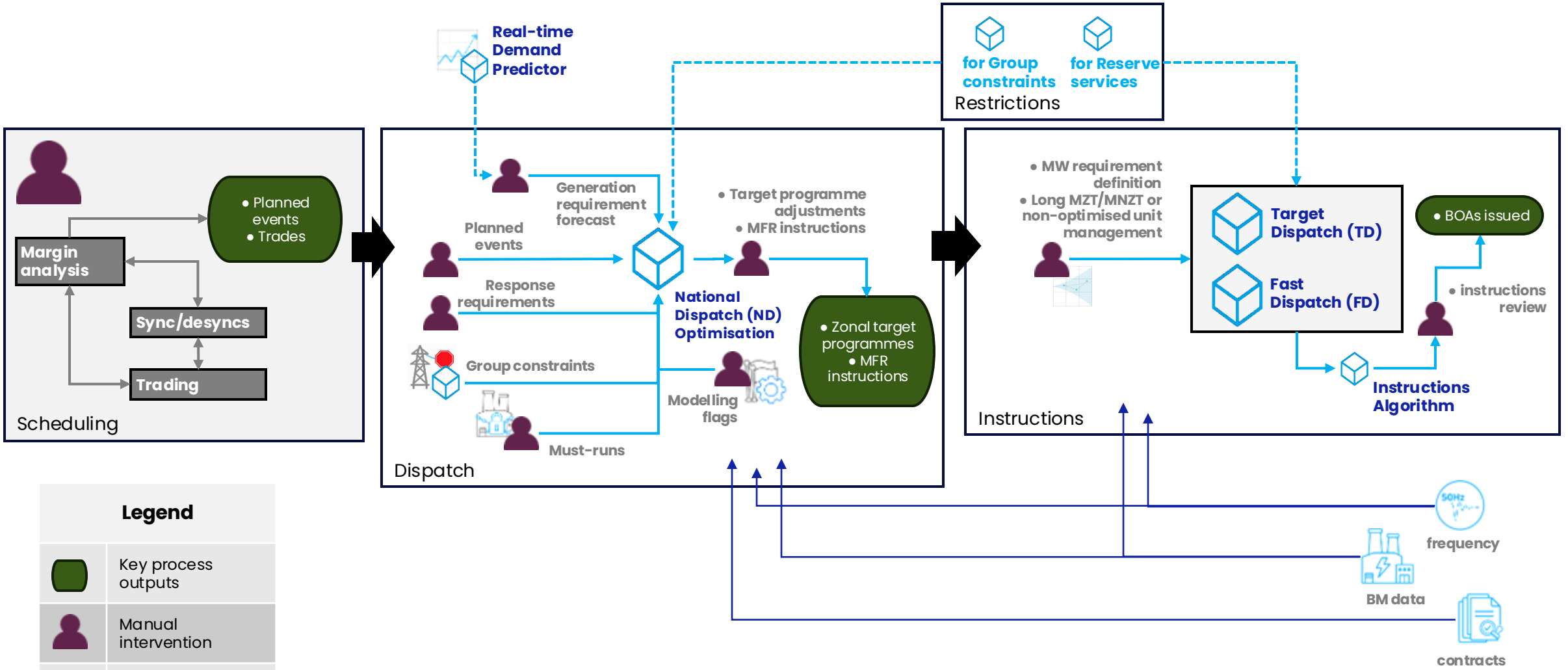
Open Balancing Platform Overview



- Cloud native solution (**microservices** in **containers** communicating via **APIs**). Each box represents one microservice.
- For creating instructions and scheduling OBP will support both **manual/heuristic solutions** and **automated solutions**
- All different optimisation types (**ND/TD/FD** and later scheduling) are provided through the same OBP microservice (**Bulk Dispatch Optimiser - BDO**)

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"Automated" End-to-End Journey Baseline

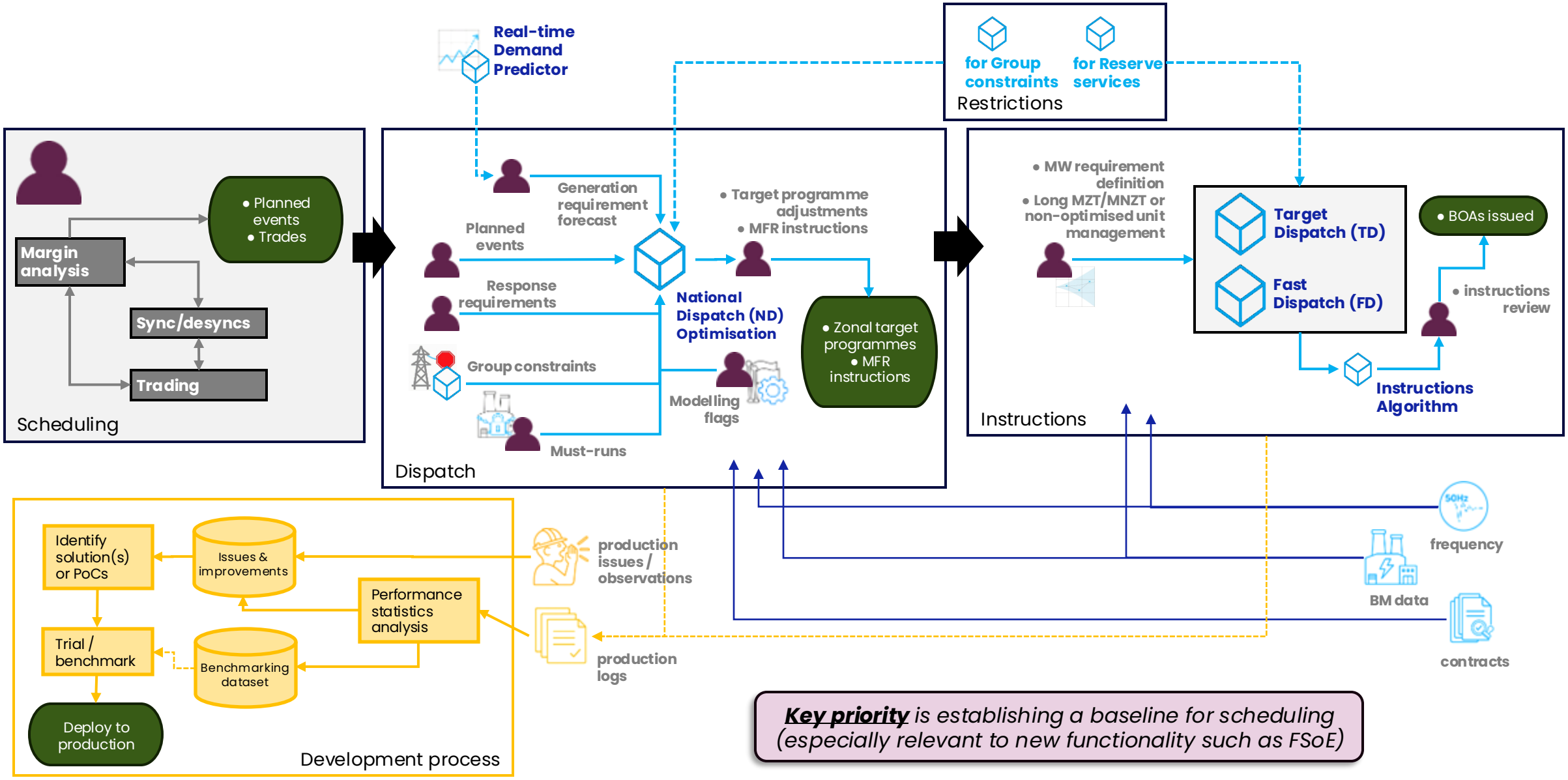


Legend	
	Key process outputs
	Manual intervention
	Functional block (typically one OBP microservice)

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… and our Development Process



Key priority *is establishing a baseline for scheduling (especially relevant to new functionality such as FSoE)*

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Optimisation Processes Compared [Functional]

	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	TBD	every 5'	on demand	
Constraints				
… generation requirement	✓	✓	✓	✓
… response requirement	×	✓	×	×
… ramp rates	✓ (simplified)	✓ (simplified)	✓	✓
… SEL/SIL	✓	×	✓	✓
… MZT/MNZT	✓	×	✓	✓
… MFT	×	×	✓	✓
… group constraints	✓ (modified)	✓	×	×
… response capabilities	×	✓	×	×
… margins requirement	✓	×	×	×
… inertia requirement	✓	×	×	×
… 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

With a baseline in place, we can more effectively align modelling and functionality among core optimisation problems.

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Optimisation Processes Compared [Operational]

	Scheduling	National	Target	Fast
Processes				
Requirement setup	n/a	n/a	[1]	[1]
Instruction creation	n/a	n/a	[2]	
Unit events management	[3]	[3]	[3]	[3]
Zones coverage				
NORTH/SOUTH			[3]	[3]
WIND				
SOLAR				
BATTERY				
SMALL			[4]	
PUMPED STORAGE		[5]		
NON-BM		[6]	[6]	[6]
INTERCONNECTORS			n/a	n/a

- No implemented solution (needs to be handled manually / via price stack)
- PoC/v1.0 in development
- In testing
- In use - no issues
- In use – improvements identified

Work in progress

[**1**] Does not allow sufficient flexibility in how requirement is defined, leading to more complex instruction patterns / use
[**2**] Limited control which means unwinding considerations impact requirement setup
[**3**] Setting sync/desync times for long MZT/MNZT units, requires manual intervention, not fully data driven

[**4**] Occasional partial-loading
[**5**] Pumped storage not fully optimized, requires manual intervention (current solution aligns with legacy systems)
[**6**] Due to the number assets we are looking for scalable solution
[*] Performance!

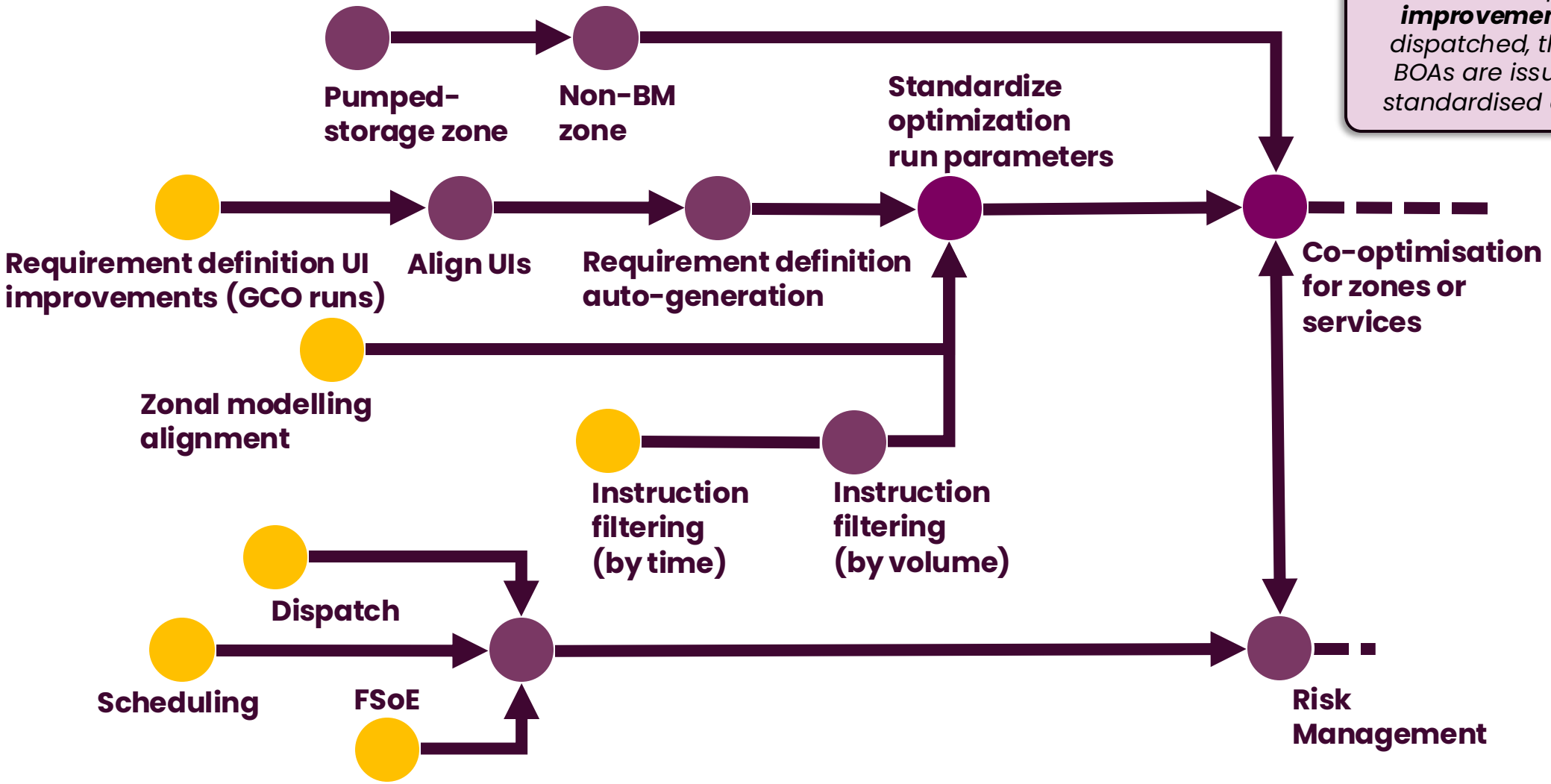
Production data provides a much clearer direction on what needs to be improved.

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Optimisation Roadmap

*We can expect **incremental improvements** in how units are dispatched, that will impact what BOAs are issued, through a more standardised end-to-end process.*



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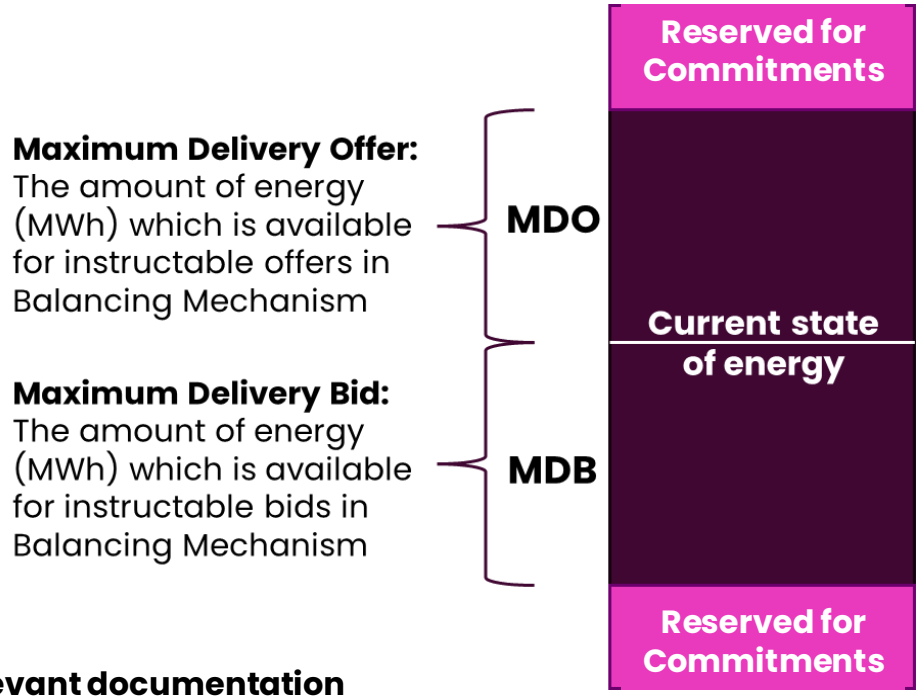
Q&A

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GC0166 Ongoing Developments

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[MDO/B] Implementation So Far



Relevant documentation

- Data Validation, Consistency and Defaulting Rules
- EDL Message Specification
- **Wider Access API Message Specification** – accessible on the Wider Access API Developer's Portal.
- Best practice guidance document

- **Implementation in OBP**
  … completed for Target/Fast Dispatch and manual instructions
  … price-stack bulk dispatch to follow
  … National Dispatch at a later stage

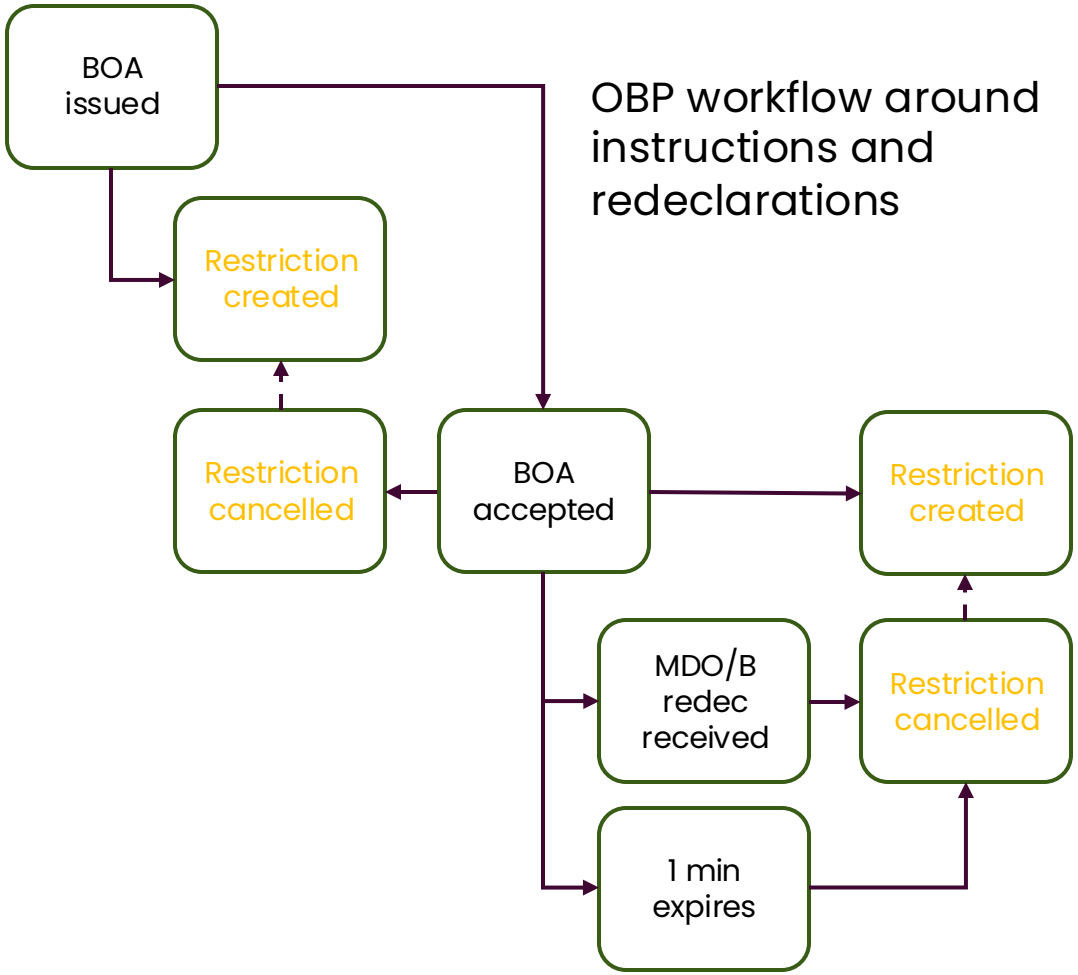
- **Target/Fast Dispatch workings as presented in our July 2026 Optimisation stakeholder webinars**
  … linearly interpolate submission data over time
  … valid BOA is one that: at each minute, total energy spent on the BOA up to that minute, is less than the MDO/B declared value

- **All live storage assets have now transitioned (250)**
  … we are removing the 30min related logic
  … instructions longer than 30min are now possible, however these would happen more often for system reasons; energy/balancing instructions will be considered but issued in shorter chunks to preserve flexibility

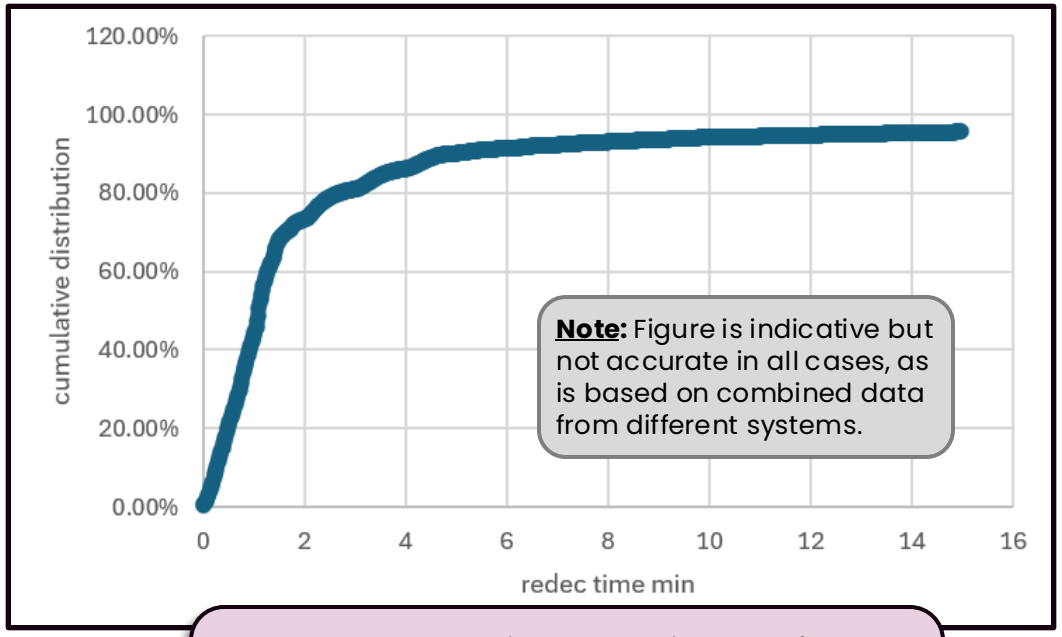
- **On MDO/MDB data**
  … focus has been on answering queries related to BOA validity and on reducing submission volumes (we are seeing more submissions than expected, including significant numbers of duplicate submissions).

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[MDO/B] Redecs Considerations



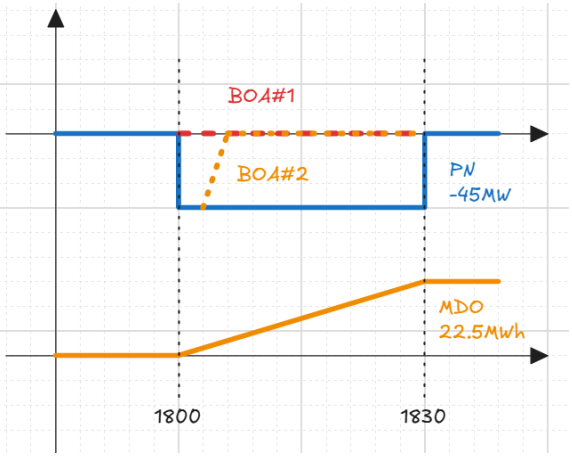
OBP workflow around instructions and redeclarations



What is your estimate of how long it takes to get a relevant MDO/B redec back to us following a BOA acceptance?

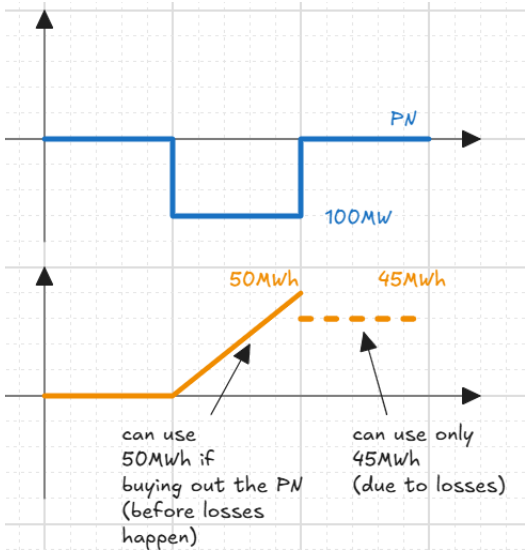
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[MDO/B] Other Cases of Interest



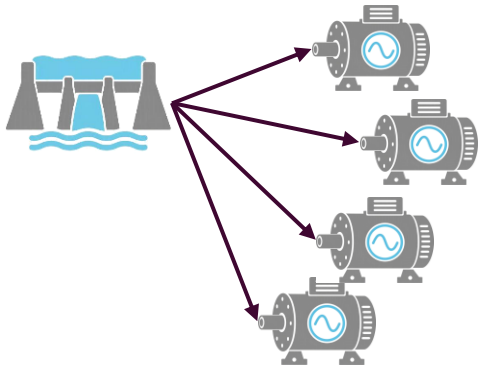
#1 Buying out PNs with step-changes

- The optimiser assumes linear interpolation between MW values – as a consequence when a unit moves from e.g. 0 to -45 in a single minute, half a minute worth of energy is spent within that last minute.
- This did not allow the optimiser to fully buy out a PN (rather there is a 2min delay introduced due to the Minimum Flat Time setting).
- This is now resolved - by a minor adjustment in optimiser input data to address this half minute missing volume, around step-changes.



#2 Efficiency considerations

- Depending on when the BOA occurs, more (or less) volume might be available.
- Ensure all potential BOAs are deliverable.



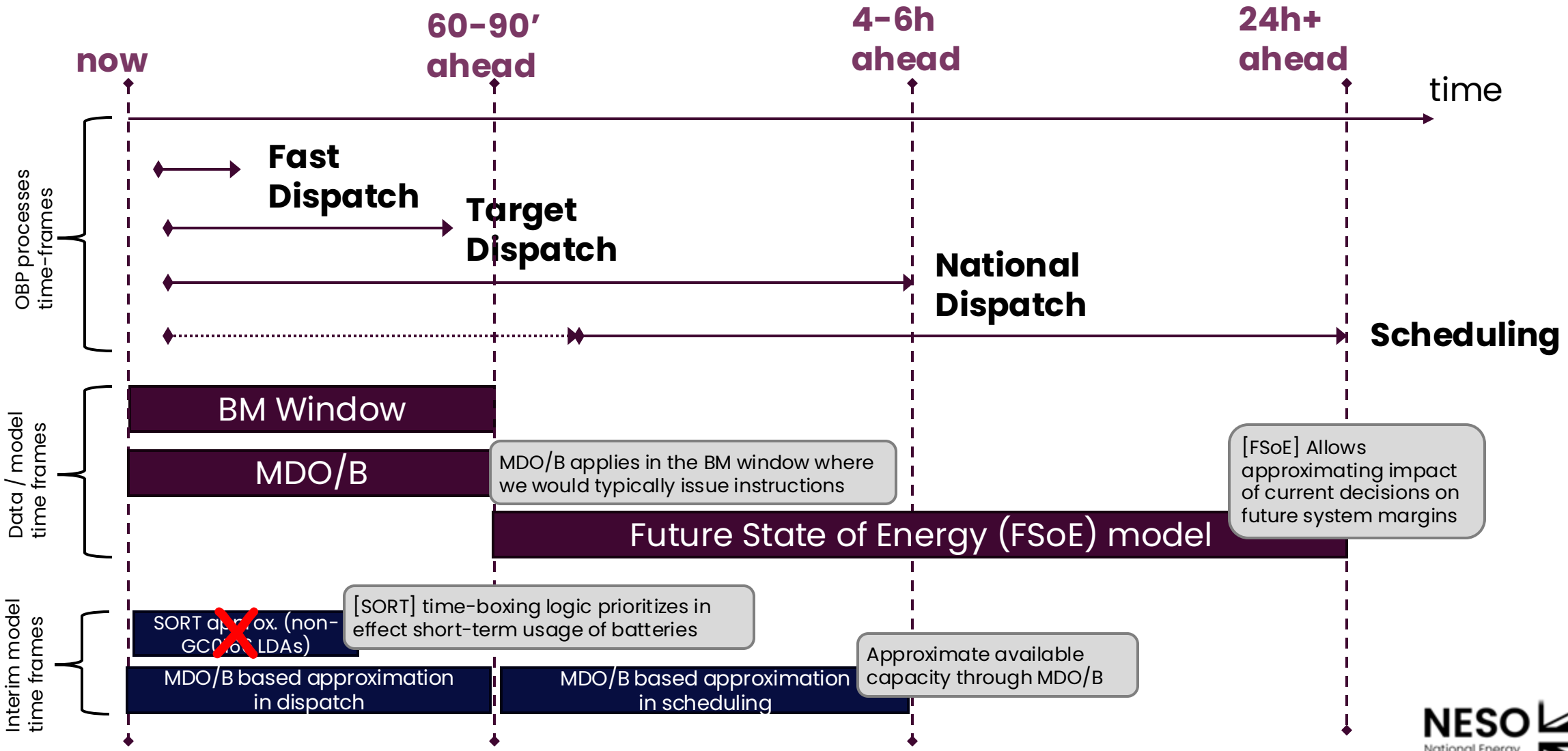
#3 Station constraints

- For BMUs that “share” energy storage (i.e. pumped storage) we are looking for ways to apply MDO/B limits at station level.

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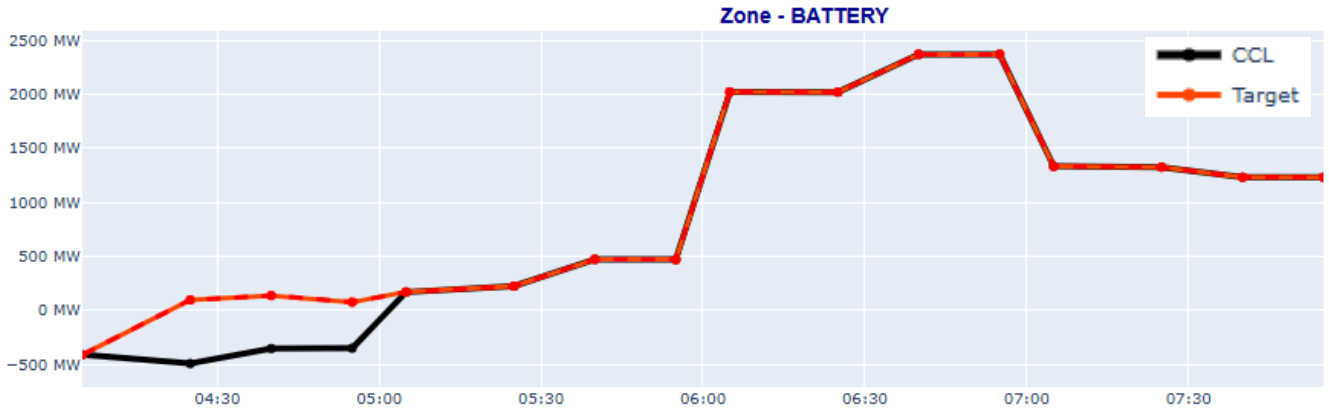
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[FSoE] Modelling Time-Frames

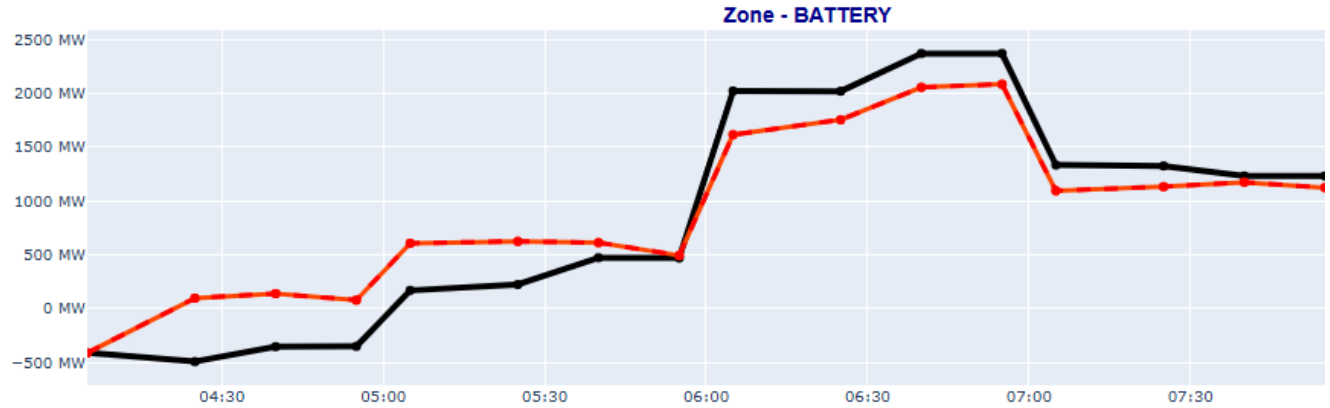


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[FSoE] Starting Point & Expected Issues



1-Hour Optimisation Window (Current approach)



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

Starting point : simple lossless battery model

$SoE_t = SoE_{t-1} - targetMW_t \cdot \Delta T_t$

$SoE_min_t \leq SoE_t \leq SoE_max_t$

…overlaid to MDO/B constraints

DOES

- Allow the creation of longer target programmes in Dispatch time-frames

BUT we still need to ensure

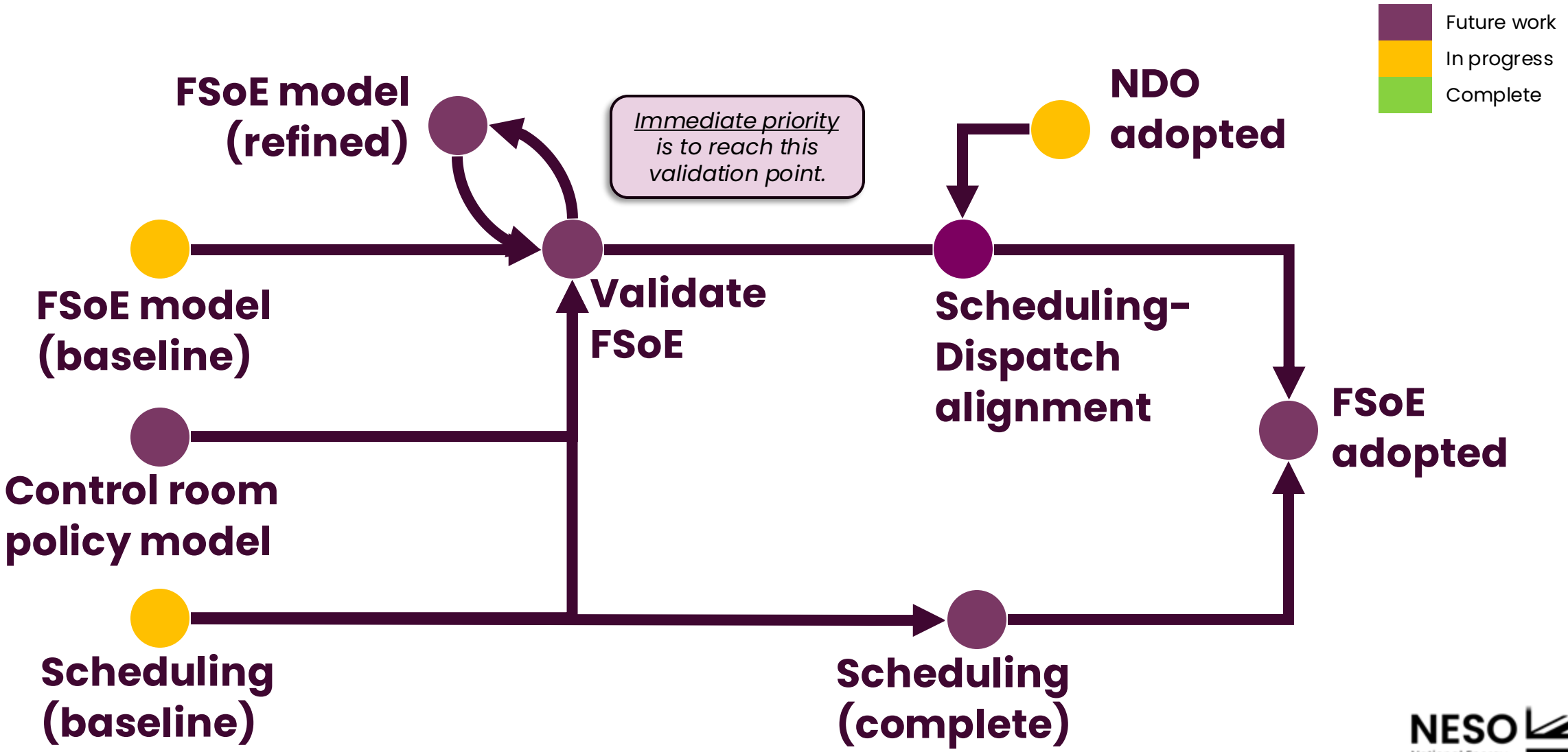
- Dispatch advice aligns with scheduling
- No unrealistic cycling of assets is present, and reasonable system operating plans would be produced.
- A good balance between short- vs long-term costs (i.e. we don't unnecessarily end up skipping assets reserved for later)
- SoE model does not overly restrict asset in BM window more than MDO/B model.
- The model reflects the impact of market conditions (a more complex model may be appropriate)

We need a longer look-ahead (i.e. scheduling) to be able to validate the FSoE model.

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Scheduling / FSoE roadmap



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Q&A

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Modelling Approximations

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BDO Variable Time Steps

The problem: During optimisation 1-minute resolution time steps were slow to solve. We addressed this by solving fewer timestamps, then reconstructing a 1-minute dispatch profile.

How?

1 Down-sample

Select a subset of timestamps from the 1-minute payload.

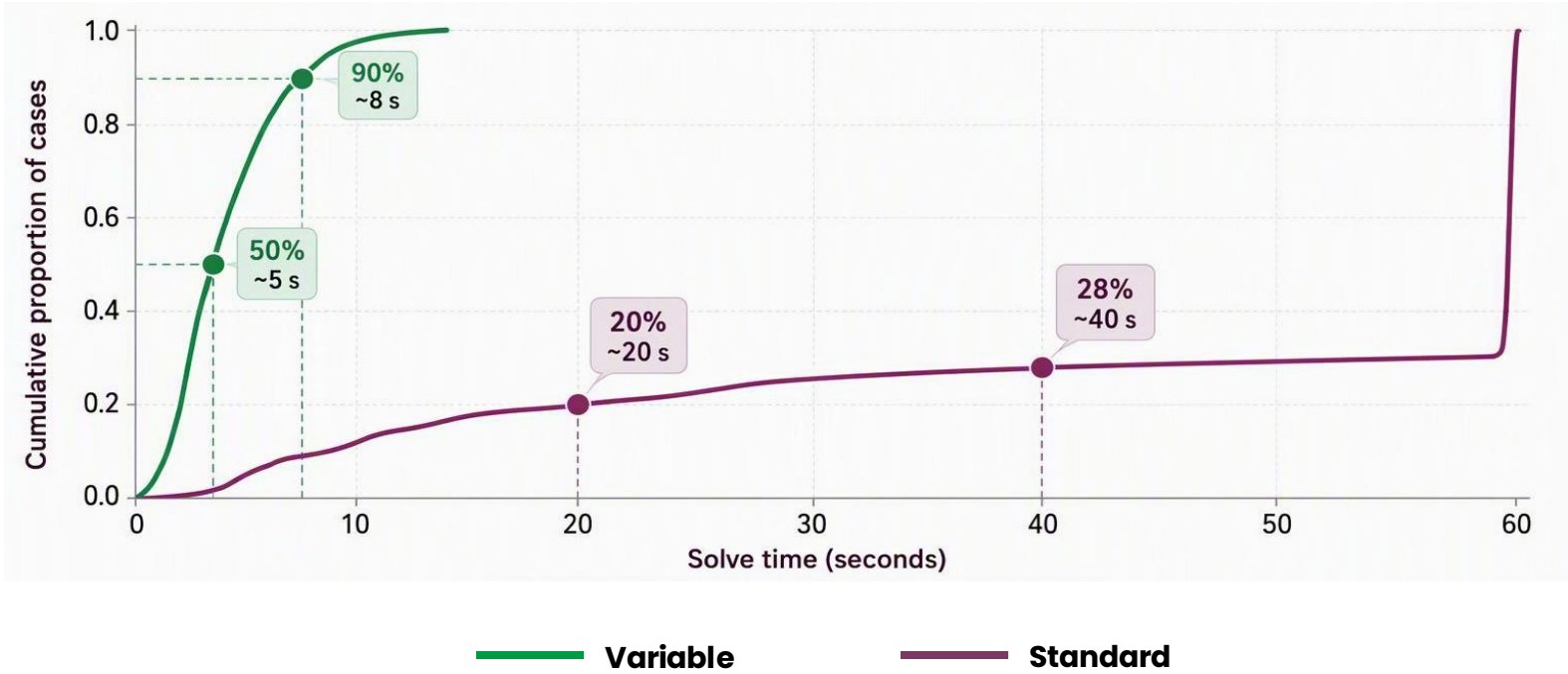
2 Optimise

Solve the approximate system level problem at the sampled time points.

3 Up-sample

Reconstruct 1-minute redispatch profiles.

The Result: Faster Convergence



Why this matters Modelling approximations affect optimiser solutions. The next slides explain what that means for dispatch.

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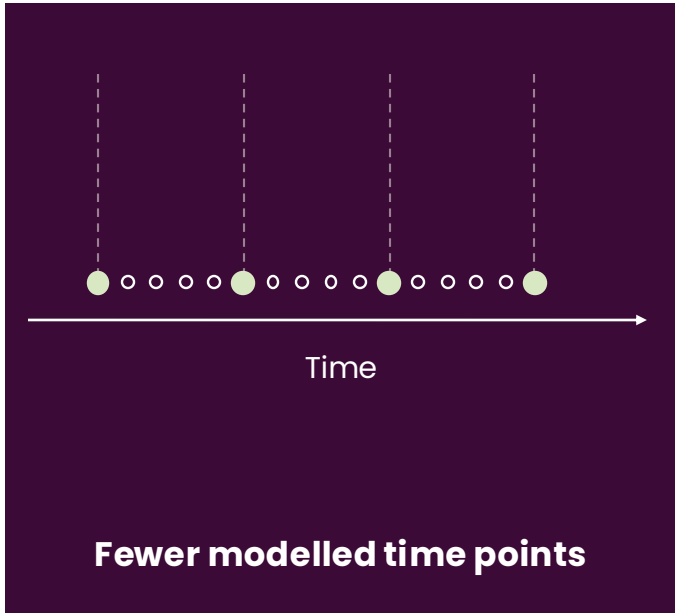
1. Down-Sampling

The system problem uses selected timestamps from the original 1-minute input.

Current implementation

Fixed 5-minute intervals

The values of Headroom, Footroom and pre-optimisation committed level (POCL) are selected for the specific down-sampled time-points.



The system problem does not model intervening 1-minute detail. This allows us to improve performance and reduce model complexity.

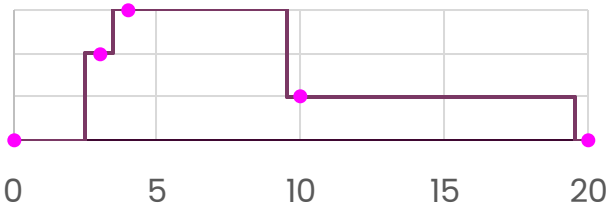
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2. Optimise Down-Sampled Problem

Approximations affect the optimiser solution

Ramping-cost timing

Redispatch is assumed to start just before the sampled timestamp and continue until just before the next, reducing the impact of ramping to the approximate cost.



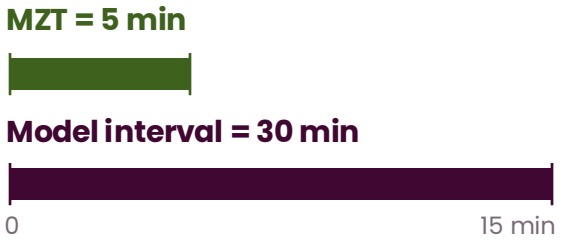
Cost approximations

The sampled timestamp uses its own cost model. We use an approximation for costs based on the interval modelled.



Model constraints

We adapt constraints to account for the interval size. For example, a 5-minute Minimum Zero Time (MZT) often needs no explicit constraint with 30-minute intervals.



Sampling changes how costs and time-coupled requirements are represented

1 Down-sample | **2 Optimise** | 3 Up-sample

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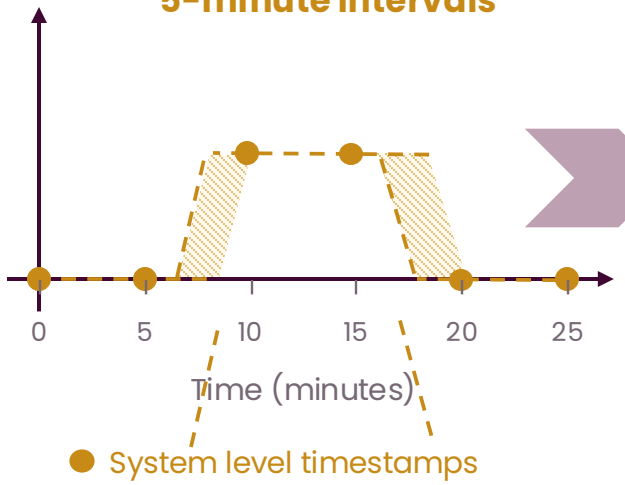
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3. Up-Sample

The sampled solution uses 5-minute intervals, but creating instructions requires feasible 1-minute profiles. The optimiser solves BMU-level subproblems to produce these profiles.

Sampled solution

5-minute intervals

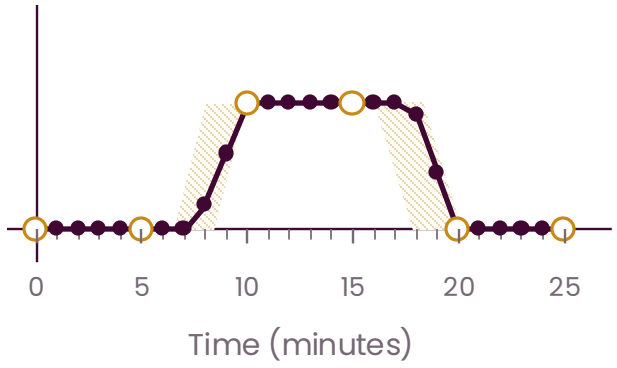


Unit-level (Single-BMU) 1-minute subproblems

- BMU 1
- BMU 2
- BMU 3
- BMU 4

Reconstructed profiles

1-minute resolution



- Reconstructed every minute

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Implications for dispatch

SIMPLER INSTRUCTIONS

Less Partial Loading

Fewer decision points reduce the scope for a unit to load briefly before unloading. This can reduce partial loading and support simpler dispatch instructions.

JOINT OPTIMISATION

Group Constraints

Joint optimisation across larger groups becomes practical, allowing economic selection across eligible BMUs.

USER CONTROL

Driving the Optimiser

This will give users the ability to drive the optimiser, giving them control over the level of modelling detail.

FORECAST UNCERTAINTY

Units that do not Follow PN

Provides flexibility to model uncertainty for forecasted units.

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Q&A

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Optimisation within a Constraint

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Optimisation within a Constraint Process

The user remains in control through each stage of constraint management.

The outline of the process is illustrated below:

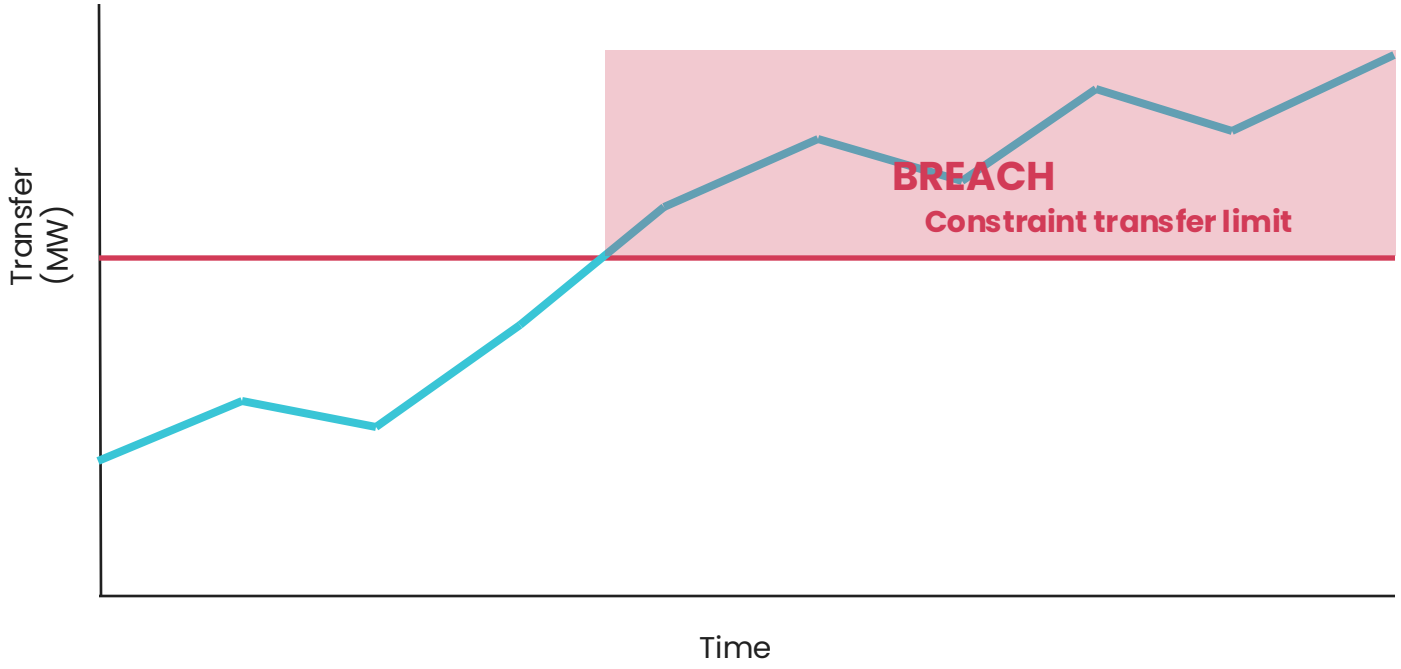
1 Breach and action	2 Requirement & scope	3 Optimise	4 Review & monitor
Identify the timing and size of the breach. Use price stack or manual dispatch for immediate action.	Specify the target time and remaining MW requirement. Coordinate between zones.	Bulk Dispatch Optimisation (BDO) proposes an economic solution across optimized zones.	Review proposed instructions, dispatch approved actions and track the impact on the constraint.

Optimisation within a Constraint uses the existing Target Dispatch process for balancing, but operates on the subset of units associated with a constraint, instead of a zone.

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1. Breach Identification and Action

The Control Room identifies when transfer exceeds its limit, by how much and for how long.



In this part of the process, the breach can be resolved using the price stack or manual dispatch.

Breach identified

See the timing and magnitude of the breach.

Immediate action

Use price stack or manual dispatch to address the breach.

Remaining requirement

Identify the MW change still needed after immediate action.

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2. Requirement and Eligible BMUs

The remaining MW requirement is identified and eligible BMUs will be used to find a solution.

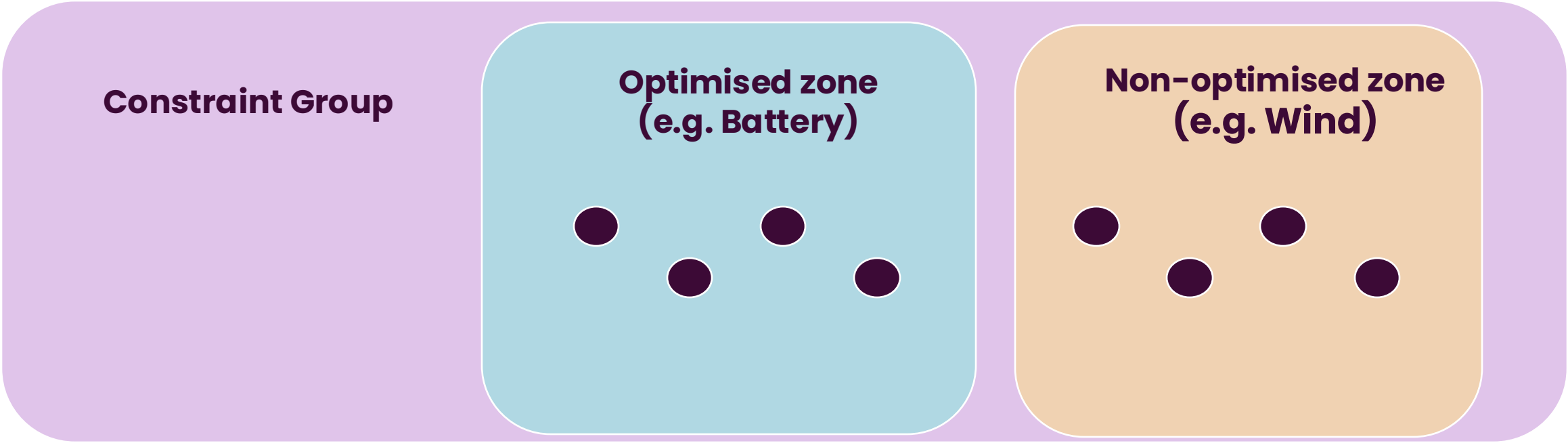
Optimised				In Development	Future Scope	
SMALL	BATTERY	NORTH / SOUTH	SOLAR	WIND	PUMPED STORAGE	NBM

Optimisation within a Constraint will create BOAs only for units in "optimized" Zones. Units in non-optimized zones have to be dispatched manually or the via-price stack.

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Zonal Coordination

One constraint can span zones with both optimised units and manual dispatch actions.



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3. Optimisation within the Constraint

The usual BDO process for Target Dispatch applies to eligible units within the constraint, producing feasible BMU-level profiles.

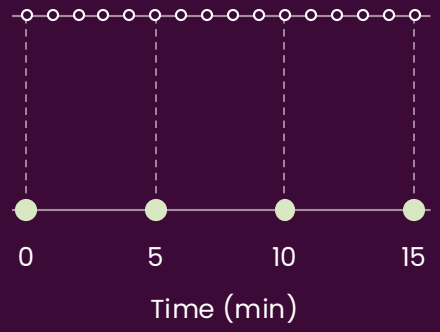
REQUIREMENT AND SCOPE

- Target time and MW requirement at modelled time points
- Eligible units within the constraint

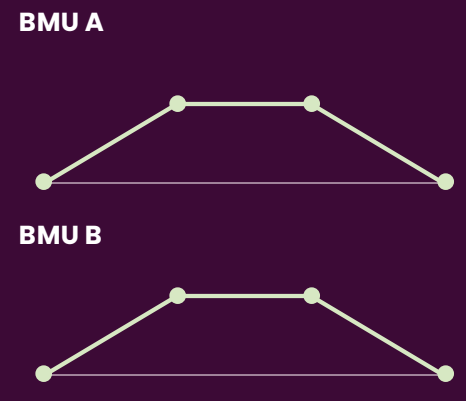
We are introducing a new way for users to setup optimiser requirement, that enables users to directly change the modelled points

BDO OPTIMISATION

1 Down-sample



2 Optimise group



3 Up-sample



1-minute BMU profiles
Ramps close to target times

Illustrative profiles and ramp timing, not dispatch data

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4. Review, Dispatch and Monitoring

The operator reviews proposed instructions and monitors their effect on the constraint.

Review proposed instructions

Assess the proposed actions before dispatch as per standard process.

Dispatch approved actions

Combine optimised instructions with any manual dispatch actions performed.

Monitor constraint transfer

Track whether the dispatched actions resolve or delay the constraint.

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Development Outlook

Constraints development combines wind support with changes to how users set up and drive the optimiser.

User interface and optimiser setup

As part of the constraints work, we are changing the user interface and how users set up and drive the optimiser.

We expect use of the optimiser for group constraints to increase once Wind is enabled, and as we refine the UI design and requirements.

Wind and asset coverage

Wind is key to many constraints. Extending eligible assets and zones to include wind should encourage wider use of the optimiser.

Performance and solution quality

We aim to reduce solve times while maintaining solution quality across zones.

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Q&A

Public

Optimisation for Wind (& other units with forecasts)

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The Problem

- **Physical Notification (PN):** Wind BMUs submit expected generation profiles
    - However, PN accuracy can vary across BMUs, with significant deviations potentially affecting balancing requirements
- **NESO Forecasting Platform (PEF):** Provides an independent estimate of wind generation to complement PN where forecast errors are identified
    - Combines 68 weather forecasts from the Met Office (18) and European Centre for Medium-Range Weather Forecasts (50) - forecasts horizons from a few hours to two weeks with 30-minute granularity.
    - Uses trained wind models, including machine learning based residual corrections to estimate generation.
    - Forecasts are updated as new information becomes available, e.g. core models trained daily.
- **Forecast in Balancing Optimisation:** BDO uses PN or PEF forecasts depending on the accuracy
    - PN is the default reference, with PEF forecast used where PN errors are identified.
    - This supports more accurate assessment of system balancing requirements and economic redispatch decisions.

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The Modelling Challenge

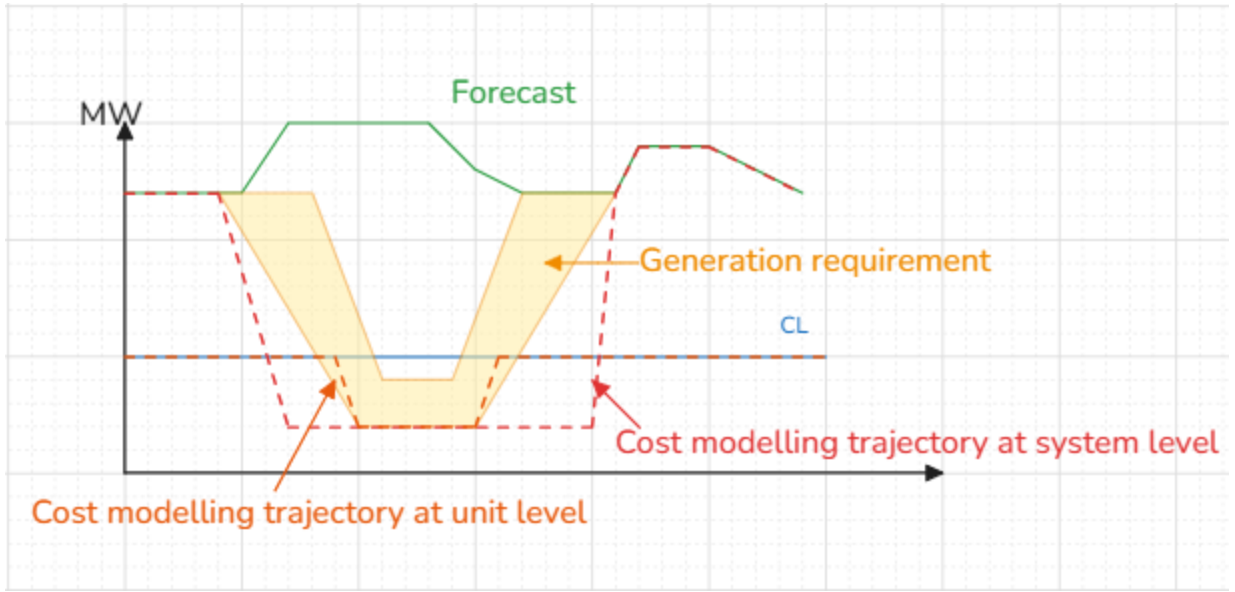
- BDO receives two operating references: **Forecast** and **Committed Level (CL)**
- **Optimisation against forecast vs CL**

  The optimiser needs to identify the most economical BMU redispatch actions to meet "system" level generation requirement using the "forecast",

  but actual instructions must be issued from "CL", respecting unit dynamics.
- **Redispatch cost representation**

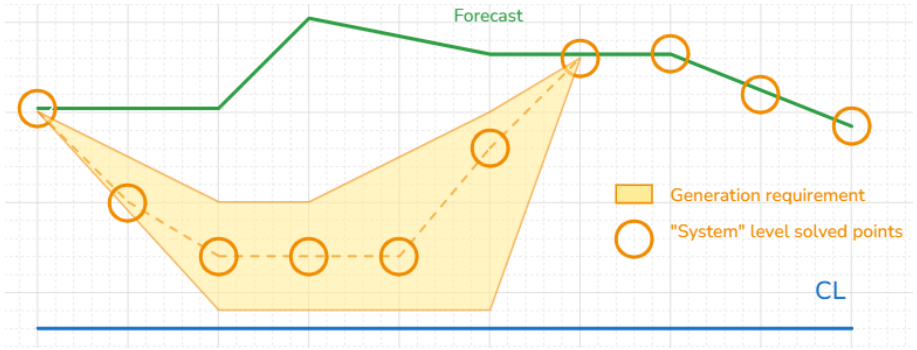
  Costs modelled along the forecast-based trajectory can differ from those associated with the actual "unit" level CL-based instruction trajectory,

  but modelling both profiles simultaneously introduces substantial computational complexity.

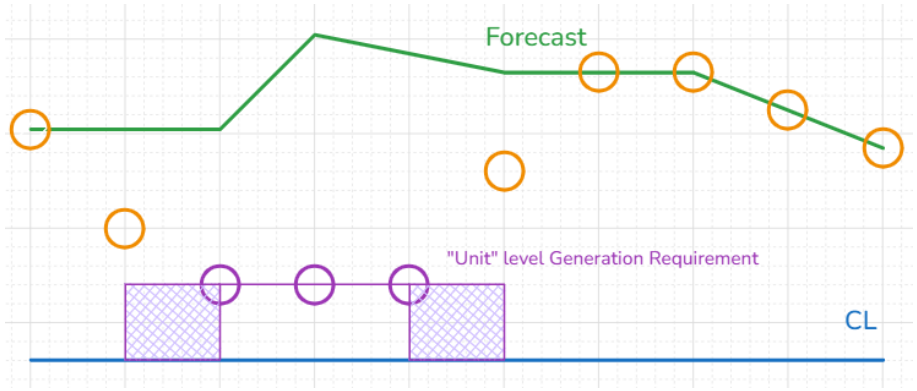


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Modelling Approach for Wind BMUs



“system” level optimisation problem



“unit” level optimisation problem

Two optimisation problems:

1. **“System” level problem (5-minute intervals)**

   Optimises against the forecast to get the most economical combination of wind BMU redispatches to meet the system generation requirement

2. **“Unit” level problems (1-minute intervals)**

   Translates the system-level redispatch targets into CL-based instructions, respecting unit dynamics and calculating redispatch costs against CL.

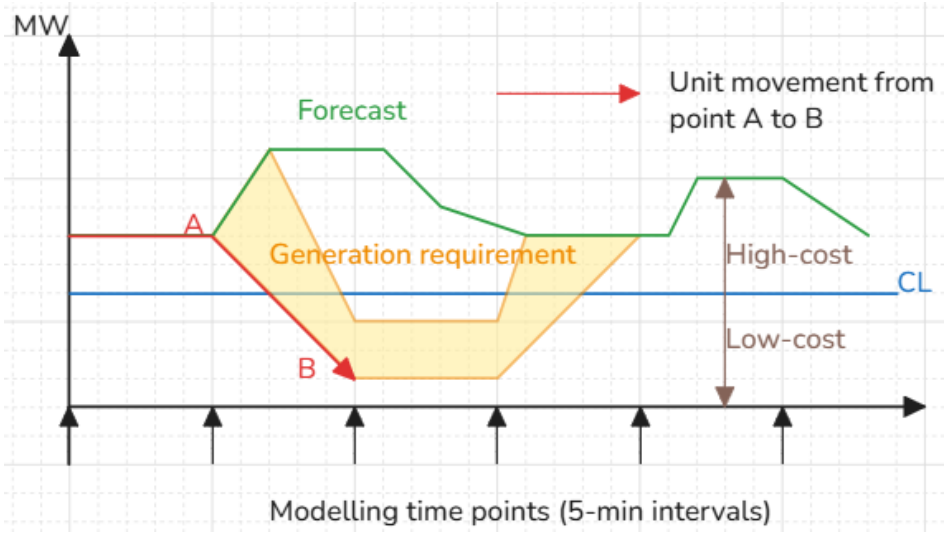
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Solving the "System" Level Problem

When the forecast and CL are close:

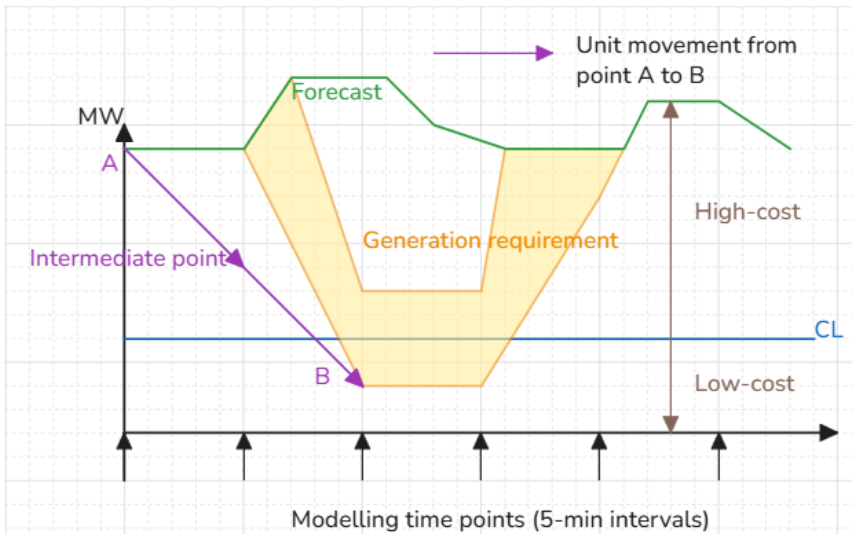
Optimiser sees only the low-cost region for BMUs that can move to the target within 5 minutes.



When the forecast and CL are significantly different:

The modelled transition may pass through high-cost region (optimiser can see high-cost region).

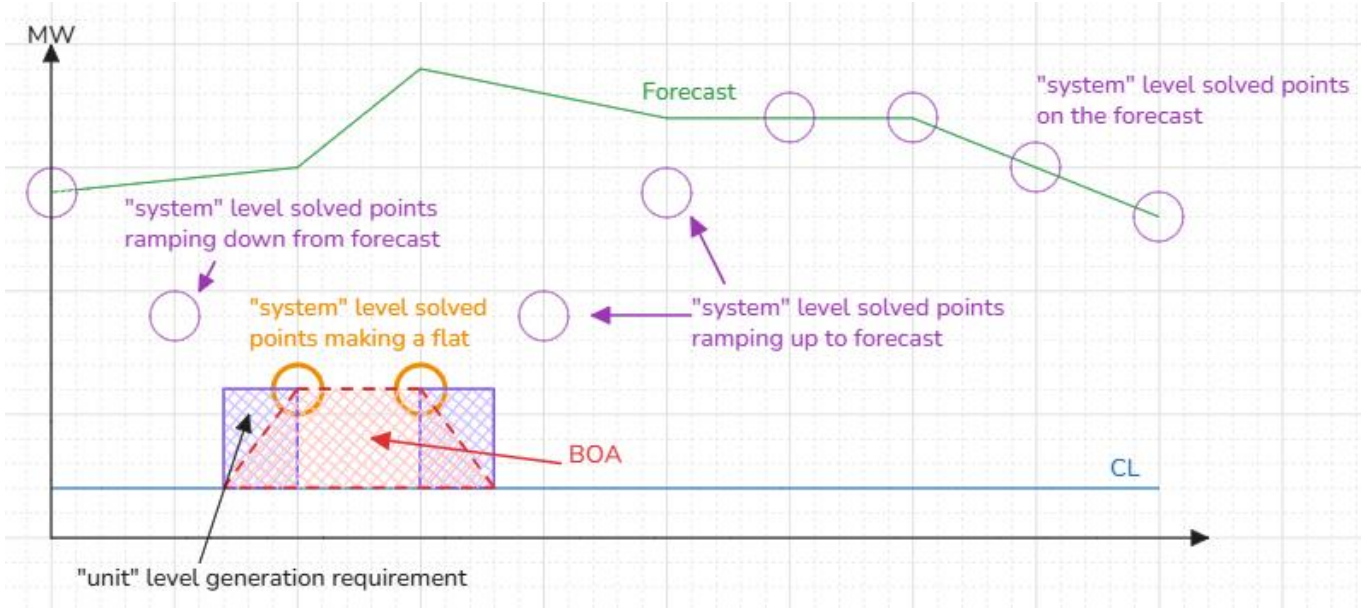
This can make the BMU less likely to be selected.



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Solving the “Unit” Level Problem

- The unit level problem identifies the target operating periods (or “flats”), where generation is required to deviate from the forecast.
    - The following system level solution points are excluded in the unit level problem.
        - points that are on the forecast.
        - points that are ramping up or down from and to the forecast.
- These targets are converted into unit-specific generation requirements, allowing the unit-level optimising to reach the target in the minimum feasible time from CL, while respecting unit dynamics.

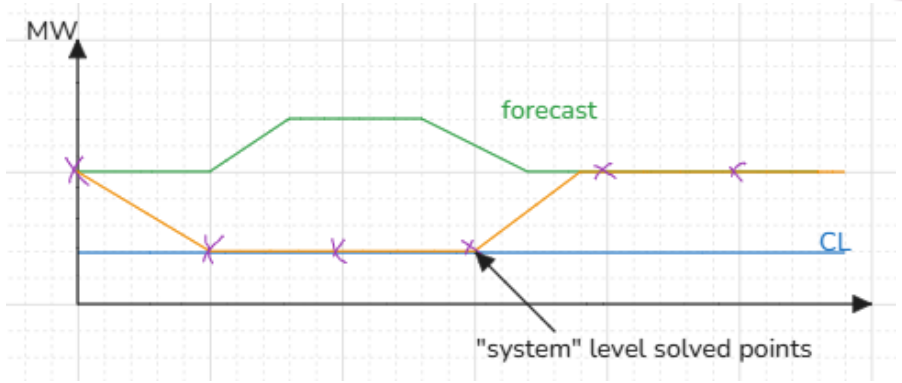


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Edge Cases

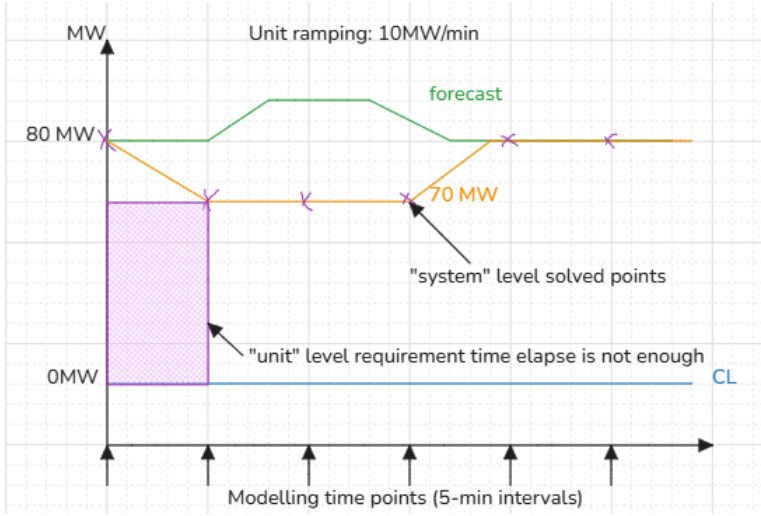
Zero-MW BOA

When the system-level redispatch target coincides with the CL, no generation requirement is created for the unit-level problem, resulting in no BOA being issued. To avoid overlooking zero-MW BOA, an alert is raised.



Delayed redispatch when the forecast and CL differ significantly

When a BMU cannot reach the system-level target from CL within the available time interval, the resulting redispatch may be delayed.



- *Wind BMU modelling will initially be introduced into Balancing optimisation, with subsequent trials and feedback guiding further improvements.*
- *At a later stage, the modelling approach will be extended to support optimisation within a constraint.*

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Q&A

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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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