Public

Battery Storage Forum

4 December 2024

NESO
National Energy System Operator

Introductions

Mili Gupta
Head of Systems, Support & Insight

Cathy Fraser
Head of Market Requirements

Anna Blackwell
Battery Storage Technical Manager

Rich Mather
Battery Storage Strategy Manager

Sangeeta Squires
Portfolio Delivery Office Project Manager

Bea Marques
Customer Experience Lead

Will Seward
Data Engineer

Presenters and Q&A panel

Operations
- **Charlotte Horne:** Customer Strategy Manager
- **Jean Hamman:** Control Future Design Energy and Strategy Lead
- **Scott Bannister:** Power System Engineer

Markets & Ancillary Services
- **Ed Farley:** Electricity Market Development Manager
- **Michael Coldwell:** Market Requirements Future Design and Development Manager

Energy forecasting & trading
- **Catalina Cuzzani:** Short-Term Strategy Manager
- **Priyanka Lodhia:** Trader

Connections
- **William Kirk-Wilson:** Manager, Electricity Network Control Engineering

Balancing programme:
- **Neil Morgans:** Principal Product Manager
- **Leon Walker:** Governance & Insights Manager

Please note, we will be recording today's session.

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Purpose of today

Structure

Main Room (start)

Lunch

Breakout Room 1

Breakout Room 2

Breakout Room 3

Main Room (Q&A, end)

Working together

Updates

Sharing our roadmap

Insight

The dispatch process

Listening

Your ideas, Your concerns

Collaborate

Identify solutions together

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Public

Agenda for the day

WIFI
Name: British Motor Museum
Password: No password required

Main room

You said, we did	10:05 – 10:20
Skip rates definition and exclusions	10:20 – 10:50
Overall roadmap	10:50 – 11:00
Skip rates datasets and engagement	11:00 – 11:10
Your expectations	11:10 – 11:15
Networking, ask us questions	11:15 - 11:45
Lunch	11:45 – 12:45
Battery connections	12:45 – 13:00
Breakout rooms	13:00 – 16:00
Q&A	16:00 – 16:30
Final thoughts	16:30 – 16:45

Breakout rooms

(45 mins each)

NESO Engineers & Systems they use

Market & Ancillary Services

Energy Forecasting & Trading

First breakout	13:00 – 13:45
Break	13:45 – 14:00
Second breakout	14:00 – 14:45
Break	14:45 – 15:00
Third breakout	15:00 – 15:45
Break	15:45 – 16:00
Reconvene in Main room	

How can you engage today?

Join at Slido.com

#BatteryForumDec24

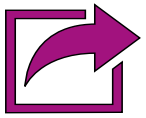
1. **Now:** Tell us what you are hoping to get from today?
2. **Throughout the day:** Utilise the Slido Q&A function.
3. **During breakout sessions:** Verbal interactive Q&A.
4. **To close:** Provide us with your feedback from the day.

We will have a short session before lunch for reflection on key themes that you would like out of today, along with the main Q&A session to close the day.

Q&A via Slido

Please post any questions you have for our speakers on Slido - #BatteryForumDec24 - ensuring to list both your full name and organisation; this will enable us to follow up with you after the event where necessary.

All questions posted in Slido will be published online with answers after the event; this will include any questions we are unable to answer in the session due to time constraints or the need for further information.



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.

Please use the Slido upvote function for questions asked, we will be taking questions in an upvoted order in the Q&A panel session at the end of the day.

Slido will close at the end of the event; if you have any further questions, please get in contact with us at box.NC.Customer@nationalenergyso.com**.**

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You said, we did

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You said…

Communication & responsiveness

"It's difficult to get timely responses from NESO to market participants queries and concerns"

Balancing Mechanism & skip rates

"NESO should publish clear and accurate data on battery dispatch. They should improve dispatch rates for batteries "

IT systems

"Legacy IT systems and manual processes are hindering effective dispatch of low carbon flexible assets. Can NESO deliver IT reforms?"

Transparency & Accountability

"NESO should provide greater transparency in dispatch decisions and reasons for skipping assets, to give confidence in their processes"

Urgent Actions & Reforms

"Grid code changes and interim measures should be prioritised to improve battery dispatch rates"

Consumers Impact

"Dispatch issues are putting billions of pounds of investment at risk and increasing balancing costs for consumers"

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What we are working on

	Reserve Review	GC0166	30-min Storage Rule	BSC P462	CUSC CMP393
What is it	A review of our reserve products in response to industry feedback.	A Grid Code modification introducing new BM storage parameters. Enables NESO to better optimise storage usage.	Individual instructions sent to storage operators are currently limited to 30 minutes (note, multiple instructions can be sent).	A BSC modification that will improve BM and subsidies alignment (e.g. CfDs), reducing market distortion and consumer costs.	CUSC modification proposal to change the definition of Annual Load Factor (ALF) for storage assets, reducing TNUoS charges.
Current status	Current reserve products and requirements	Consultation launched 18th Nov.	Tied to GC0166.	Workgroup considering modification.	Rejected by Ofgem
Next steps	**YESTERDAY** Increased Balancing Reserve holding & penalties regime enhanced Quick Reserve Go Live	Working group to reconvene in January. Exploring how to accelerate benefit.	30-minute rule will be reviewed as progress is made on GC0166.	We will continue to consider the impact of the mod on battery users. Aiming to issue final report to Ofgem Apr '25.	N/A

CEO round table commitments

1.

Release of Balancing Platform dispatch algorithm

COMPLETED
22 October

2.

From start of November critical new resource start in control room

COMPLETED
6 new starters in place

3.

Introduction of new transparency tools by the end of November

ON TRACK
Post System Actions Skip Rate* Monitor live in ENCC

Dataset externally released 16 December

4.

Publish the LCP Delta definition, methodology and full report

COMPLETED
Report published 2 December

Initial webinar on 7 November

5 methodology surgeries run

*Skip rate definitions provided later in deck

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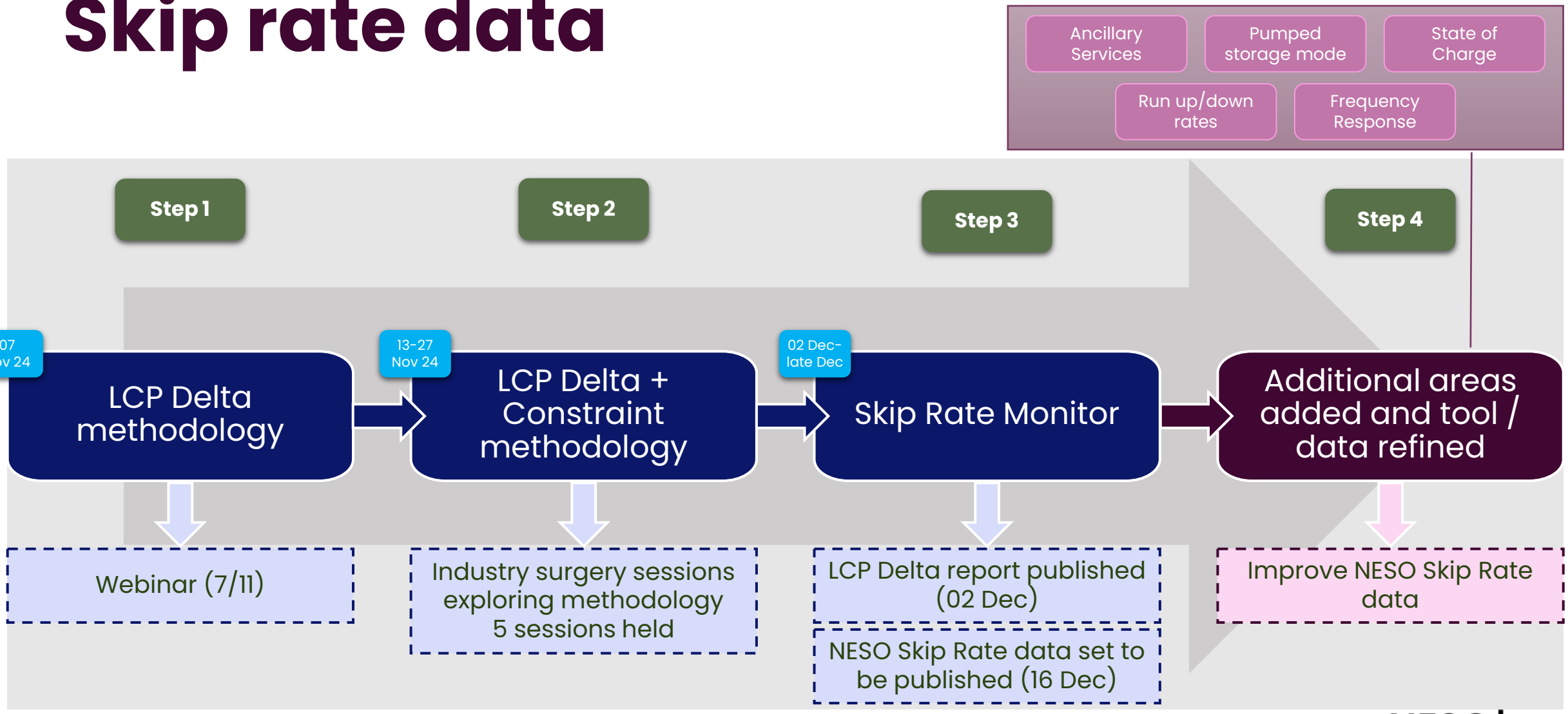
Skip rate data



Skip rates definition and exclusions

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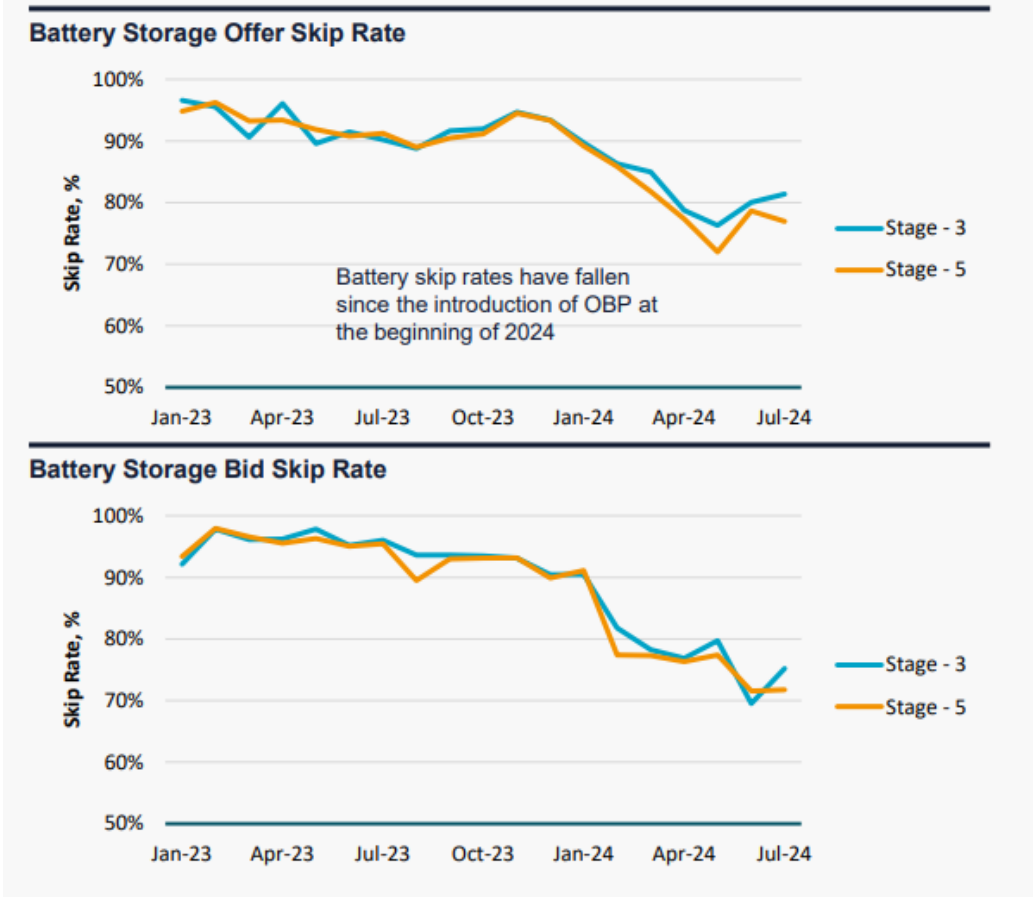
LCP Delta Skip Rate Report

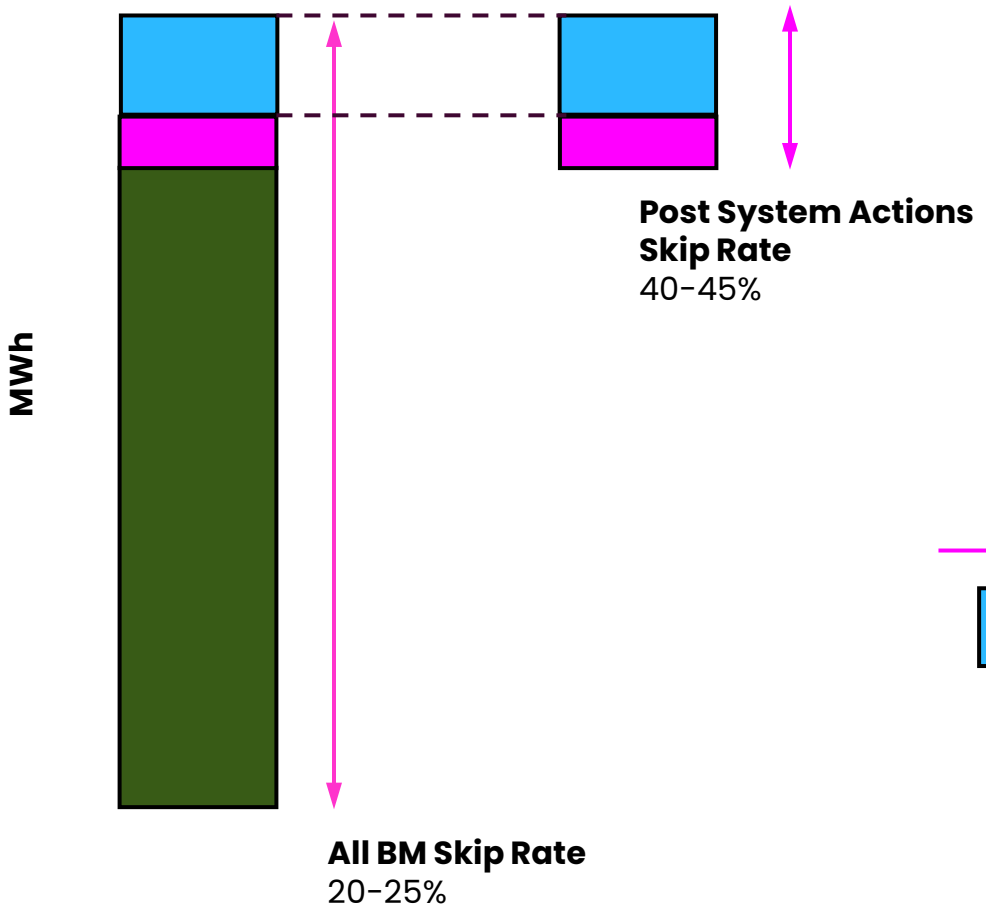
[Skip rates | National Energy System Operator]

Planned webinar for LCP Delta Report

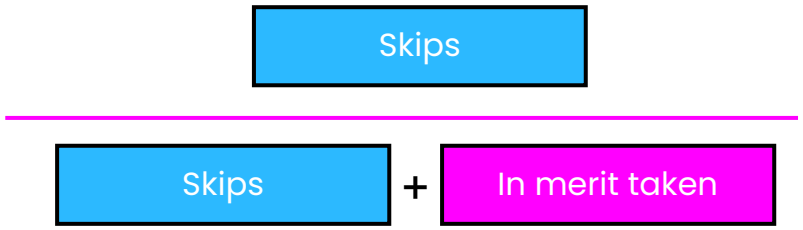


Skip rate definitions

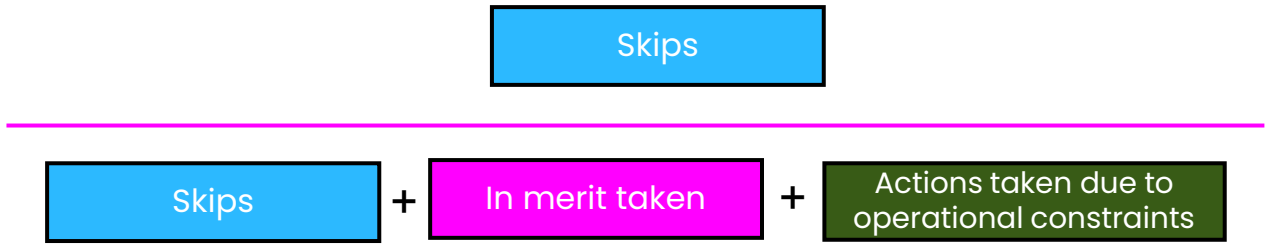
While skip rate changes depending on methodology, the number of skips remains the same



Sample from Offers
12:00 15/11/24-12:00 21/11/24



Post System Actions Skip Rate



All BM Skip Rate

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Skip rate definitions

All Balancing Mechanism (BM) Skip Rate

A measure of unacceptable skips, taking into consideration all BM actions we could have taken over the relevant period.

Calculated by considering the **out-of-merit actions taken by NESO** (which cannot be attributed to NESO's requirement to maintain operational security or respect individual dynamic physical parameters) divided by **the total volume of actions available up to the most expensive action taken**.

Post System Actions Skip Rate

A more targeted measure of unacceptable skips; this measure disregards actions taken for system reasons.

Calculated by considering the **out-of-merit actions taken by NESO** (which cannot be attributed to NESO's requirement to maintain operational security or respect individual dynamic physical parameters) divided by the **total volume of actions not excluded by NESO's requirements**.

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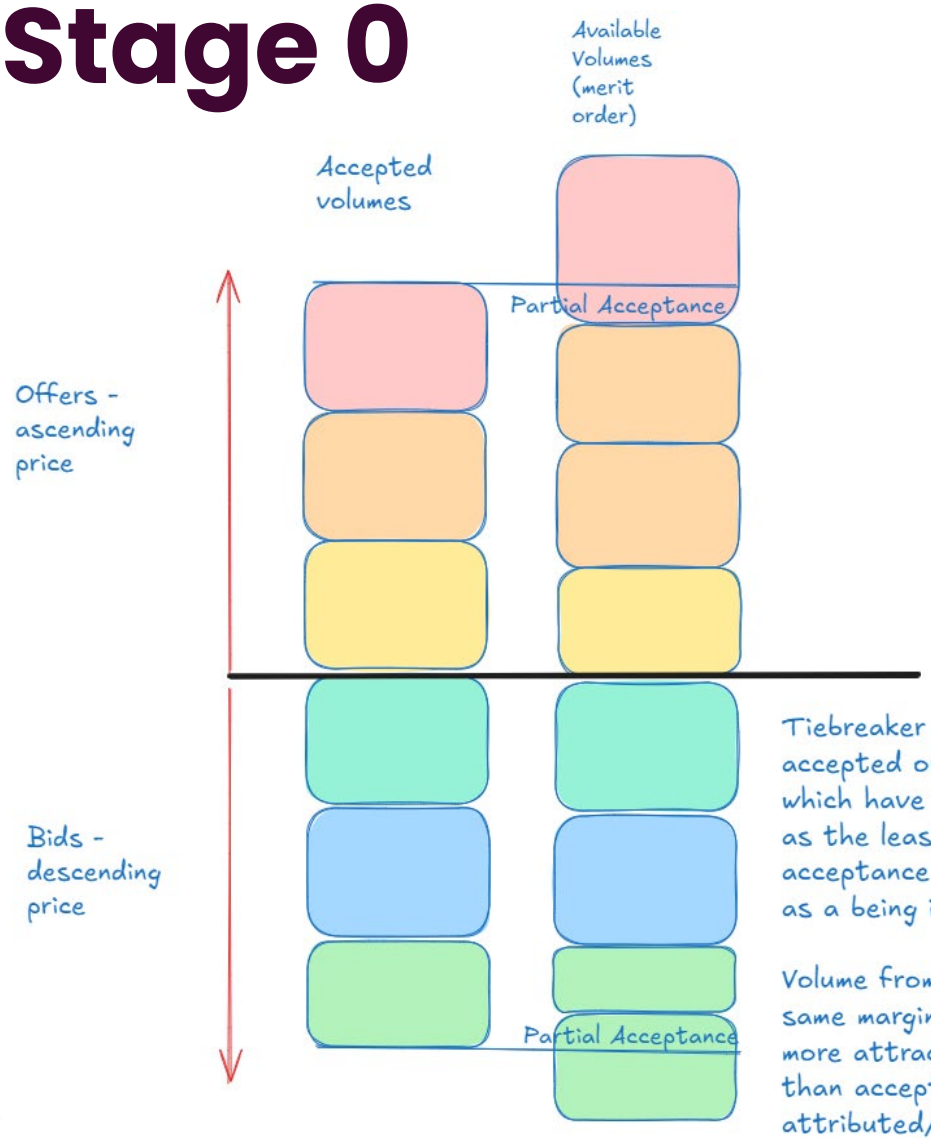
Allocation of volumes from merit order – Stage 0



Tiebreaker rules: BM units accepted or not accepted in merit order which have the same price as the least attractive acceptance will not be recorded as a being inefficient

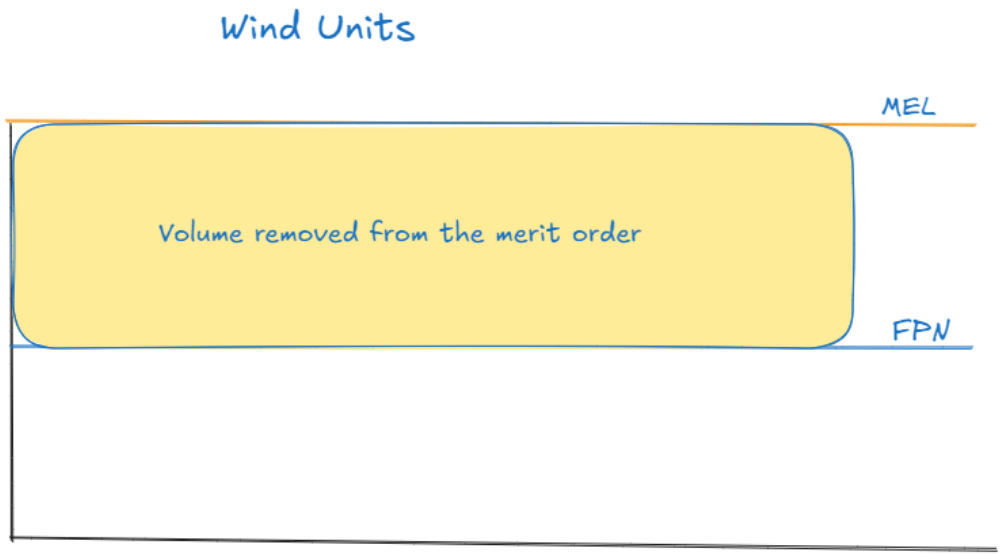
Volume from BM Units which have the same marginal price in merit order but more attractive price than accepted volumes will not attributed/allocated to BM units where requirement is less than available volume

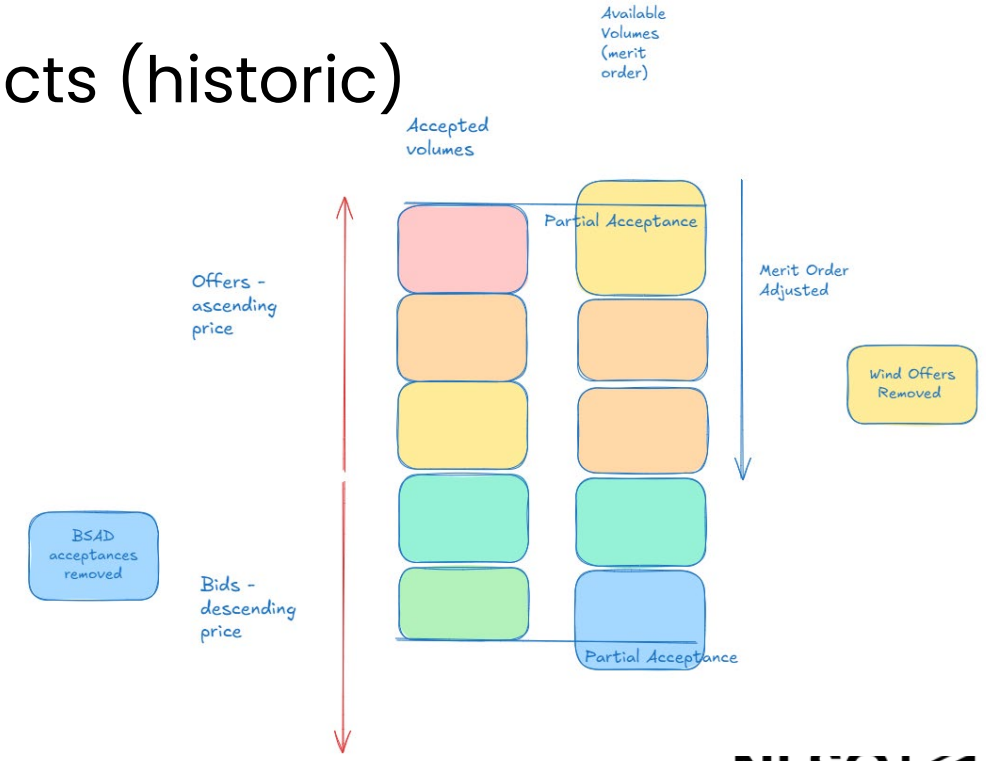
Stage 1:

Offers on Wind will be removed from the available merit order

Balancing Services Adjustment Data will be removed from acceptances (where available)

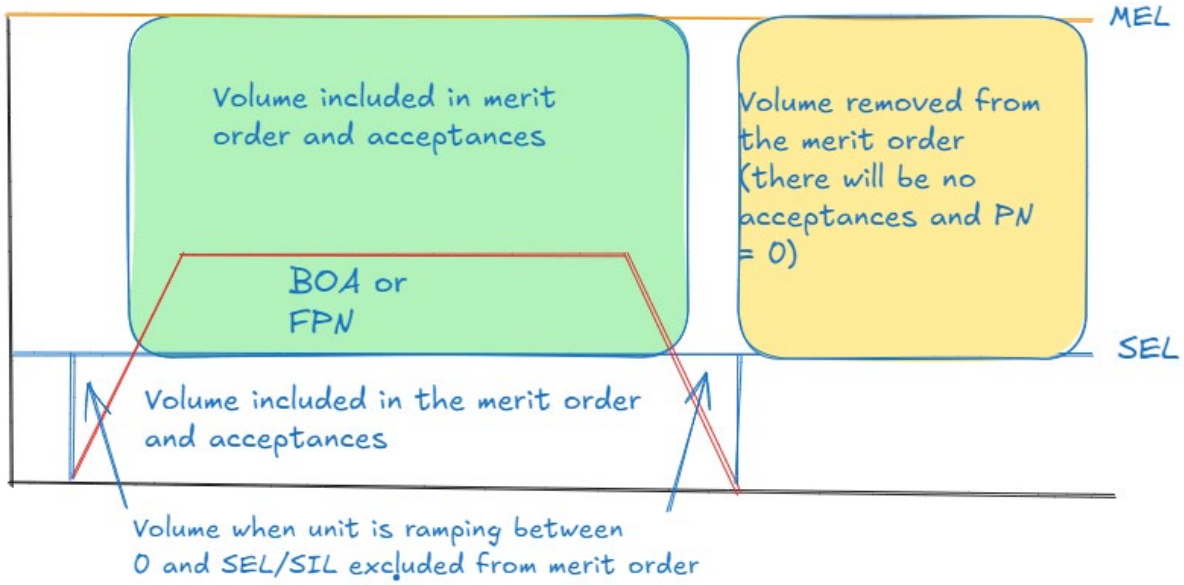
Removed Winter coal contingency contracts (historic)





Stage 2:

Very Long Notice Plant
MNZT >= 12 hours, MZT >= 12 hours, NDZ >= 90



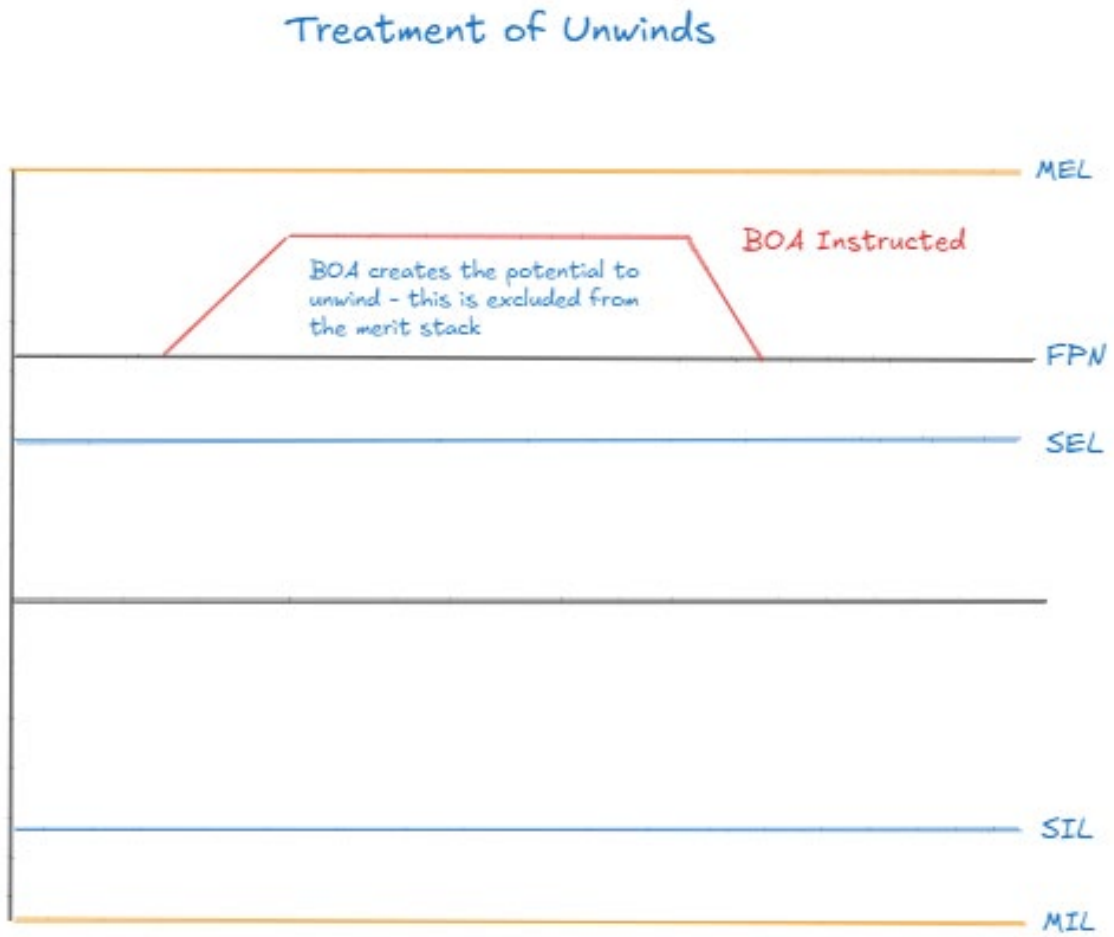
Treatment of SEL/SIL and in-merit action

Stage 3:

Anything tagged as a system action will be removed

Volume which would result in a constraint becoming active will be removed (see previous slides)

Stage 4:



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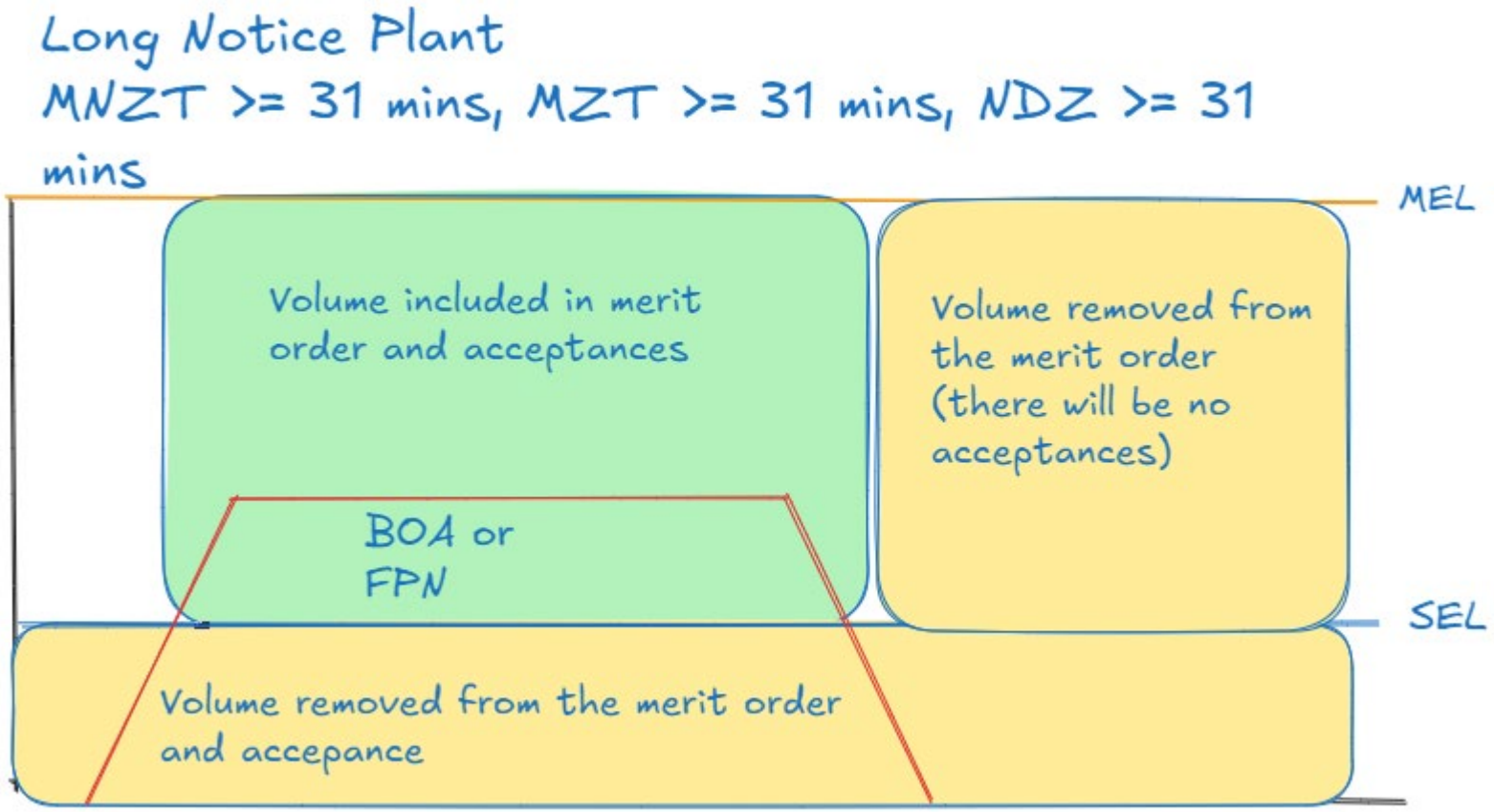
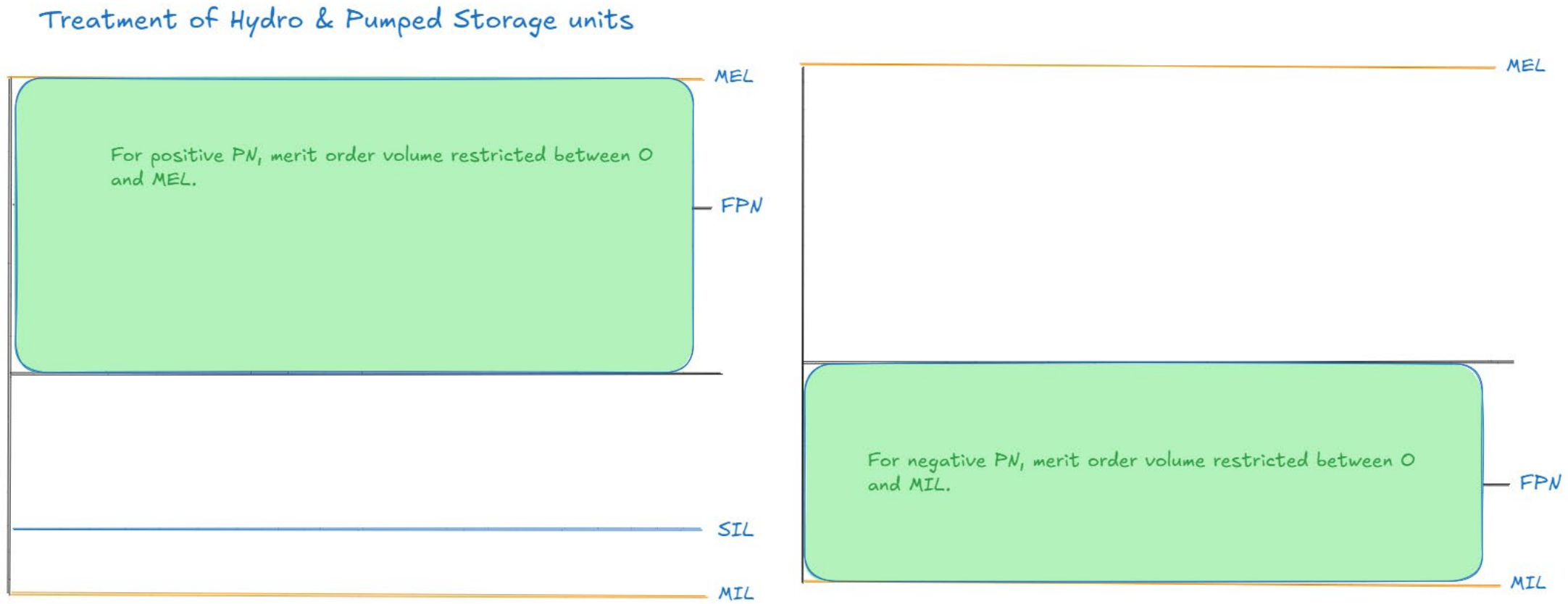
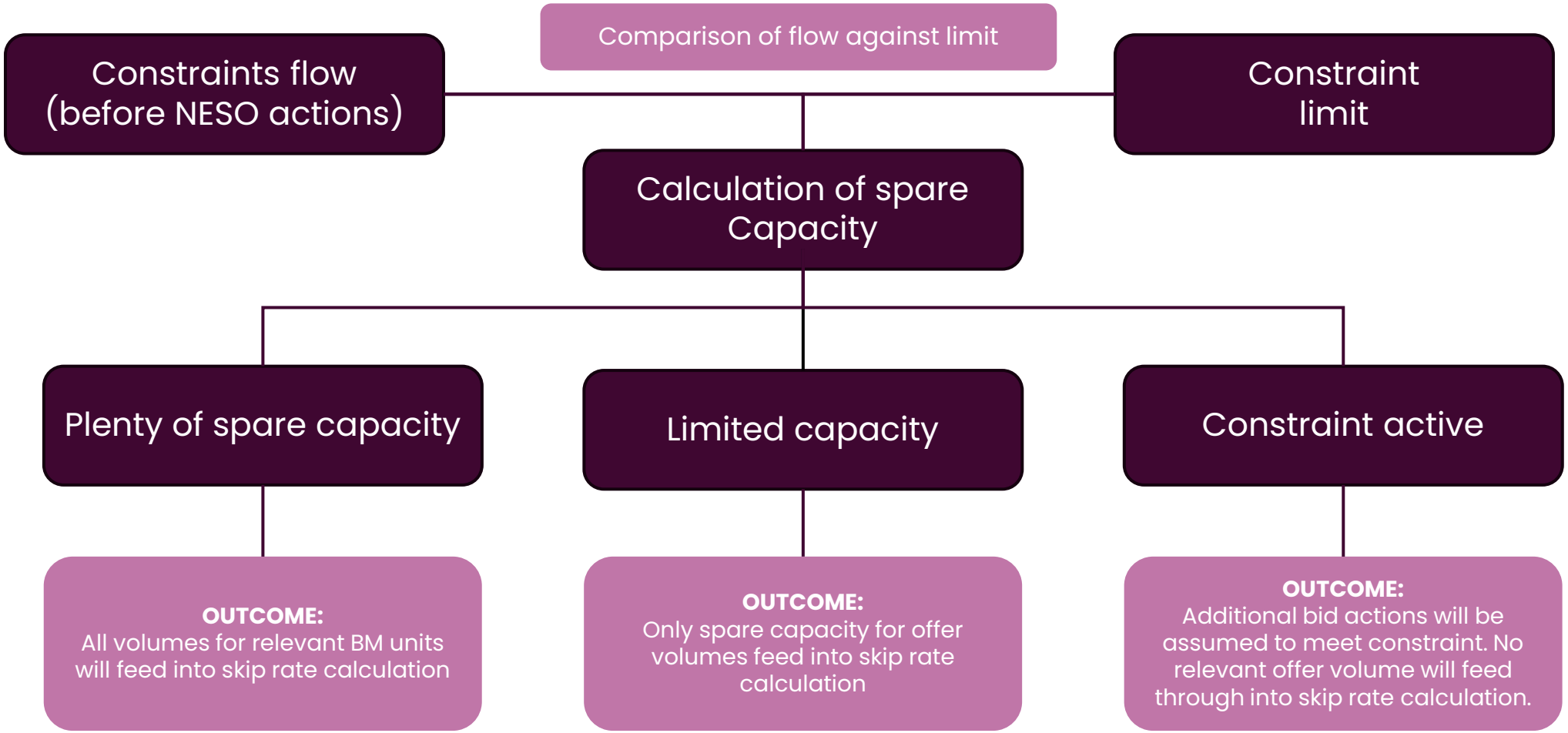
Stage 5:


Long Notice Plant
MNZT >= 31 mins, MZT >= 31 mins, NDZ >= 31 mins
MEL
Volume included in merit order and acceptances
Volume removed from the merit order (there will be no acceptances)
BOA or FPN
SEL
Volume removed from the merit order and accepance

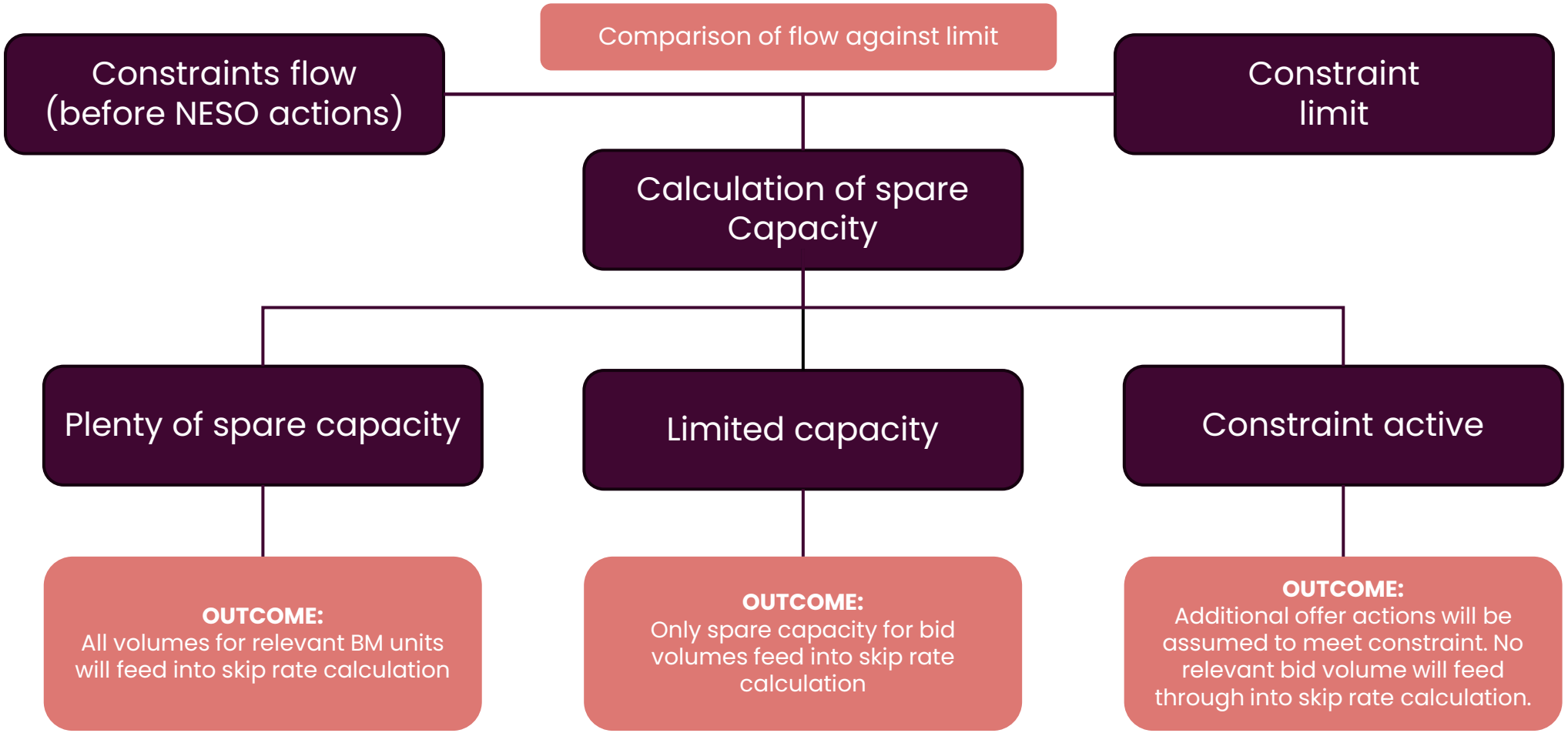
Stage 5:


Treatment of Hydro & Pumped Storage units
MEL
For positive PN, merit order volume restricted between 0 and MEL.
FPN
SIL
MIL
MEL
For negative PN, merit order volume restricted between 0 and MIL.
FPN
MIL

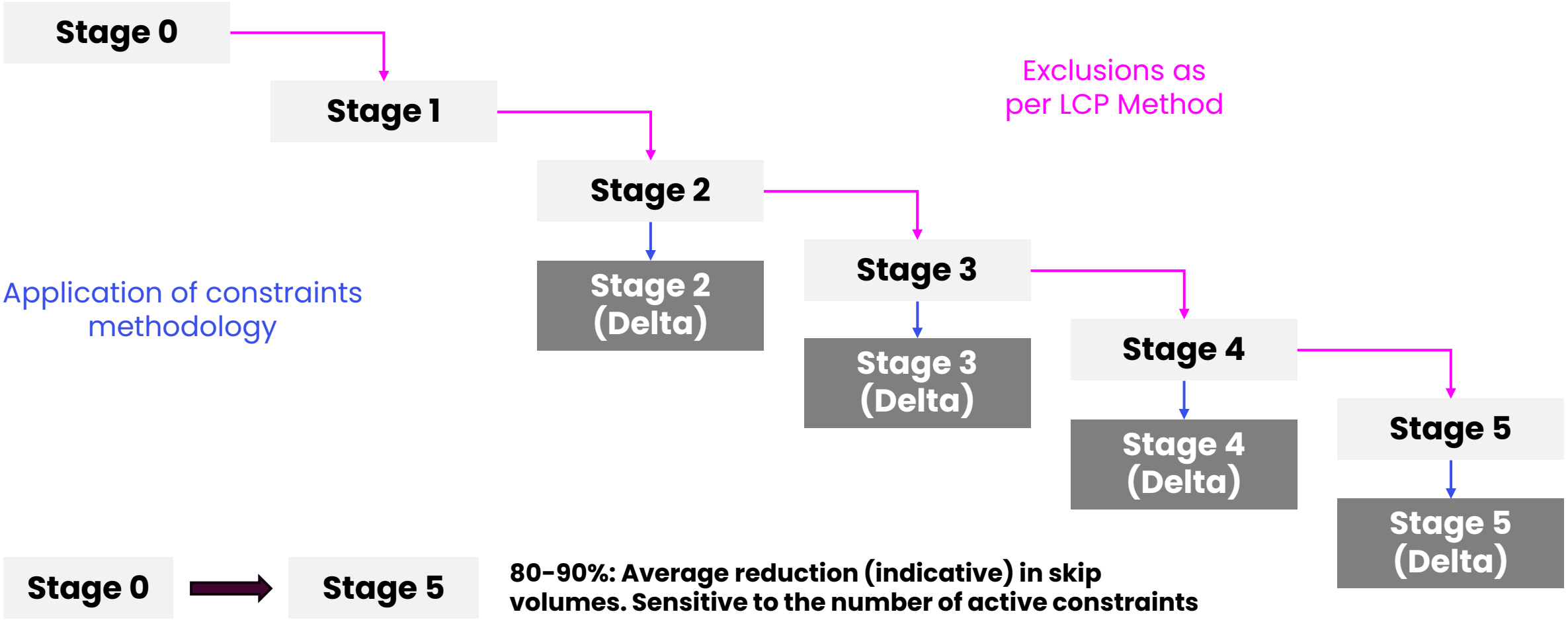
Constraints methodology: export



Constraints methodology: import



Detailing the stages



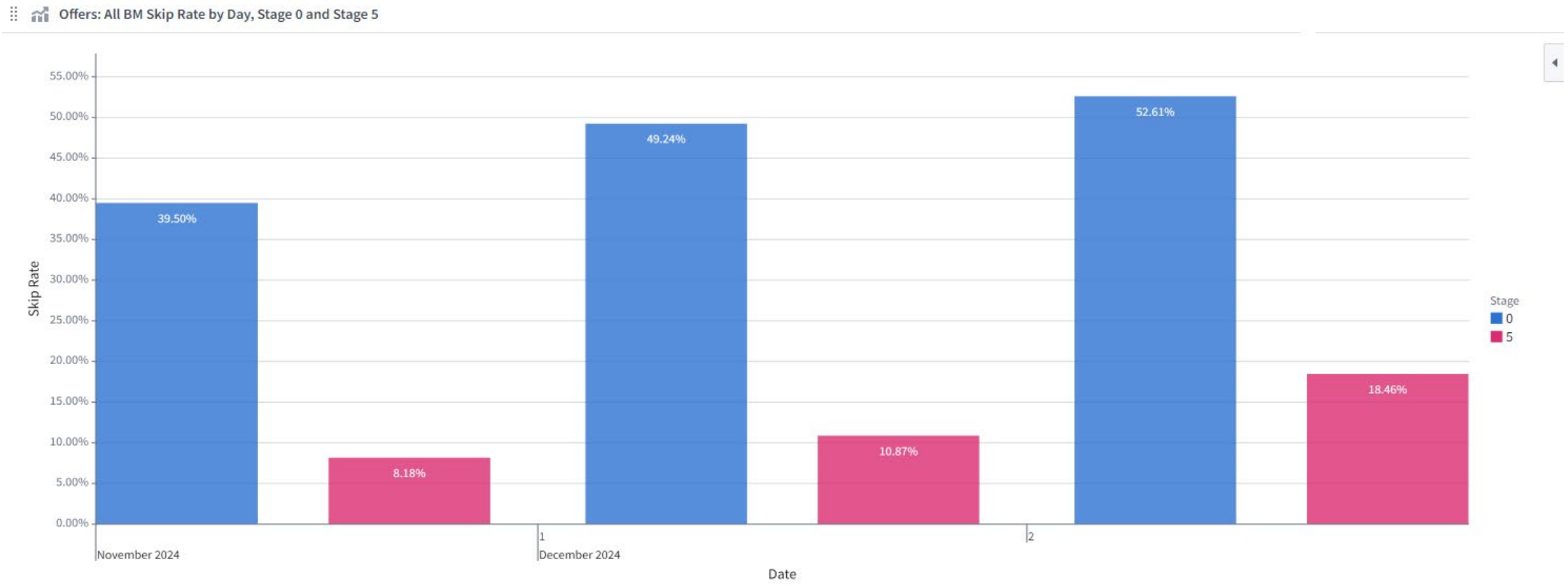
Stage 0 → **Stage 5**

80-90%: Average reduction (indicative) in skip volumes. Sensitive to the number of active constraints

**Note: The Delta is not the same across all stages*

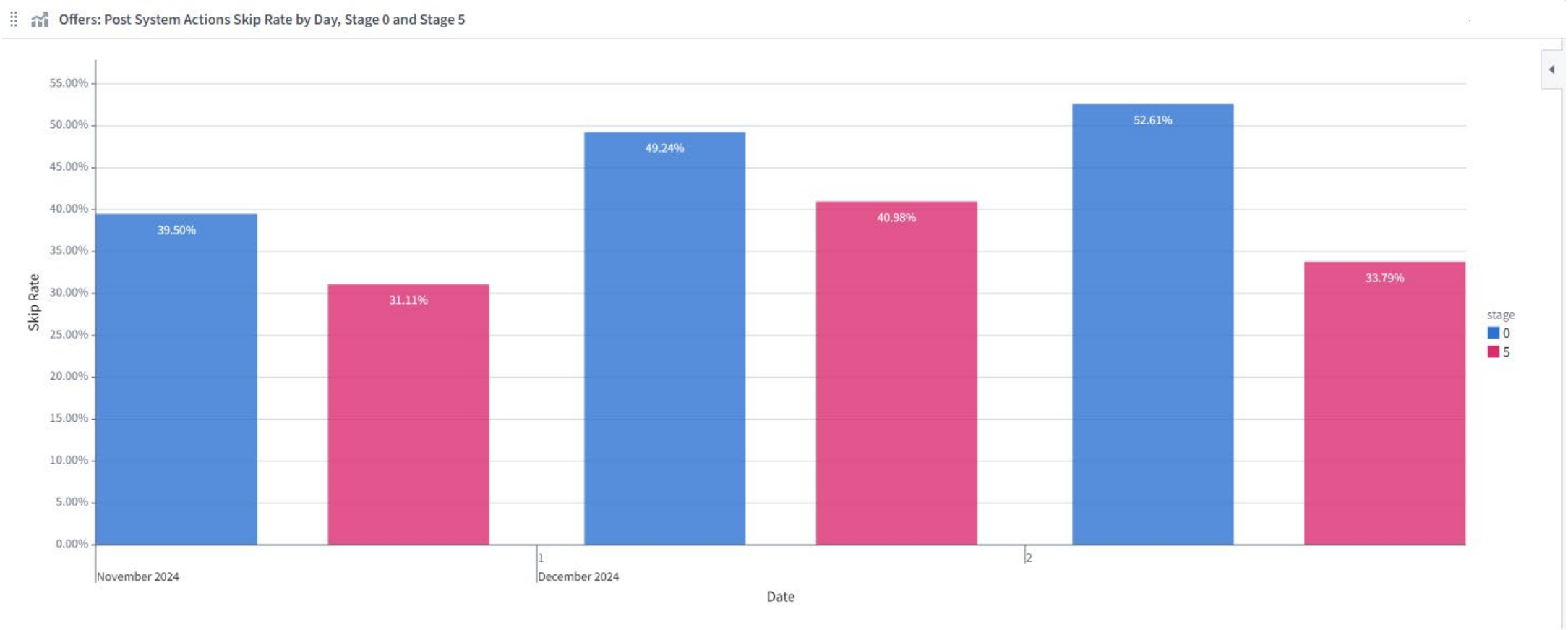
Indicative results – last three days

Offers | **All BM**



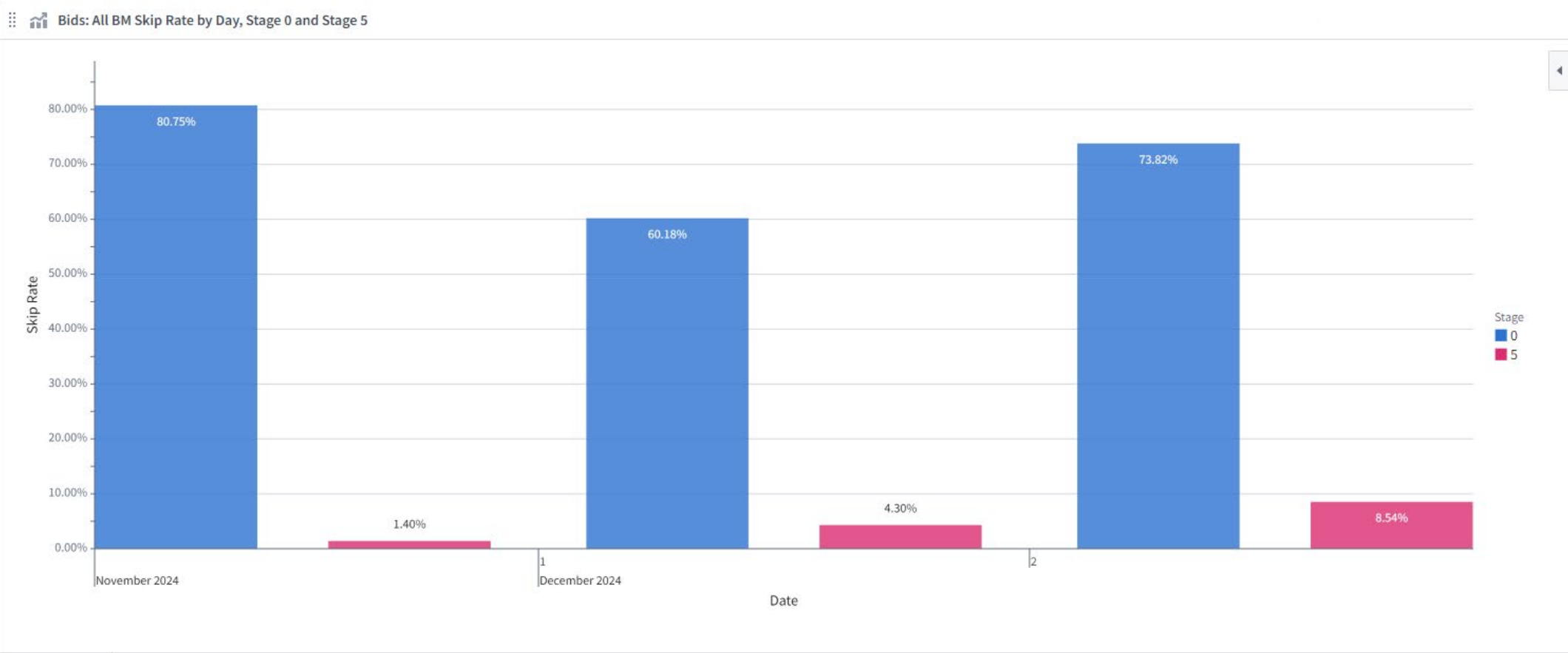
Indicative results – last three days

Offers | **Post System**



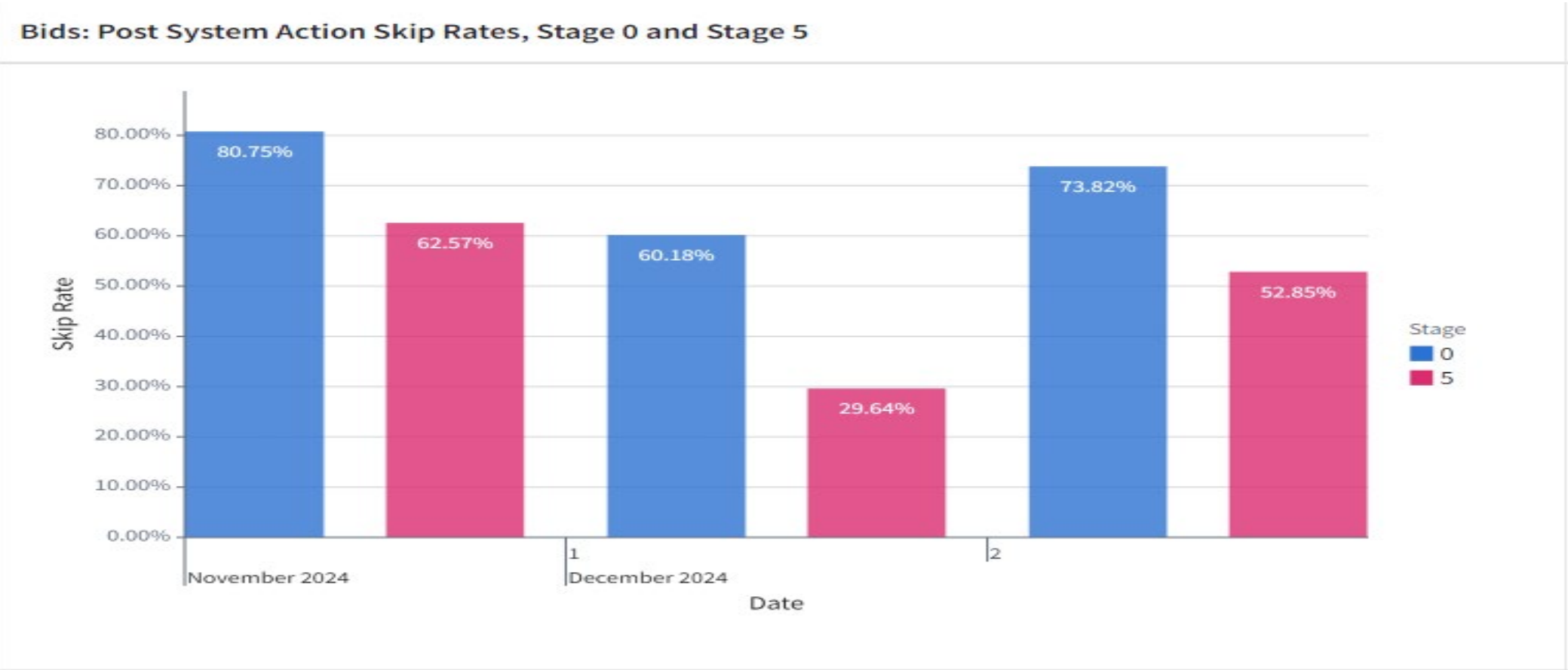
Indicative results – last three days

Bids | **All BM**



Indicative results – last three days

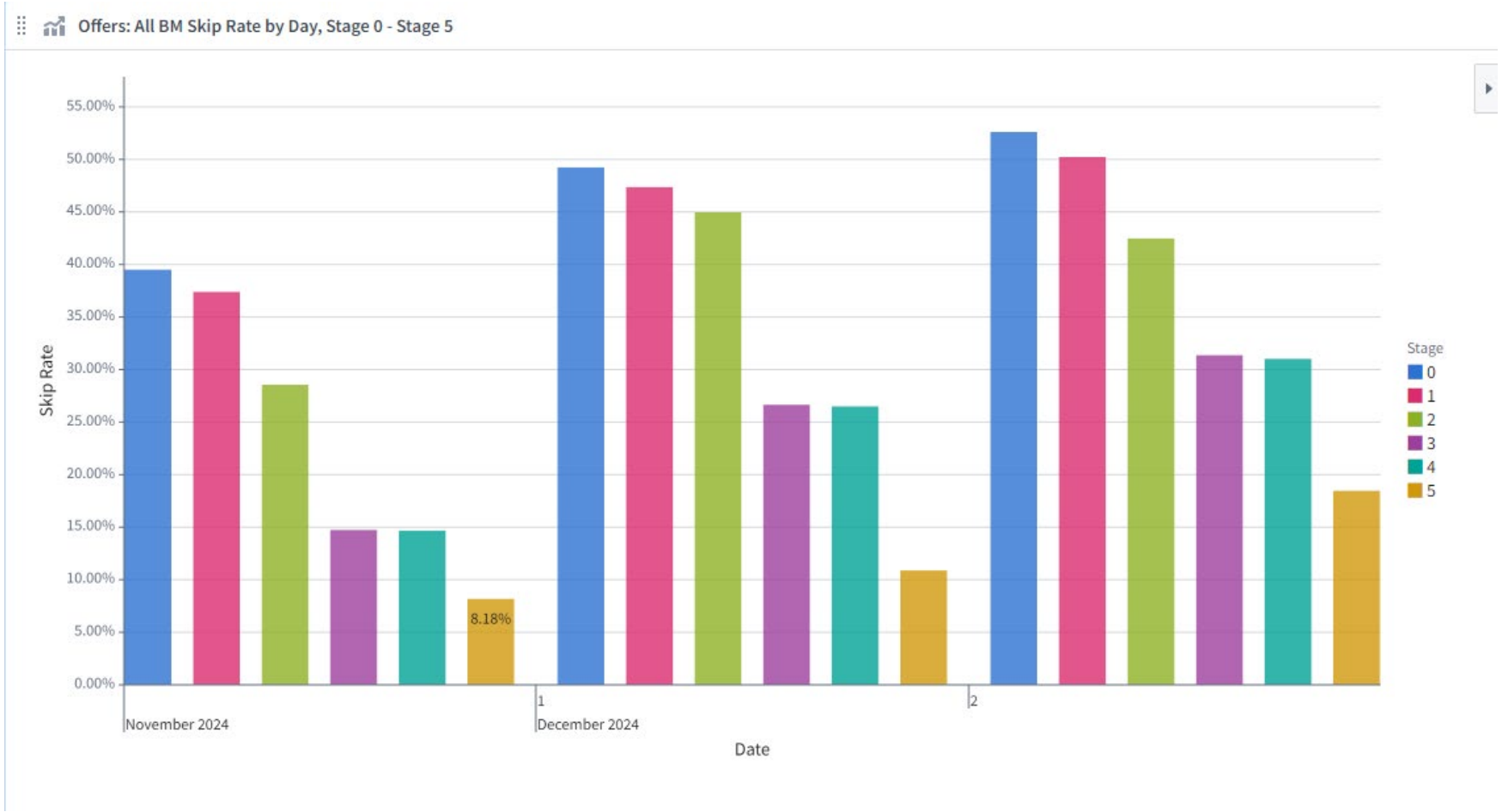
Bids | **Post System**



Indicative results – last three days

Offers

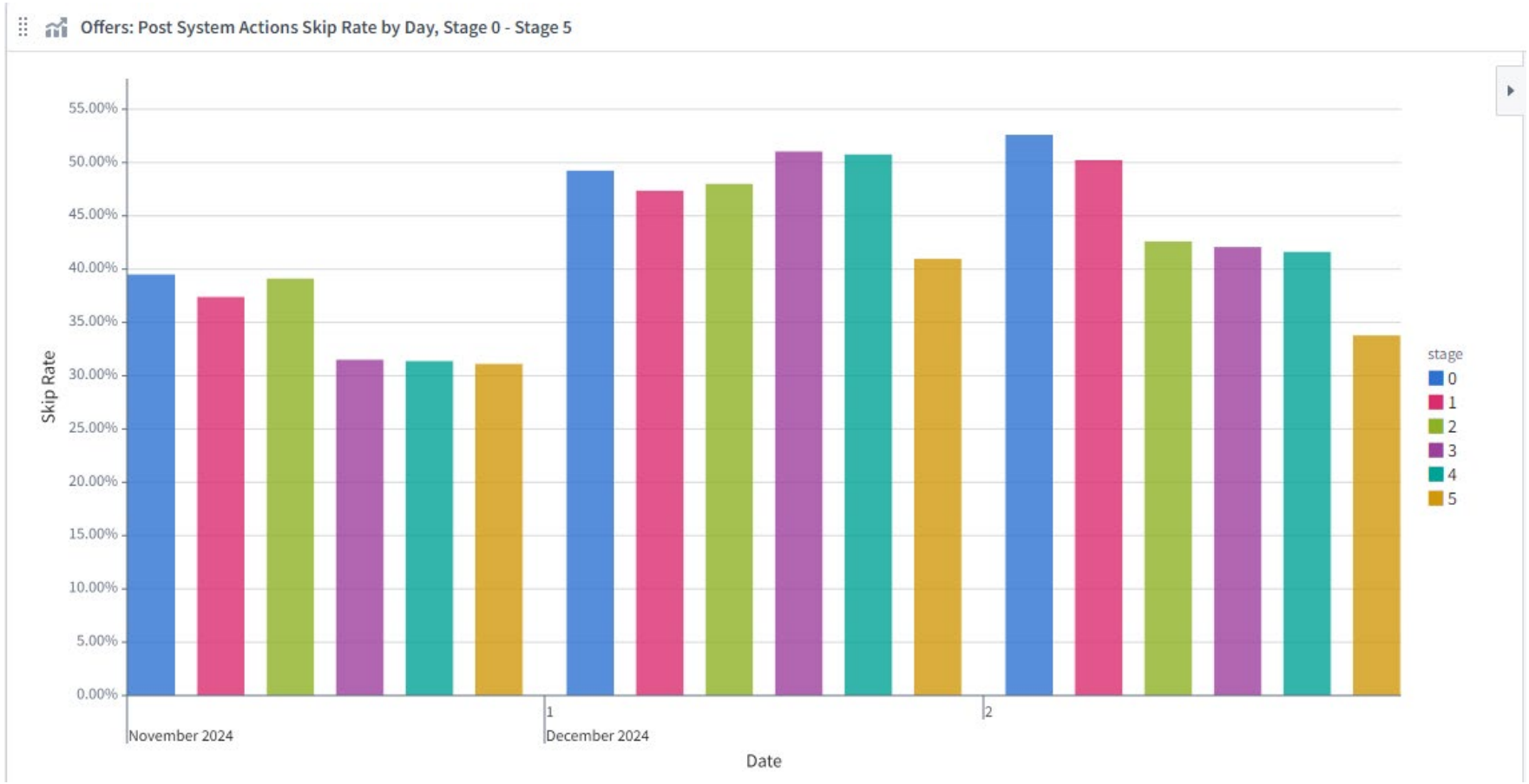
All BM



Indicative results – last three days

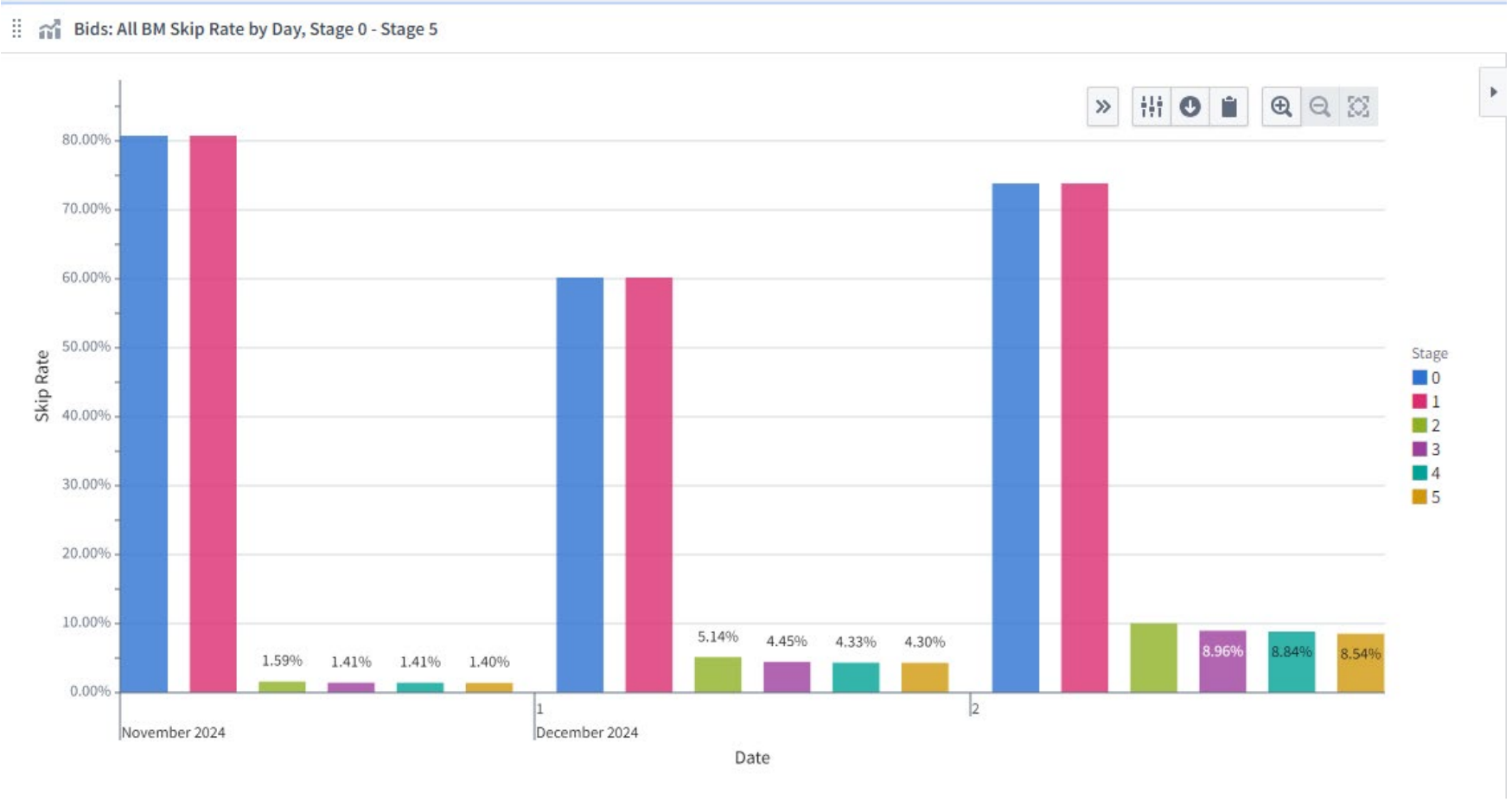
Offers

Post System



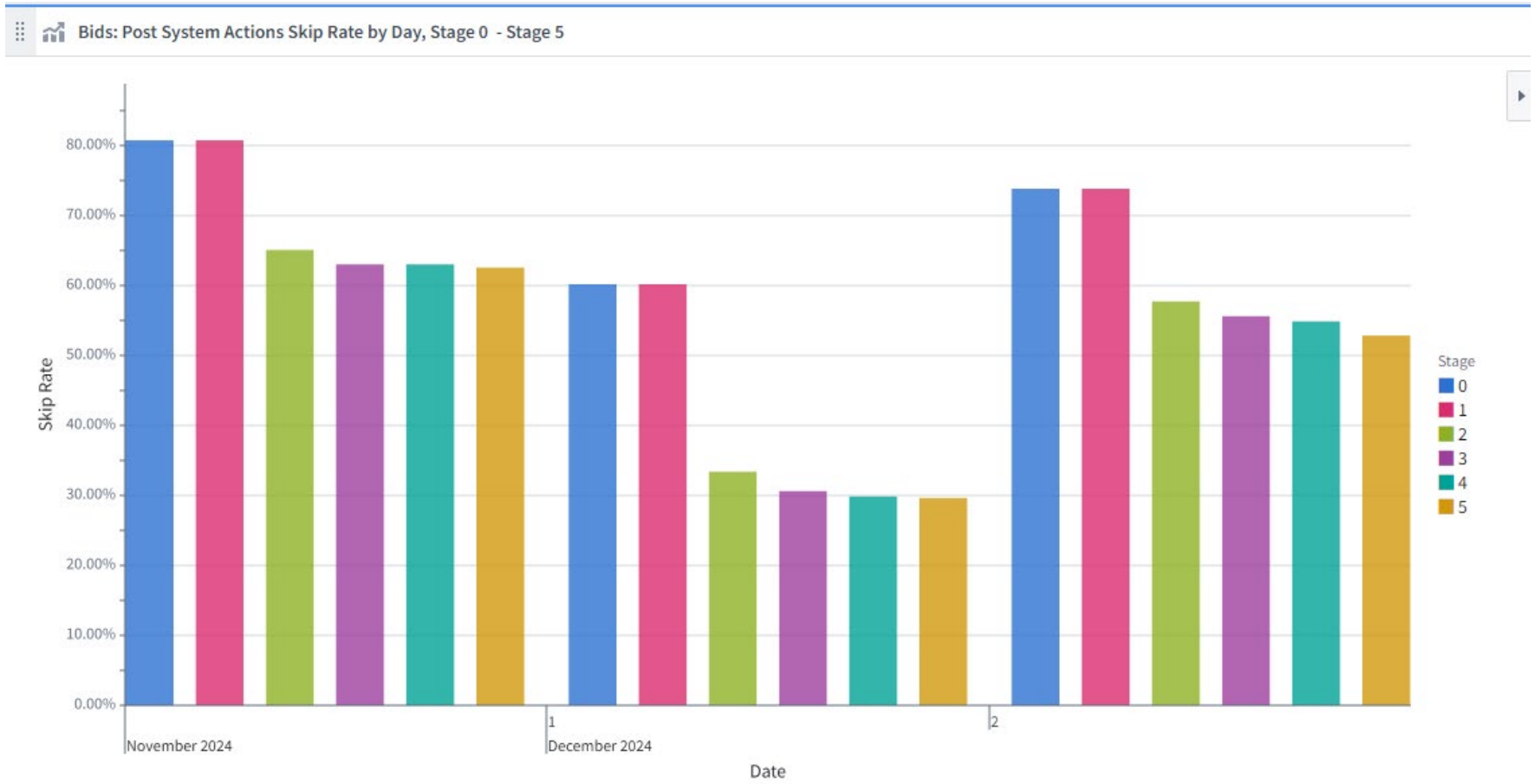
Indicative results – last three days

Bids | **All BM**



Indicative results – last three days

Bids | **Post System**



Overall roadmap

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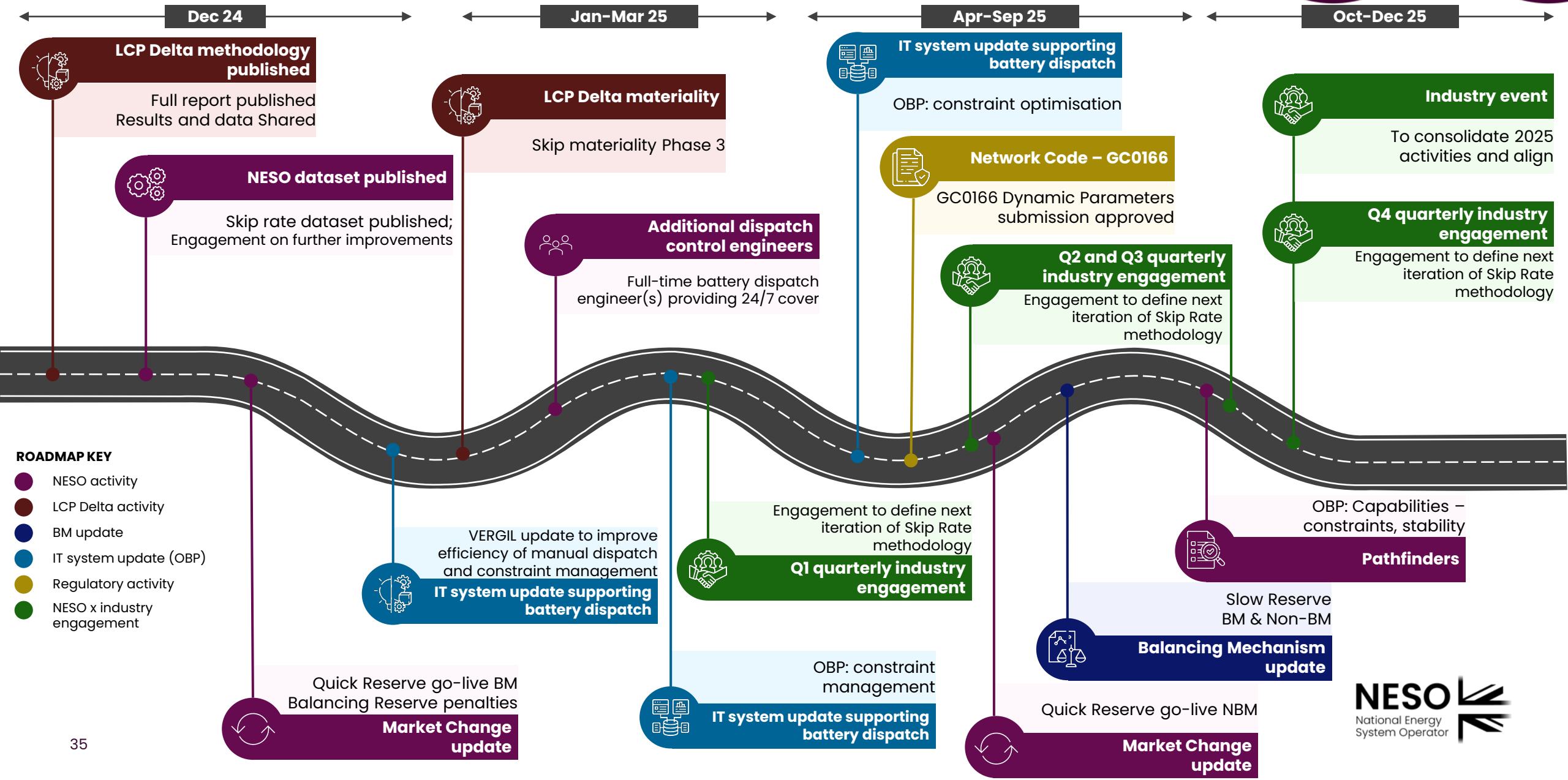
Now to 2026: What we're going to do



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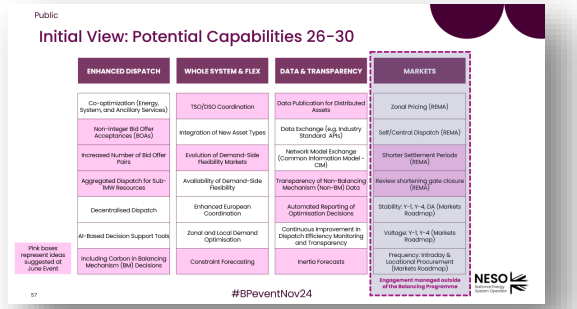
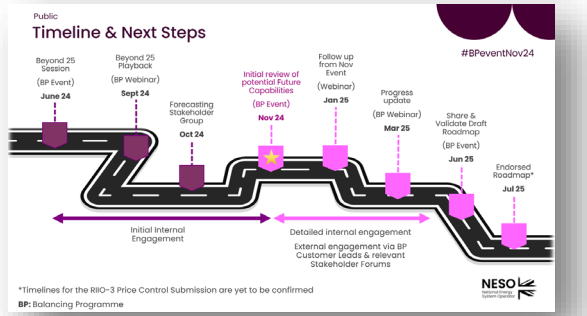
Balancing Programme: Future Capabilities for 2026-2030

Recap of Balancing Programme: Beyond 2025 Session

- At our November event, we discussed future capabilities for the Balancing Programme, focusing on the period beyond March 2026.
- We presented key potential capabilities to gather feedback on their significance, delivery challenges, and familiarity with them.





Please Share Your Feedback:

- Surveys are open until **16:00 on 13 December 2024**.
- Share your thoughts and ideas to shape our future delivery.

For More Information:

- Survey Guide & Capability Descriptions (includes survey links, scoring context, and more details)

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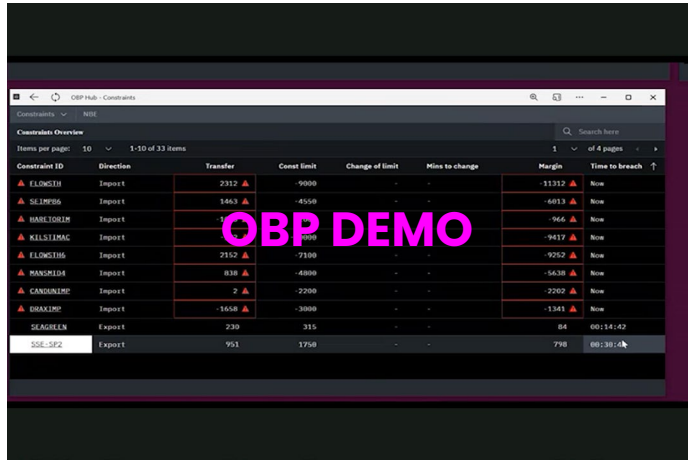
Balancing Programme: Further Information



Covers Constraint Management screens, Fast Dispatch & UI updates

Includes overview of Legacy Dispatch Algorithm changes and Constraint Management overview

Contents from the Nov 27th event

Key Resources:

- Constraints for Non-Power System Engineers
- Balancing Programme Publications
- Subscribe to Our Newsletter: Select *Future of Balancing Services inc. Balancing Programme*
- Join Our Stakeholder Focus Groups: Optimisation, Technology, & Forecasting
- Contact Us: For any other queries, email us.

Skip rates datasets and engagement

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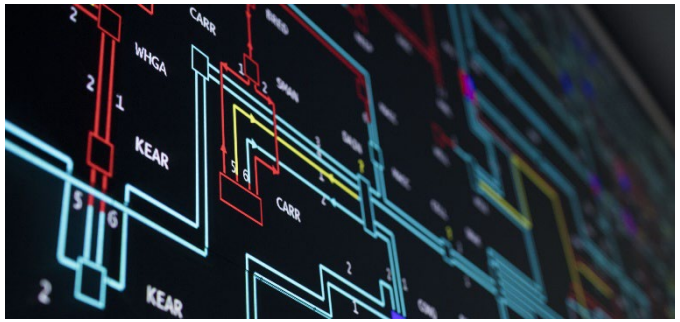
Skip rates datasets

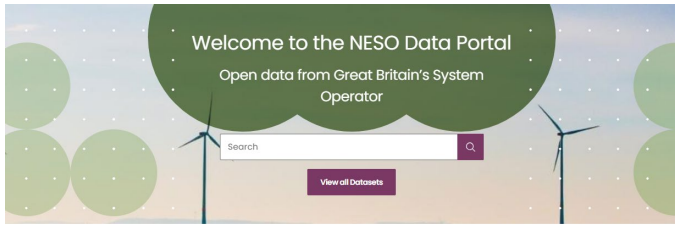
We are continuing to work on our new dataset to ensure it meets NESO's and our stakeholders' needs.

It will be based on the LCP Delta Methodology and applying constraints

It will be made up of 3 feeds of data

It will be published once a day at D+1





- We will share this **new dataset** on the **NESO Data Portal** and it will be usable via **API**.
- We will share an **FAQ document** to explain key information and answer critical questions. This document will be **regularly updated**, after data releases.
- We will continue to **update the methodology** over the coming months, to apply the **remaining exclusions** to the data and provide a **clear understanding** of the reasons **why actions are taken** in different orders.

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What we want to publish

December 2024

- All BM Skip Rate (% & MWh)
- PSA Skip Rate (% & MWh)
- Methodology
- List of Implementation Criteria
- LCP Report
- Roadmap of Recent Changes and Future Changes

WILL PUBLISH LATER

- Datasets (Assets at Each Stage)
- PSA Skip Rate without constraints

Phase 3 work with LCP

- Materiality of Skips

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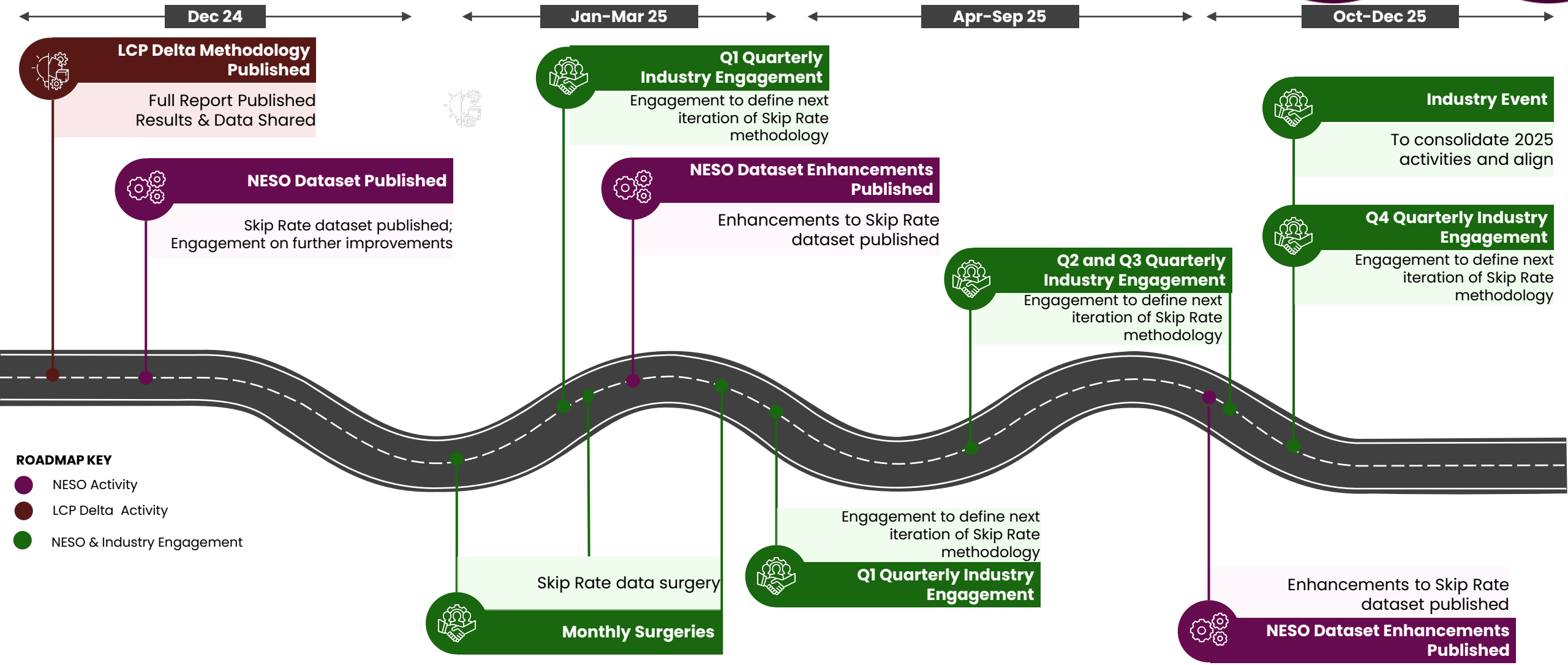
Now to 2026: how are we engaging with you



Skip rate data queries

Queries should be directed to .box.NC.customer@nationalenergyso.com and **not individuals** you have **contacted previously** on this or control room colleagues.

If you think your data is misrepresented in this dataset, **please reach out via the above email** and we will **seek to support** on this.

We will be **unable to answer** questions on reasons **why specific units have been skipped**, where we have **multiple similar style queries**, we will respond via the publicly available **FAQ**s.

Operational queries continue to be directed to **existing operational channels**, and will **not deal with skip rate questions.**

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Reviewing today's expectations

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Networking, ask us questions

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Lunch

1. Please make your way to the main hall for lunch

- Vegan, vegetarian and gluten free options are available, please speak to a member of staff if you have any questions.
- Café Situated on the first floor (Junction 12 Café) that serves a range of hot and cold meals, snacks and drinks, freshly prepared onsite.

2. Please return to the main room after lunch.

Battery Connections

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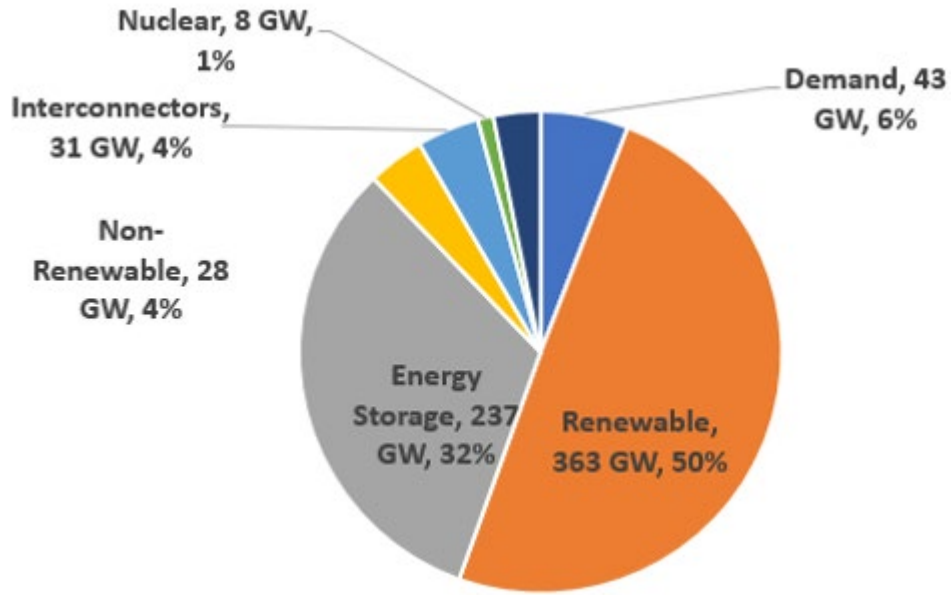
The queue is very big

Connections queue summary – July 2024

	September		Transmission		Distribution	August
Total Contracted Connections Offer (GW)	732 GW	=	559 GW	+	172 GW	722 GW
Total Contracted Connections Offer (GW) - (Export & Storage)	688 GW	=	540 GW	+	149 GW	675 GW
Total Contracted Connections Offer (GW) - Demand	43 GW	=	20 GW	+	23 GW	47 GW
	September		Transmission		Distribution	August
New Applications Received	23 GW	=	6 GW	+	17 GW	29 GW
	September		Transmission		Distribution	August
New Connections Offers Accepted	16.63 GW	=	12.33 GW	+	4.3 GW	16.76 GW
	September		Transmission		Distribution	August
Total Connections Delivered	0.89 GW	=	0.62 GW	+	0.27 GW	0.35 GW

T&D queue by customer/ technology type



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Networks are progressing many tactical initiatives…

CMP376 Queue Management
Nov 23 – Dec 24

Technical Limits P1 30GW
Jan 2024

10 GW Accelerated Storage
Jan 2024

CMP 427 Letter of Authority
Mar 2024

Connection Reform Mods (CMP434 / CM095, CMP435 / CM096)
Apr 2024

CAP Package 2 underway
Apr 2024

Technical Limits P2 16 GW across 72 GSPs
Q2 – Q3 2024

Technical Limits Scotland 26 GSPs 216MW
Q2 2024 – Q1 2025

Securities waiver for unsigned 2 Step and BAU offers
Aug 2024

Transitional Phase 1 (new direct transmission connection applications)
Sep 2024

Rollout of Reallocation of Capacity for DNOs
Q3 2024 – Q1 2025

CAP – Bay sharing policy
Oct / Nov 2024

BCA / BEGA Guidance
Nov 2024

Third Party Works Guidance / interim action
Q4 2024/Q1 2025

Transitional Phase 2 (Mod Apps, BEGA / BELLA, PP etc)
Q4 2024

CAP – Enabling Works / Updated Connect & Manage Guidance
Dec 2024

Accelerated Storage Scotland –
Dec 2024

Monitoring and Exit of 'Zombie Projects'
Nov 2025

D **Distribution**

T **Transmission**

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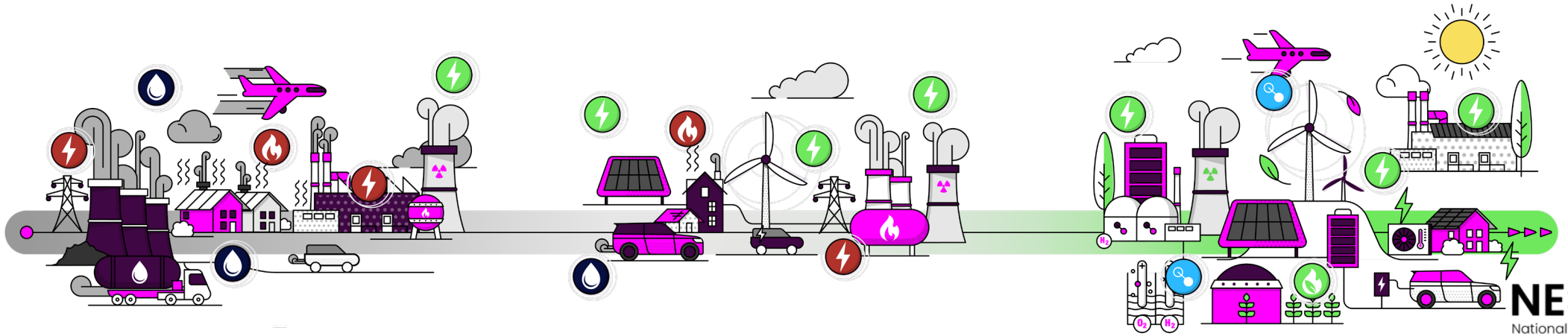
Even with all this, more is needed

- **Industry interventions successful, but the queue is still a significant barrier**
- **Total connections queue is > 700GW**
- **We need to go even further => Clean power 2030 and Connections reform**

What Government asked NESO to do

- **The Government has an ambition for Britain to be supplied with clean power by 2030.**

- **The National Energy System Operator was asked to provide independent advice on the pathway towards the 2030 ambition.**



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CP30 headline findings

- **Clean power by 2030 is achievable** - though outer edge of feasibility. It will be a herculean effort.
- **Clean power will require doing things differently**, establishing and maintaining momentum every year to 2030
- **Clean power can bring benefits for GB**
- **Broad stakeholder support for analysis**

Connections reform (TMO4+)

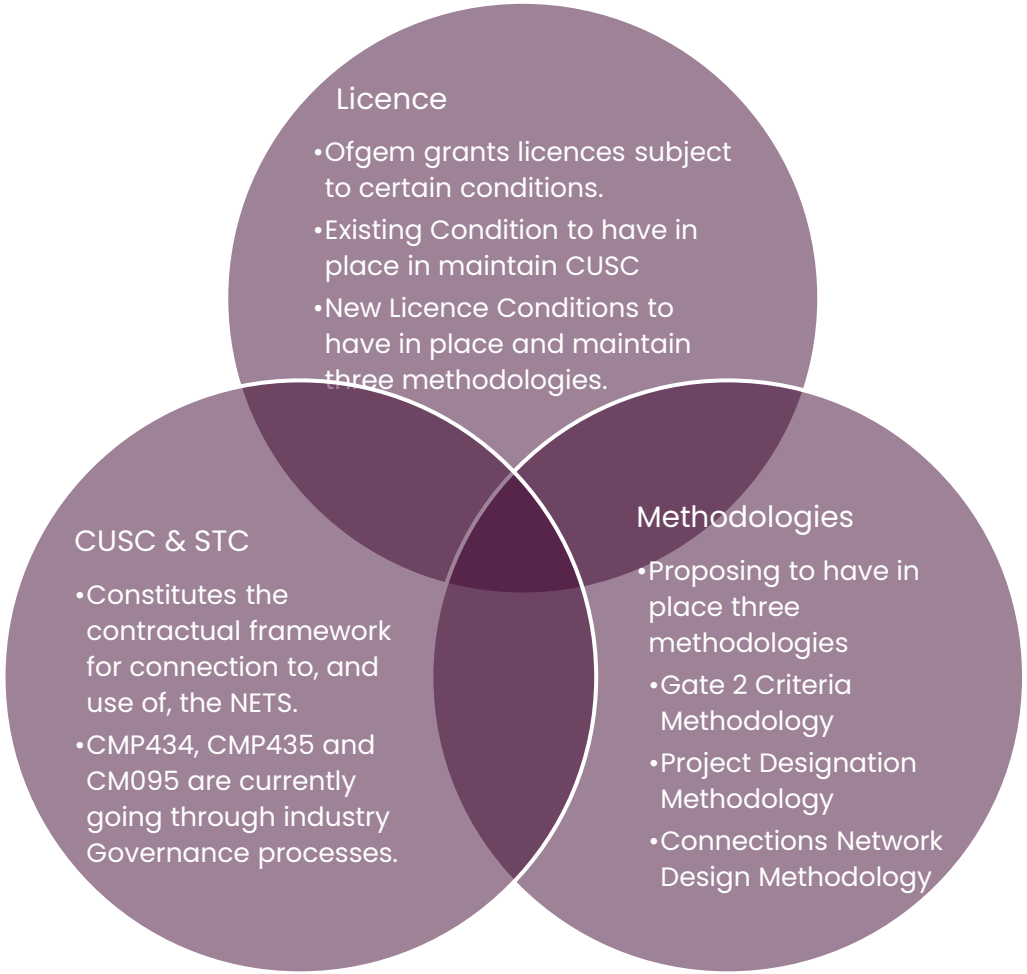
Gate 2 to the whole queue, transmission and distribution

TMO4+ Key Points
First ready, first needed, first connected approach
Gate 1 = Indicative connection dates and points (mainly transmission)
No user commitment or queue management milestones for gate 1 projects
Gate 2 = Queue positions, user commitment, QM milestone, connection dates and points
Existing queue given time to demonstrate Gate 2

Analysis suggests that:

- **Earlier connection dates for projects that meet Gate 2.**

Giving effect to Connections Reform



1. Gate 2 Criteria Methodology - Detailed Document

Purpose: Establish what projects make it into new queue
Focus: Appropriate Land rights (including Development Consent Order (DCO) submission)

2. Project Designation Methodology - Detailed Document

Purpose: Establish what projects are prioritised in the new queue
Focus: Which types of projects could be designated and prioritised

3. Connections Network Design Methodology - Detailed Document

Purpose: Establish the ordering of the new queue and determine reinforcement works
Focus: Queue formation, study approach, capacity reallocation following termination

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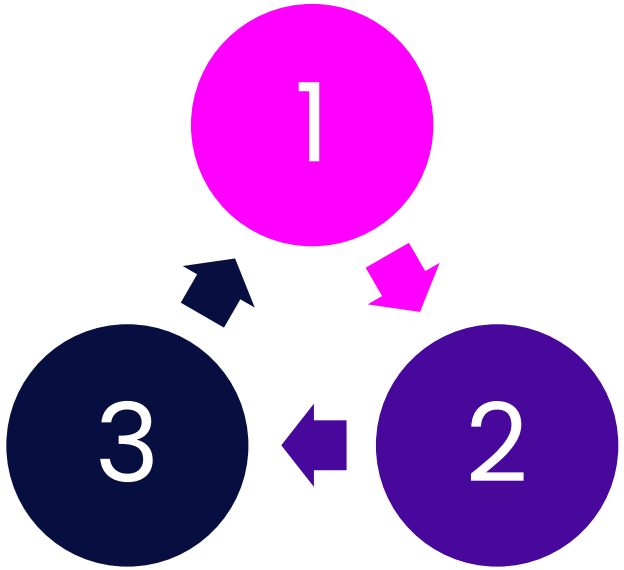
Breakout rooms

- Check your handout to see which breakout room you'll start in
- Rotate clockwise to your next room
  - If you're in room 3, go to room 1 next
- After you've visited all three breakout rooms, please return to main hall
- Interactive sessions – please ask questions (Slido is also available)



NESO engineers & systems they use

1. Training and authorisation - (~5mins)
2. A day in the life of the energy teams - how and why engineers do what they do (the journey) – (~20mins)
3. Open Balancing Platform (OBP) system & how it is used by control room (~10mins)
4. Reasons why we may deviate away from the dispatch advice (~5mins)
5. Q&A (~5mins)

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NESO engineers & the systems they use

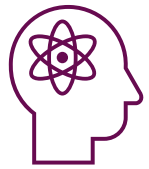
1. Training and authorisation

The minimum qualifications required to start training for a control room role is a STEM Degree (or equivalent)

Typically a minimum of 6months training for control room roles (often more for the energy roles or depending on experience)

Our Control Training Unit (CTU) is used to support the training journey through offline courses and scenario simulation

Control engineers would typically start in one of the strategy team roles before moving into the energy team after gaining sufficient knowledge and experience



As a result, our energy colleagues are typically some of the most experienced control engineers

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NESO engineers & the systems they use

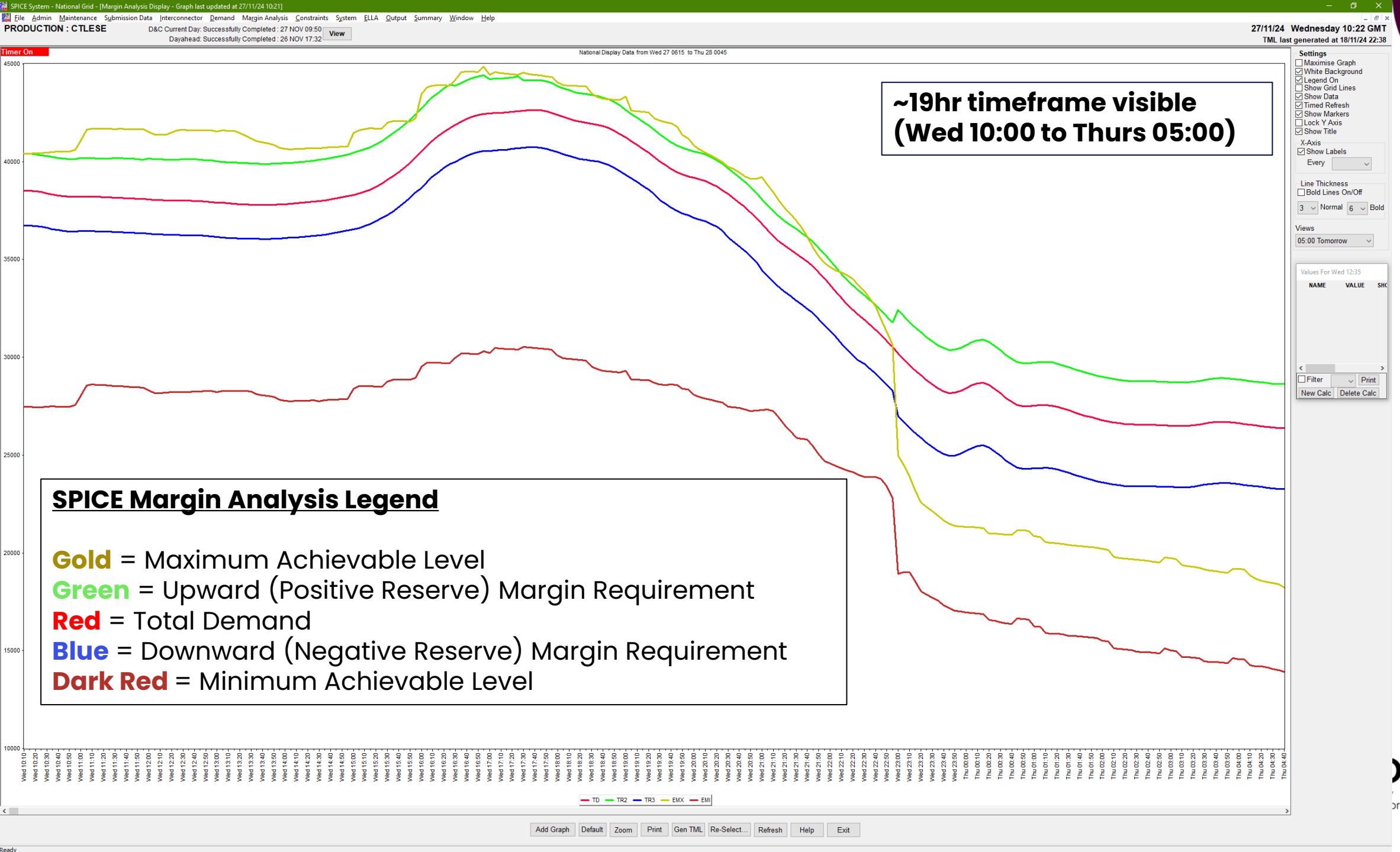
2. A day in the life of the energy teams – how and why engineers do what they do (the journey)

This section will take you through the journey from where our **System Operation Plans** (SOPs) are **first created** in the strategy team – at 24 hours ahead of real-time – all the way down to the **energy team issuing BOAs** to **BMUs** in the **real-time phase**

In the **strategy team**, we use our **BM scheduling tool** – **SPICE***. Its **margin analysis** functionality is essential to ensure we can meet our **margin requirements** (next slide)

Margin Analysis – 'the process by which submissions from market participants are compared with estimated demand and reserve requirements.'

SPICE = Scheduling Process In a Controlled Environment


SPICE System - National Grid - [Margin Analysis Display - Graph last updated at 27/11/24 10:21]
File Admin Maintenance Submission Data Interconnector Demand Margin Analysis Constraints System ELLA Output Summary Window Help
PRODUCTION : CTLESE
D&C Current Day: Successfully Completed : 27 NOV 09:50
Dayahead: Successfully Completed : 26 NOV 17:32
View
27/11/24 Wednesday 10:22 GMT
TML last generated at 18/11/24 22:38
Timer On
National Display Data from Wed 27 0615 to Thu 28 0045
~19hr timeframe visible
(Wed 10:00 to Thurs 05:00)
SPICE Margin Analysis Legend
Gold = Maximum Achievable Level
Green = Upward (Positive Reserve) Margin Requirement
Red = Total Demand
Blue = Downward (Negative Reserve) Margin Requirement
Dark Red = Minimum Achievable Level
Settings
Maximise Graph
White Background
Legend On
Show Grid Lines
Show Data
Timed Refresh
Show Markers
Lock Y Axis
Show Title
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Show Labels
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Line Thickness
Bold Lines On/Off
Normal
Bold
Views
05:00 Tomorrow
Values For Wed 12:35
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Add Graph
Default
Zoom
Print
Gen TML
Re-Select...
Refresh
Help
Exit
Ready

NESO engineers & the systems they use

2. A day in the life of the energy teams – how and why engineers do what they do (the journey)

The journey then moves into the **energy team** at **4 hours ahead of real-time**.

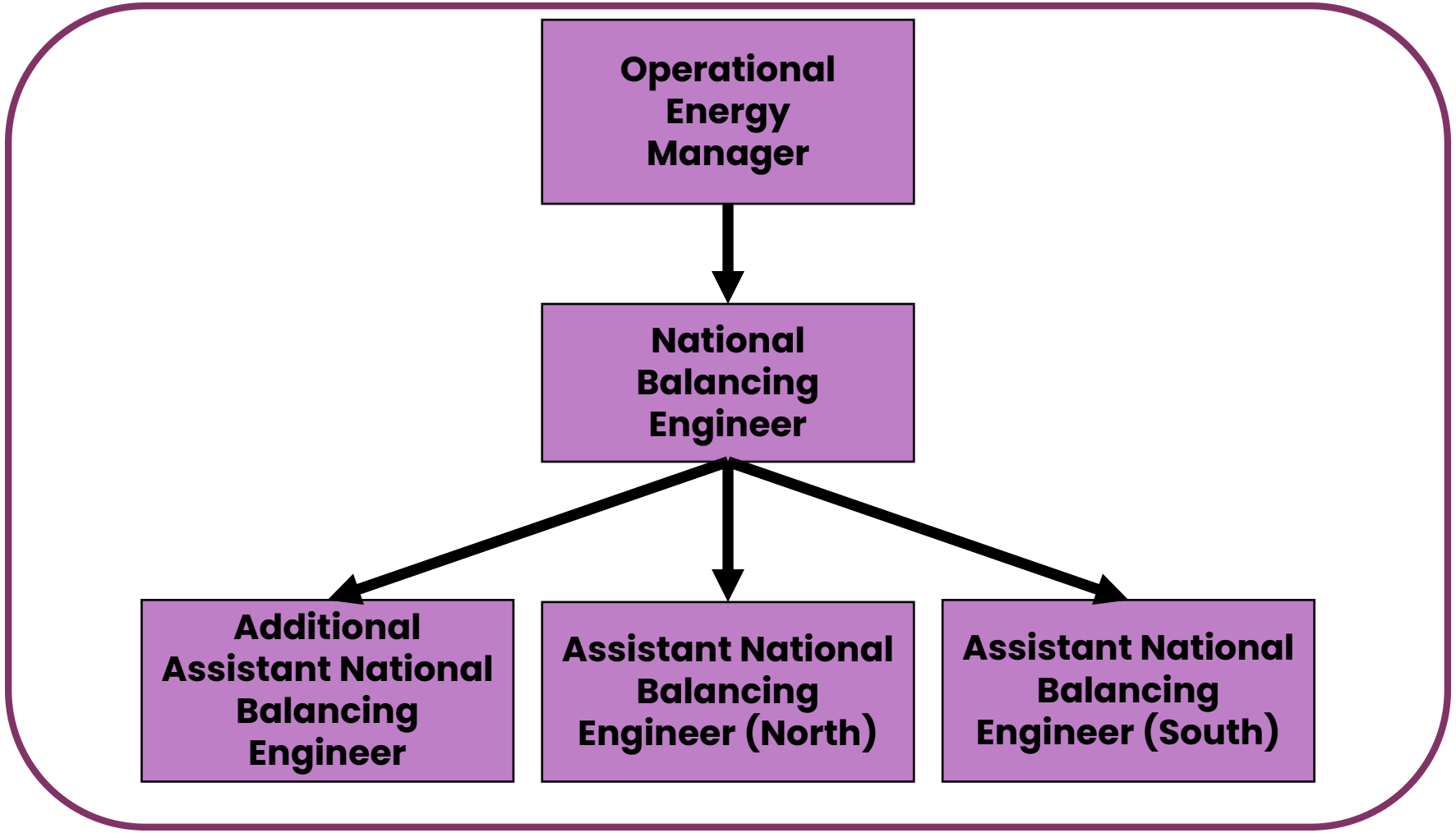
At this point we switch to use our **real-time BM tool**, **SORT***, to **issue BOAs** to make **any final commitment decisions** for additional units if required and then ultimately balance the system in the **real-time balancing phase** (1 hour to real-time).

We'll now talk about how the energy team is structured and how they balance in real-time.

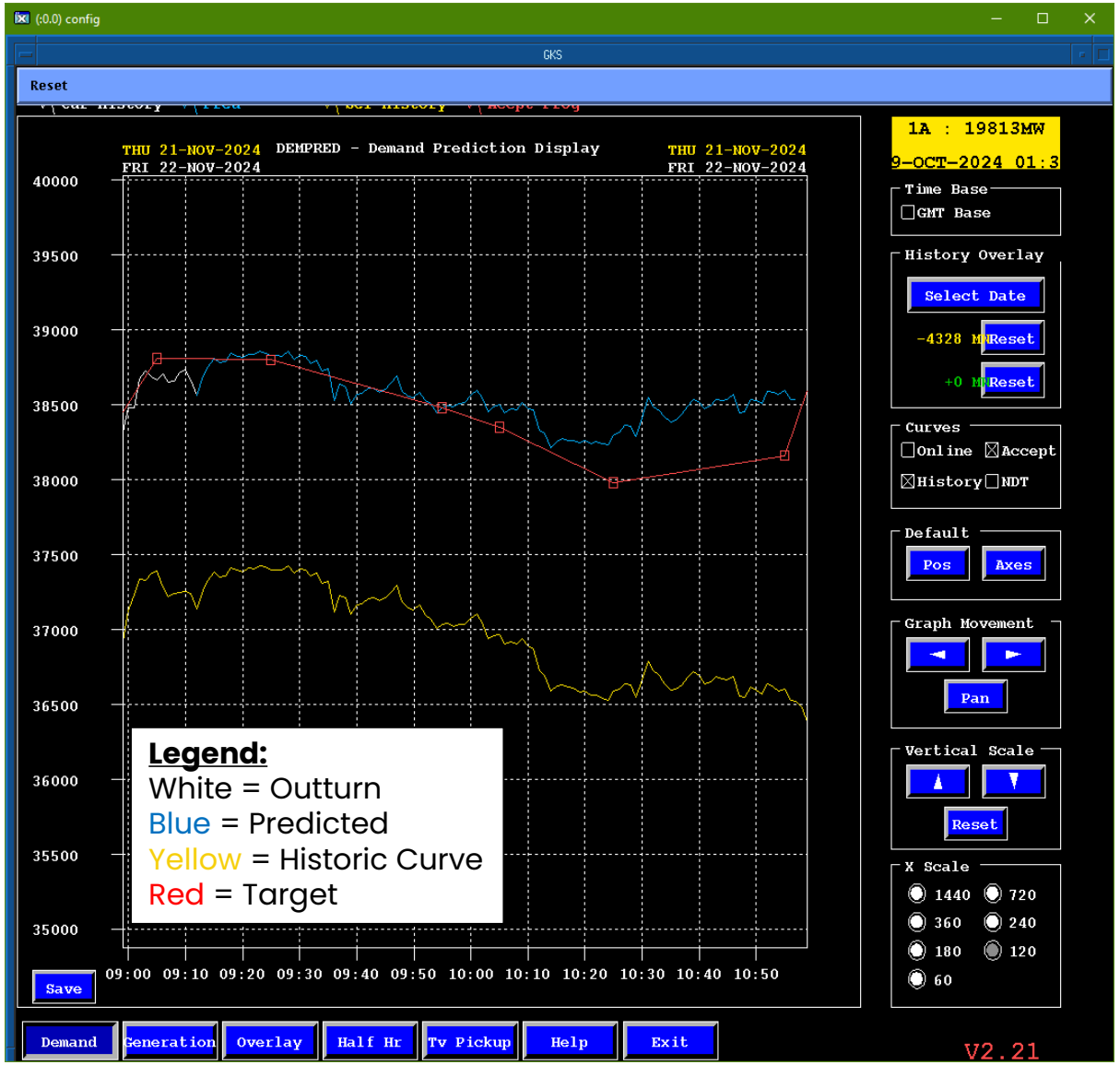
**SORT = System Operation Real Time*

NESO engineers & the systems they use

Energy Team structure



NESO engineers & the systems they use



- **Demand predictor** is a tool within SORT.
- We cannot meter demand and so use transmission generation as a proxy, given the aim is to match them.

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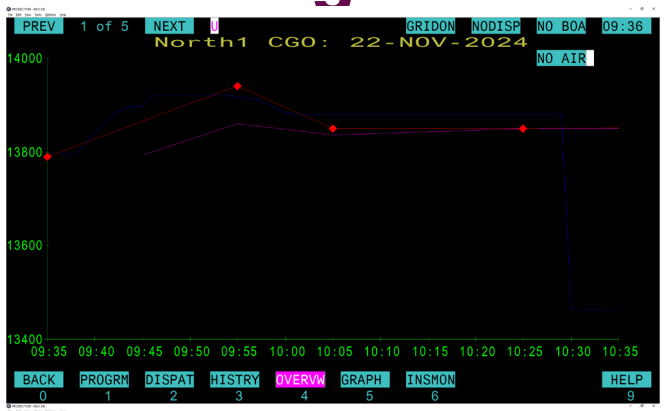
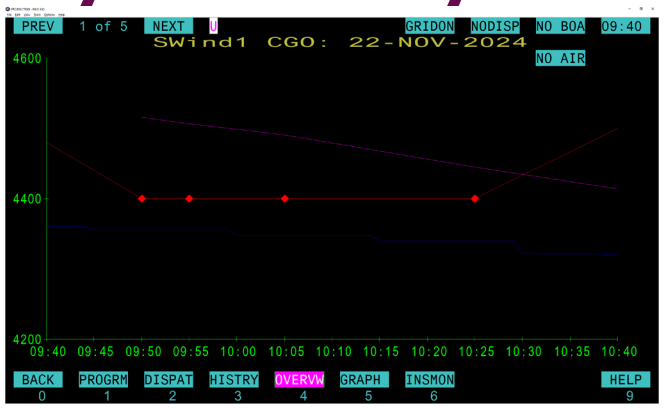
NESO engineers & the systems they use

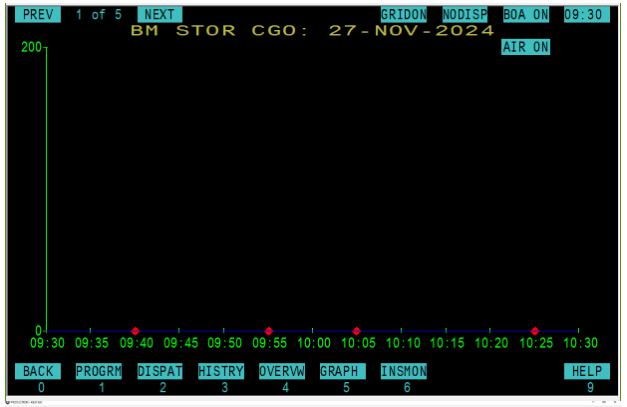
2. A day in the life of the energy teams – how and why engineers do what they do (the journey)

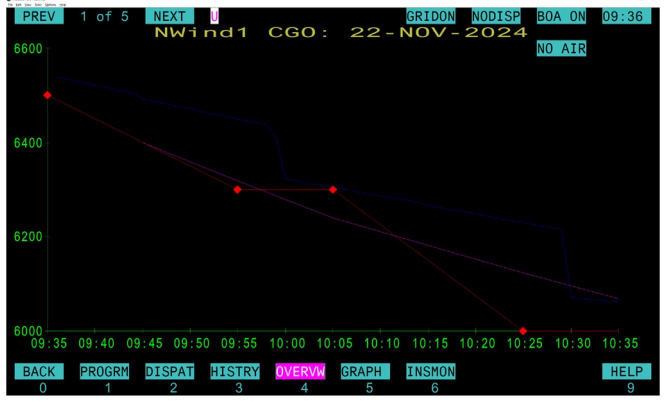
Once we are happy with how the demand predictor is set-up and thus are happy that we have the correct target set for total transmission generation requirement, we look to ensure that requirement is delivered by using BOAs to either increase or decrease as required.

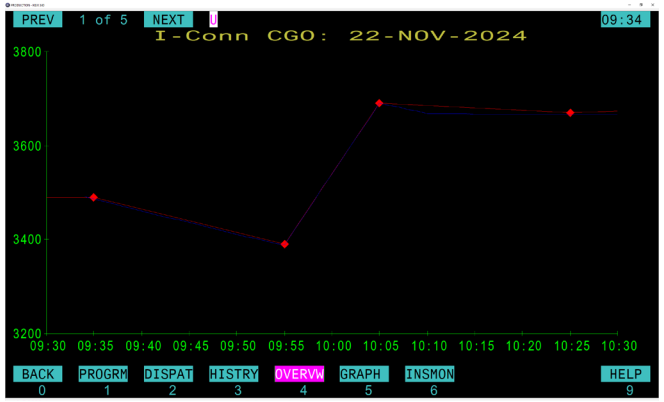
NESO engineers & the systems they use

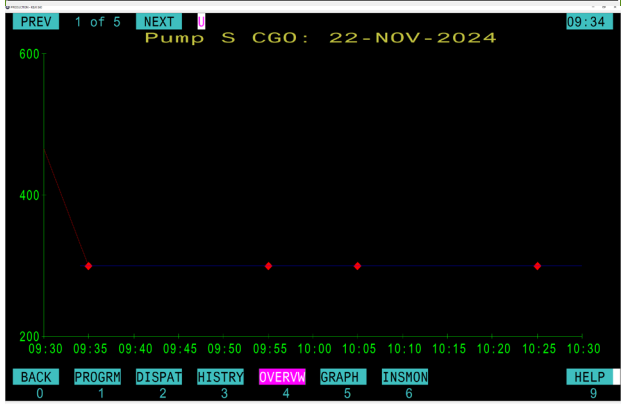


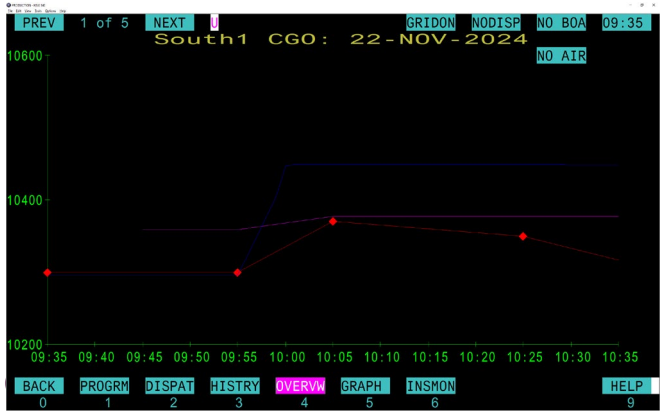


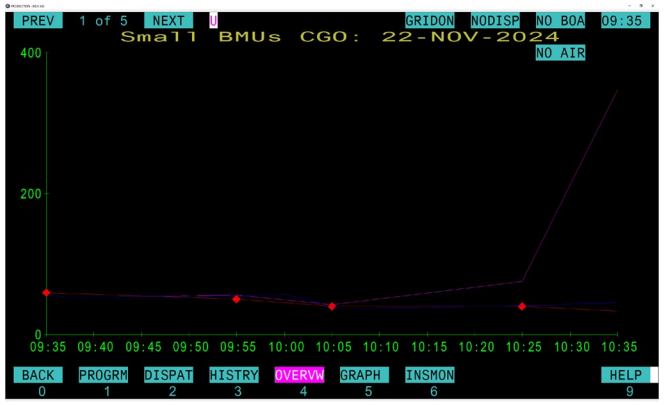












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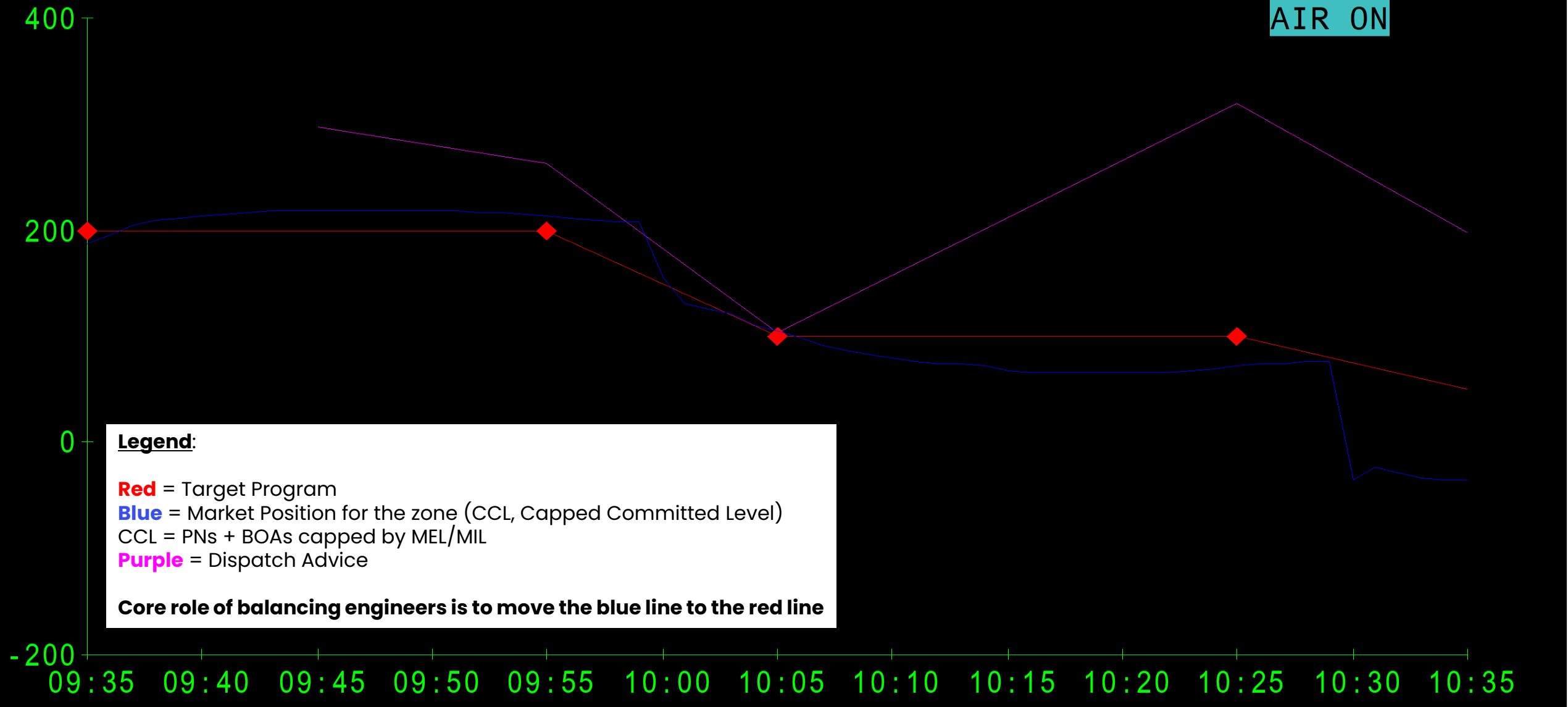
Battery CGO: 22-NOV-2024

AIR ON



Legend:

Red = Target Program
Blue = Market Position for the zone (CCL, Capped Committed Level)
CCL = PNs + BOAs capped by MEL/MIL
Purple = Dispatch Advice

Core role of balancing engineers is to move the blue line to the red line

NESO engineers & the systems they use

3. Open Balancing Platform (OBP) System & how it is used by the Control Room

Once we are happy that we need to issue BOAs in the battery zone, as described in the previous slide, we will **utilise our new OBP tool in 1 of 2 modes**:

- Target program mode
- Fast dispatch mode

The following 3 short demo videos show how our balancing engineers set-up and use each of these modes.

NESO engineers & the systems they use

3. Open Balancing Platform (OBP) System & how it is used by the Control Room

Video 1 – OBP set-up

Instruction Generator | NBE

Battery

Items per page: 10 | 1-10 of 135 items | 1 of 14 pages

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28292	02 / 12 / 2024 , 10 : 06	10:08	10:22	0	0	0	18	0	0

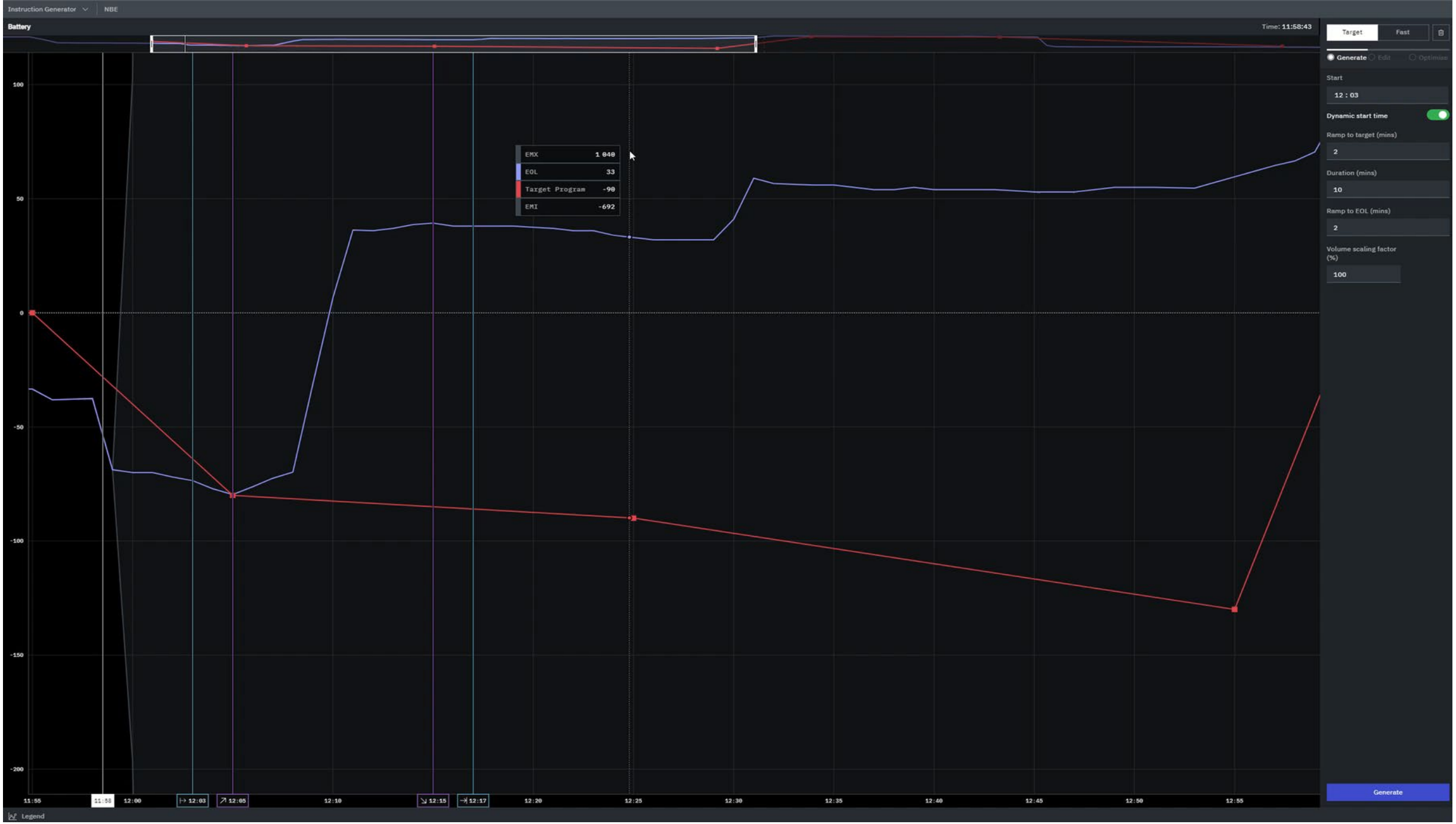
Zone selection

+ New requirement

NESO engineers & the systems they use

3. Open Balancing Platform (OBP) System & how it is used by the Control Room

Video 2 – OBP target program mode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Battery
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EMX 1 040
EOL 33
Target Program -90
EMI -692
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50
0
-50
-100
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-200
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11:58
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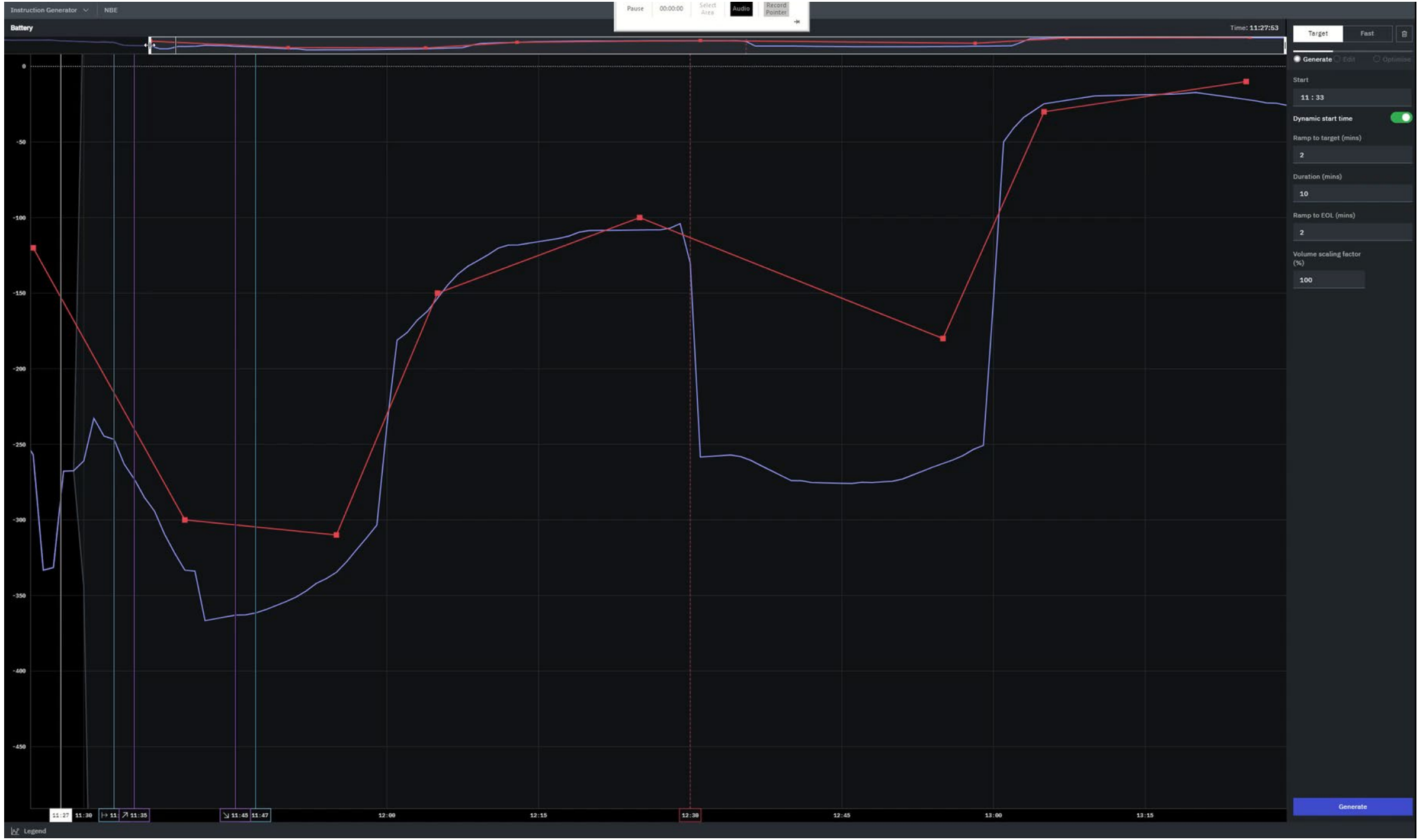
12:50
12:55
Legend
Target
Fast
Generate
Edit
Optimise
Start
12 : 03
Dynamic start time
Ramp to target (mins)
2
Duration (mins)
10
Ramp to EOL (mins)
2
Volume scaling factor (%)
100
Generate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NBE
Pause
00:00:00
Select Area
Audio
Record Pointer
Battery
Time: 11:27:53
Target
Fast
Generate
Edit
Optimise
Start
11 : 33
Dynamic start time
Ramp to target (mins)
2
Duration (mins)
10
Ramp to EOL (mins)
2
Volume scaling factor (%)
100
Generate
0
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11:27
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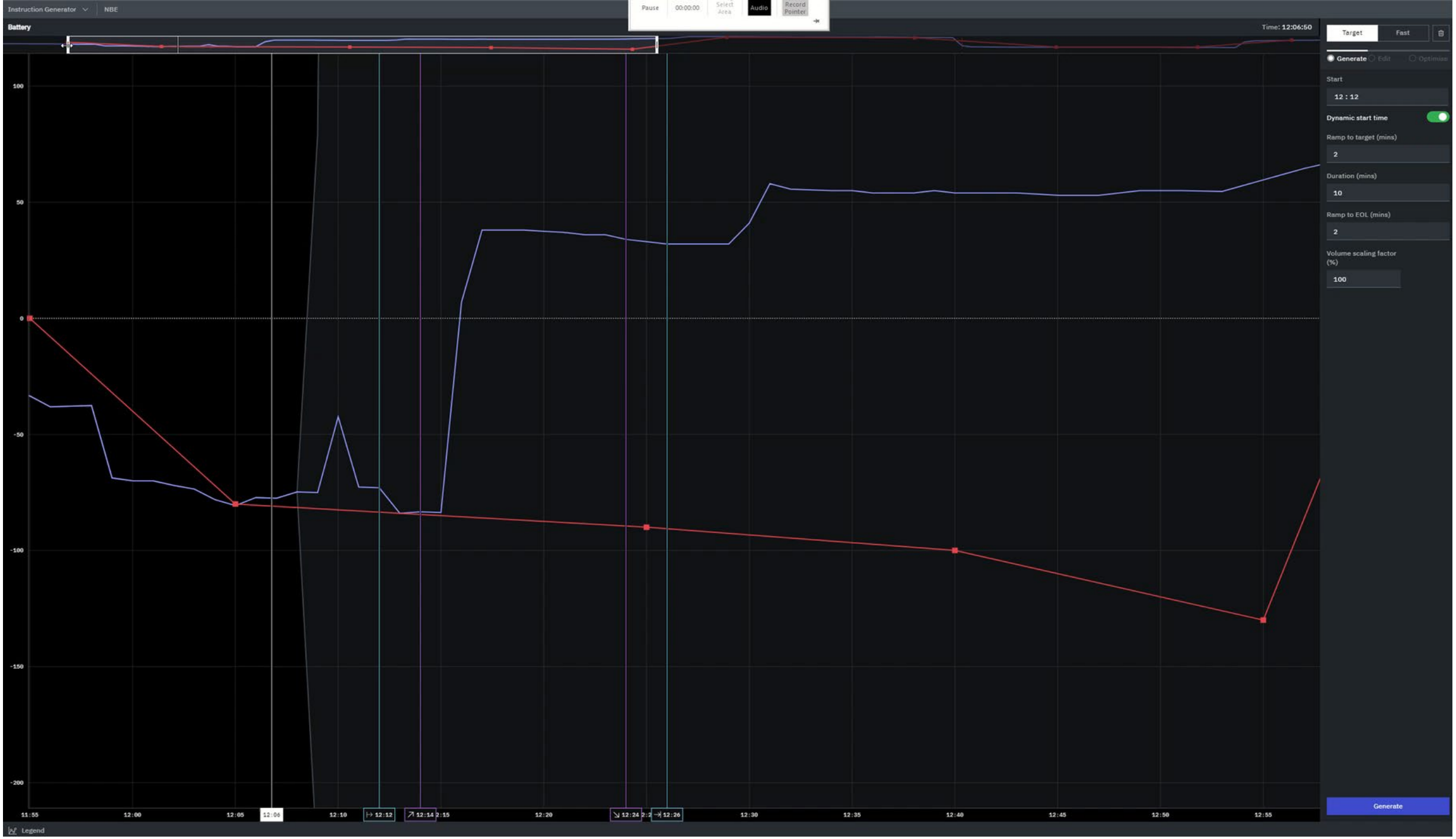
12:30
12:45
13:00
13:15
Legend

NESO engineers & the systems they use

3. Open Balancing Platform (OBP) system & how it is used by the Control Room

Video 3 – OBP fast dispatch mode


Instruction Generator
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Pause
00:00:00
Select Area
Audio
Record Pointer
Battery
Time: 12:06:50
Target
Fast
Generate
Edit
Optimise
Start
12 : 12
Dynamic start time
Ramp to target (mins)
2
Duration (mins)
10
Ramp to EOL (mins)
2
Volume scaling factor (%)
100
Generate
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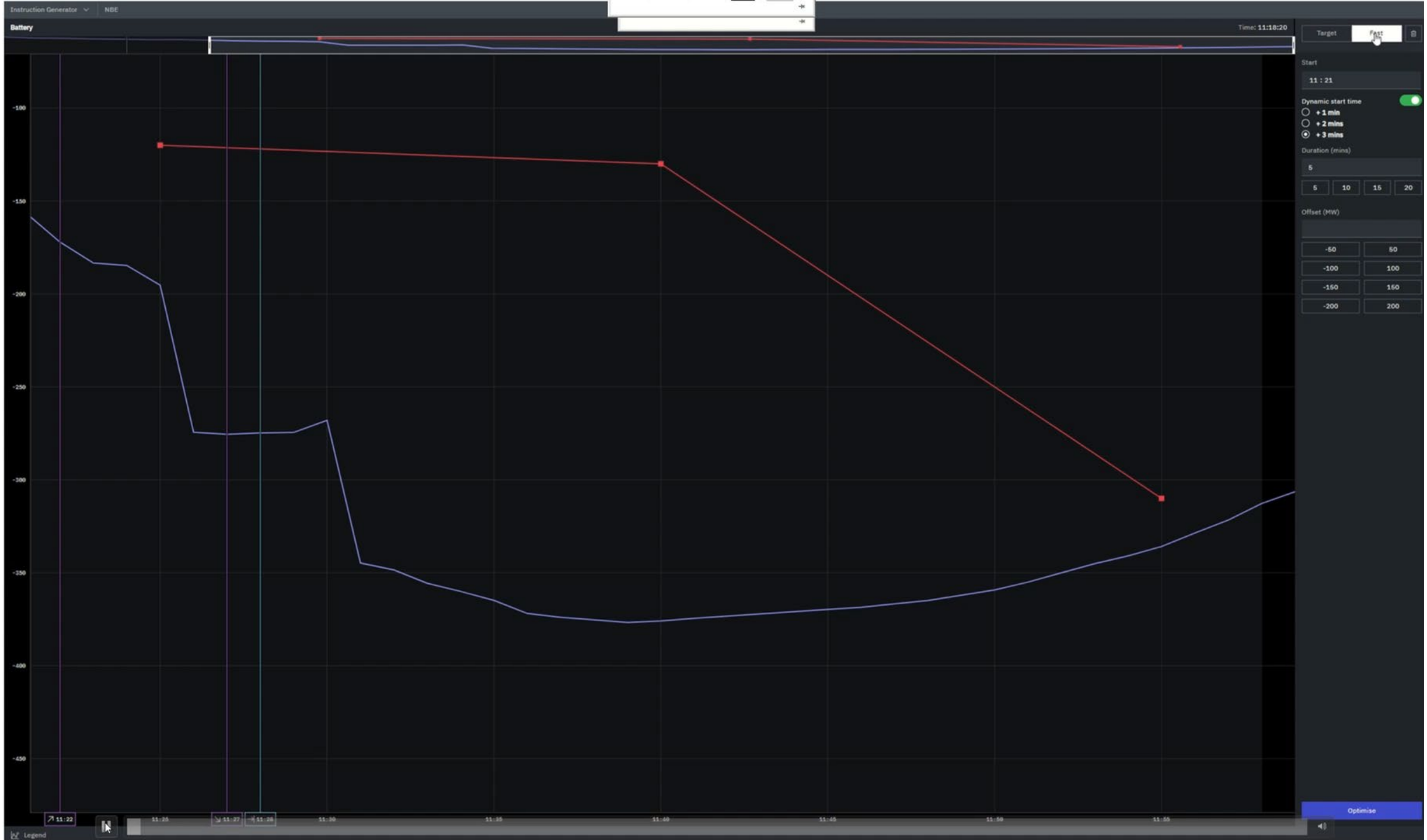
Legend


Instruction Generator
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Battery
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Target
Fast
Start
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Dynamic start time
+ 1 min
+ 2 mins
+ 3 mins
Duration (mins)
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Offset (MW)
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Optimise
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11:50
11:55
Legend

NESO engineers & the systems they use

4. Reasons why we may deviate away from the dispatch advice

The dispatch advice is always out of date as it runs every 5mins

The following scenarios are the most common reasons for going outside of dispatch advice:

- Rapidly changing demand - advice might not be accurate until demand forecasts
- Rapidly changing wind - advice might not be accurate until forecasts updated
- BMUs deviating away from expected CCL position (could be a fault or a unit struggling to ramp up as planned, or weather driven for renewables
- Dynamic data changes (e.g. MEL/MIL)
- Constraint limits can be dynamic
- Managing an 'event' that doesn't behave as expected – e.g. large I/C change with underlying embedded generation changes we cannot see; or large anticipated demand change such as TV pick-ups)

In all cases, our aim is to get back to pure cost merit order asap

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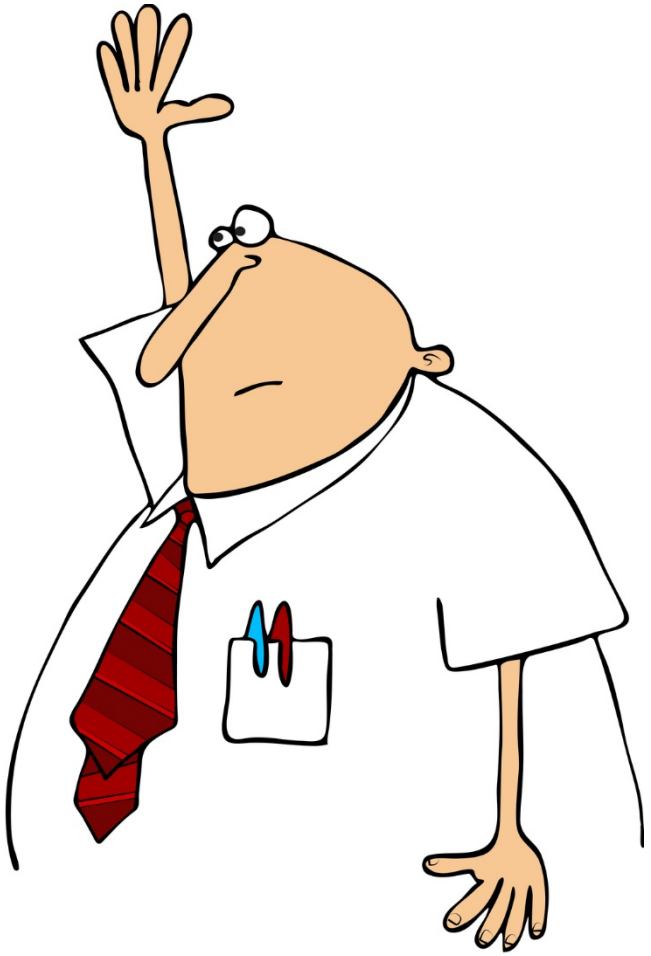
5. Q&A



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Markets & Ancillary Services

1. Drivers for market reform
2. Overview of current products
3. How we're reforming future products
4. Keep in touch

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Markets and Ancillary Services – drivers for change

To operate a safe and secure power system, NESO procure a suite of ancillary services through designated markets and via Bid Offer Acceptances (BOAs) in the Balancing Mechanism.

We continue to reform our markets to address a complex range of operational and economic drivers.

Securing the system

- Increasing largest loss size
- Decreasing system inertia
- Higher volumes of thermal congestion
- Maintaining voltage and stability under different system conditions

Enhancing market efficiency

- A need for greater transparency
- Remove barriers for participation to increase competition
- Deliver clearer market signals
- Facilitate co-optimisation

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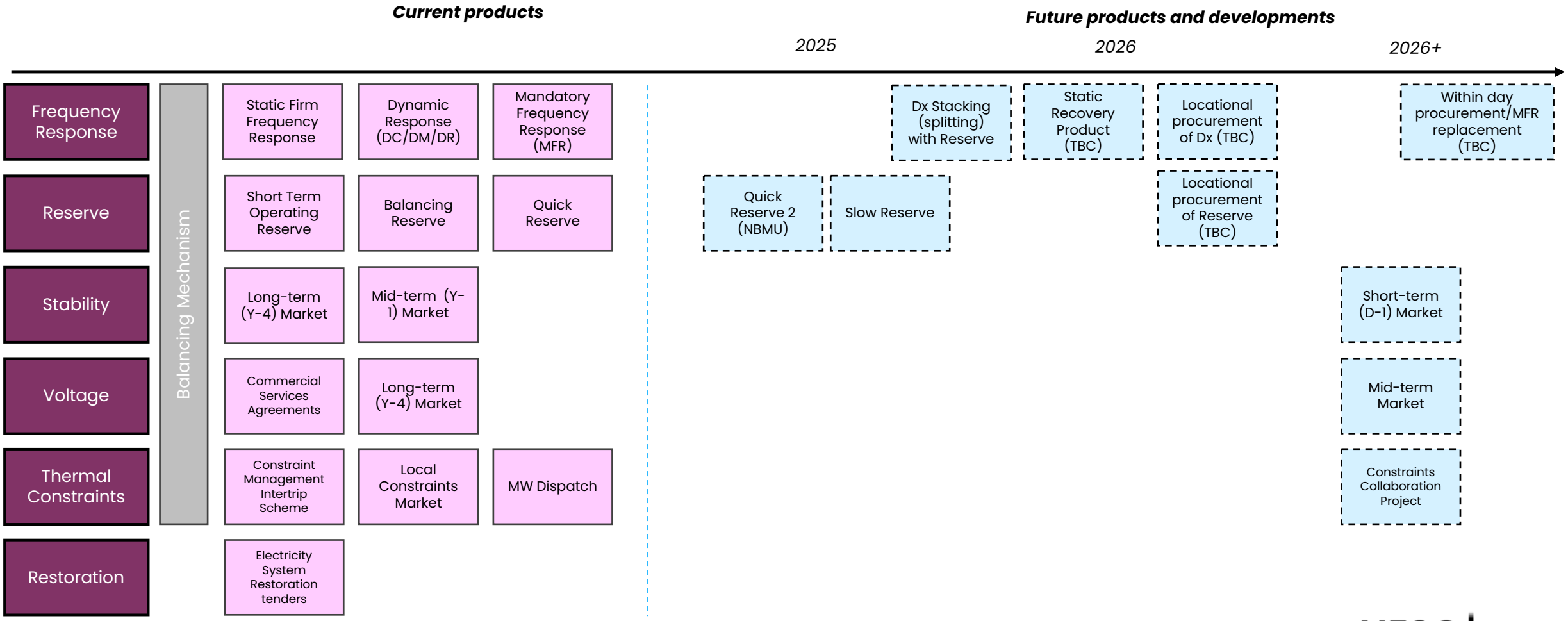
Markets and Ancillary Services – overview and roadmap

To operate a safe and secure power system, NESO procure a suite of ancillary services through designated markets and via Bid Offer Acceptances (BOAs) in the Balancing Mechanism.



Markets and Ancillary Services

How to remain informed on our latest ancillary services developments?

NESO Energising Progress Newsletter

Operational Transparency Forum
Wednesdays 11am – 12pm

NESO Markets Roadmap
Next publication due April 2025

Are there other opportunities for realising battery storage potential that we have missed?

Are there particular market reforms / aspects of market change where we should focus our attention?

Energy Forecasting & Trading

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National Energy System Operator

Trading

What do you already know about Trading functions within NESO?

Share your thoughts on MentiMeter

Trading authorisations

- Trading Advisor: generate and agree trading requirement (advice) together with Operational Strategy Manager
- Trader: negotiate deals with CPs and procures the trades to fulfil requirement from control room
- Standby: to cover trading requirements overnight

Reasons for trading

- Licence obligation to balance the system economically - benefits the end consumer
- Risk mitigation – helps alleviate BM uncertainty for system planning purposes.
- Gives BMUs more certainty which hopefully results in more favourable prices.
- To avoid emergency actions: emergency assistance, emergency instruction & demand disconnection.

However

- The further out our requirements are, the more uncertainty there is, hence higher risk of over trading.
- This could leave us exposed to expensive BM actions.

Reasons for trading

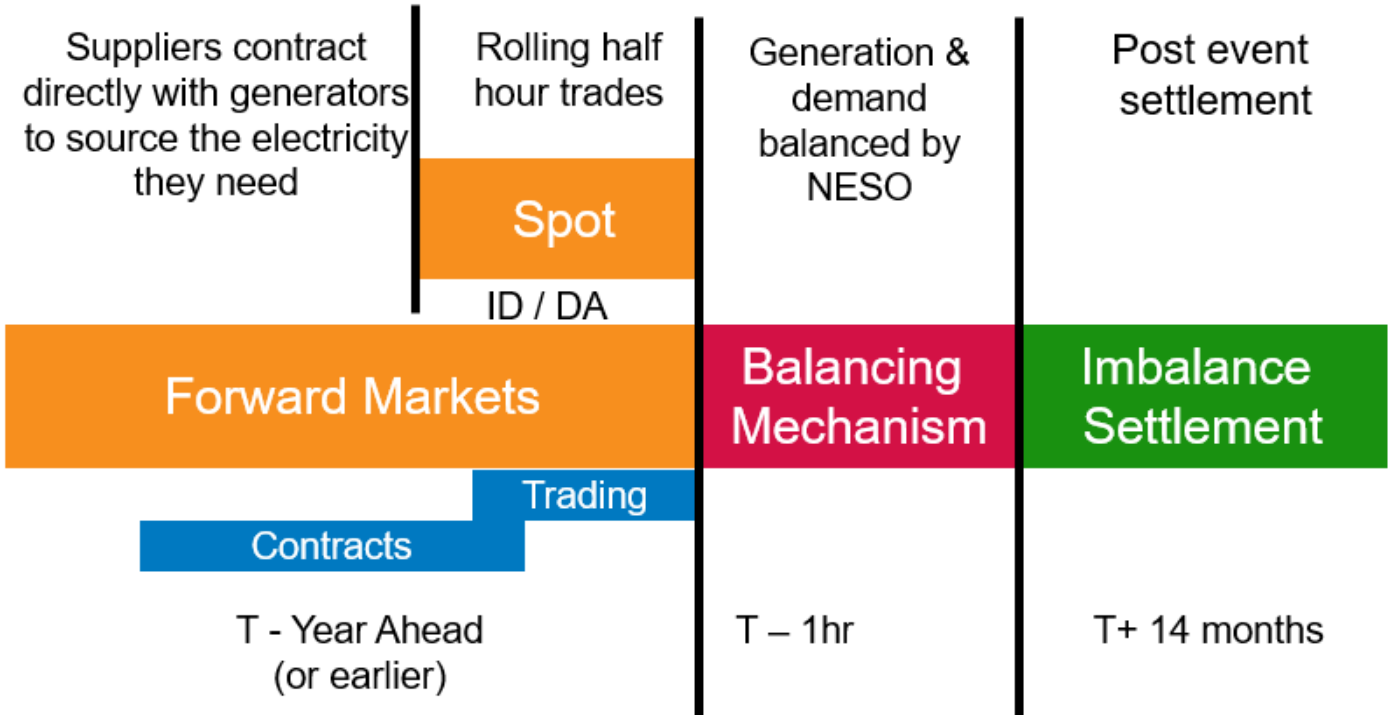
NESO carries out trades with parties for three key purposes

1. To balance the system where there is a foreseen energy requirement
2. To ensure system security where there may be constraint
3. To meet forecast NESO balancing requirements at minimum cost.

The most granular tradable period is a **single half-hour block.**

Market timescales

Most of our trading is with interconnectors due to inaccessibility in the BM



Most of the energy trading is done ahead of time between suppliers and generators and later refined in the spot markets closer to real time. Following this, we ensure that supply meets demand by acting within the Balancing Mechanism (BM). However, ahead of the BM, we also have the ability to trade with parties.

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Commercial products

1. Core function of trading with counterparties to meet our short-term energy requirements at the lowest cost possible
2. Our time horizon to trade is between day-ahead and intraday timescale
3. Under the Grid Trade Master Agreement (GTMA), **Schedule 7A** sets out the provisions for BM Unit Specific Transactions.
   - enables us to agree a trade to either increase or decrease their output to a specific volume for an agreed price and time
   - requires the counterparty to submit and maintain agreed physical notifications for the times in the trade.

Schedule 7A Pros	**Cons**
Existing contract (GTMA)	Must be (non-zero) energy trade
Flexible lead time & delivery time	All 'costs' must be incl. in £/MWh price
DA and/or ID time frame	
Minimal set up required	

Bilateral contracts

Contract Pros	Cons
Costs can be wrapped up (not £/MWh)	Existing contract templates not ideal
Can be 0MW action	Likely take longer to set up
Flexible lead time & delivery time	
DA and/or ID time frame	

- Bilateral contracts are negotiated between NESO and counterparties.
- Our trading requirements are often not met by standard products, usually because we are trading for a specific location or aiming to achieve a specific level of generation/demand or flow on the network.
- Therefore, we will often contact counterparties directly to negotiate a trade with defined parameters.
  - Interconnector counterparties or
  - BMU-specific counterparties.

Energy forecasting

Forecasting accuracy has an impact operational decision-making

- Our forecasts provide situational awareness for the control room allowing us to operate the system reliably, economically, and securely in operational timescales
- Accuracy of forecasting is important for operational planning allowing plans to be made so that more economic solutions to solving issues can be found
- We have been working to improve short-term situational forecasting accuracy across key components
- In addition to short-term we will also look at medium- and long- term changes to forecasting that will be necessary as we transition to net zero
- We anticipate that forecasting improvements will lead to greater dispatch efficiency and will continue to assess the impact on operational planning

Our control room use forecasts for operational planning

- As part of our daily planning processes within the NESO control room, the control room strategy team produces a System Operating Plan (SOP) at key demand peaks or troughs throughout the day at “Cardinal Point (CP)”
- Prior to each CP the strategy team hand over the relevant SOP to the real-time Energy team, who then use this plan to take real-time operational decisions to balance the electricity system.
- The information within the SOP ensures that the most economic, secure, and flexible plan is developed for that moment in time at the time of handover.
- The real-time energy team constantly reviews the information within the SOP to ensure it is still relevant as they approach the CP, so that to ensure the operational plan is still valid, and if required modify as needed.

https://www.neso.energy/data-portal/system-operating-plan-sop

Interconnector forecasting

- Interconnector positions can move by thousands of MWs and at 65mins notice to our control room. In official process we procure only enough reserve to cover the largest generation and demand loss, defined as a “credible loss” and a small amount extra for wind/time of year and temperature etc.
- Interconnector variability requires additional reserve capacity to manage fluctuations and maintain grid stability
- Interconnector forecasting will allow situational awareness better decision-making around reserve and unit commitment, and reduce over trading interconnectors
- We are currently improving our interconnector forecasting capability enhanced with data only available to NESO as well as publicly available data sources
- We have streamlined short-term tactical improvements to our interconnector forecasting, with new subscriptions to additional data and working closely with interconnector providers
- Current pipeline of projects could see interconnector capacity in Great Britain (GB) exceed 20GW by 2035

Platform for Energy Forecasting (PEF) release plan

Q3 FY 24/25 (Oct 24-Dec 24)

Key Capabilities:
- Visualisations and validation tools for the Energy Forecasting team

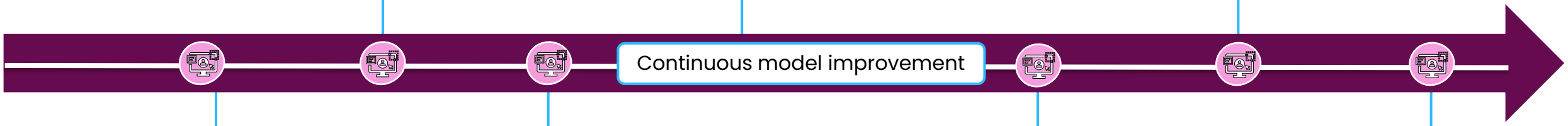
Q1 FY 25/26 (Apr 25-Jun 25)

Key Capabilities:
- Reporting and situational awareness tools for the control room

Key Enablers
- Integration with Network Access Planning tools for improved studies

Q3 FY 25/26 (Oct 25-Dec 25)

Key Capabilities:
- Continuous visualisations and validation tool improvements



Q2 FY 24/25 (Jul 24-Sep 24)

Key Capabilities:
- New Strategic Azure Platform deployed
- New Wind Power Generation Model

Key Enablers
- API's to enable OBP integration

Q4 FY 24/25 (Jan 25-Mar 25)

Key Capabilities:
- Migration of Solar and GSP products onto the new platform
- Migration of an enhanced National Demand model onto the new platform.

Q2 FY 25/26 (Jul 25-Sep 25)

Key Capabilities:
- Continuous reporting and situational awareness tool improvements

Key Enablers
- Forecast grouping to support restoration regional reporting

Q4 FY 25/26 (Jan 26-March 26

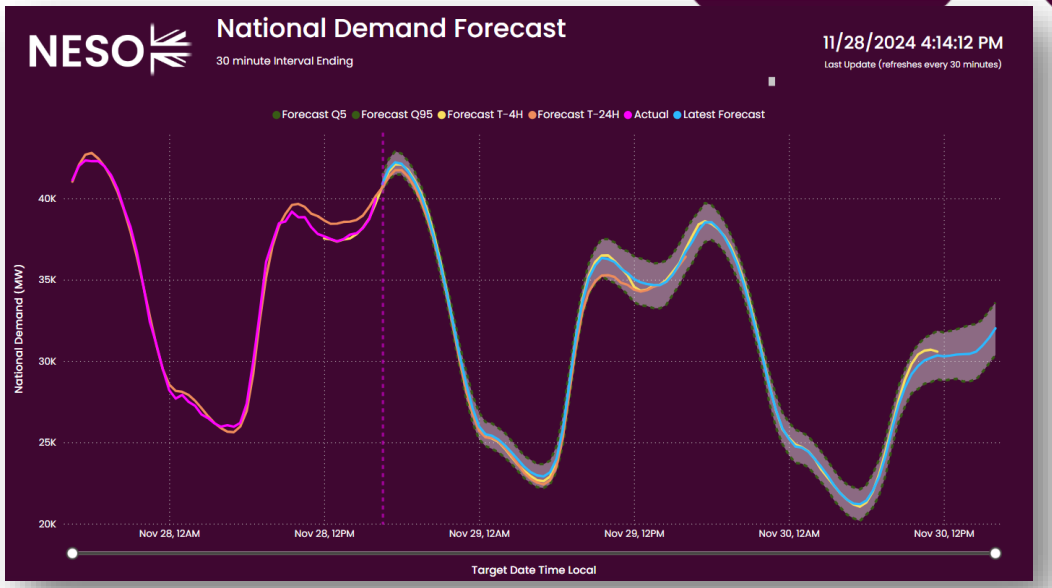
Key Capabilities:
- Advanced Analytics data integration

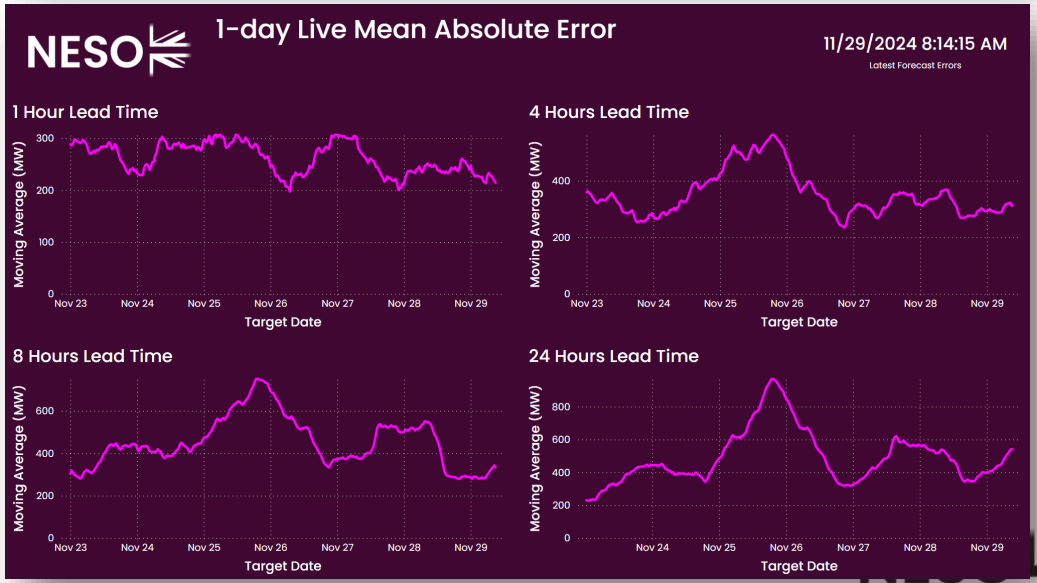
Key Enablers
- EFS system retirement strategy

Machine Learning National Demand model

- NESO's AI Centre of Excellence has developed a machine learning (ML) National Demand forecast model
- The Energy Forecasting team is continuing to monitor performance, particularly over longer (D+1) lead times
- We have developed a PowerBI dashboard for viewing forecasts and for model monitoring, allowing users to view recent history of errors at different lead times

Forecast dashboard





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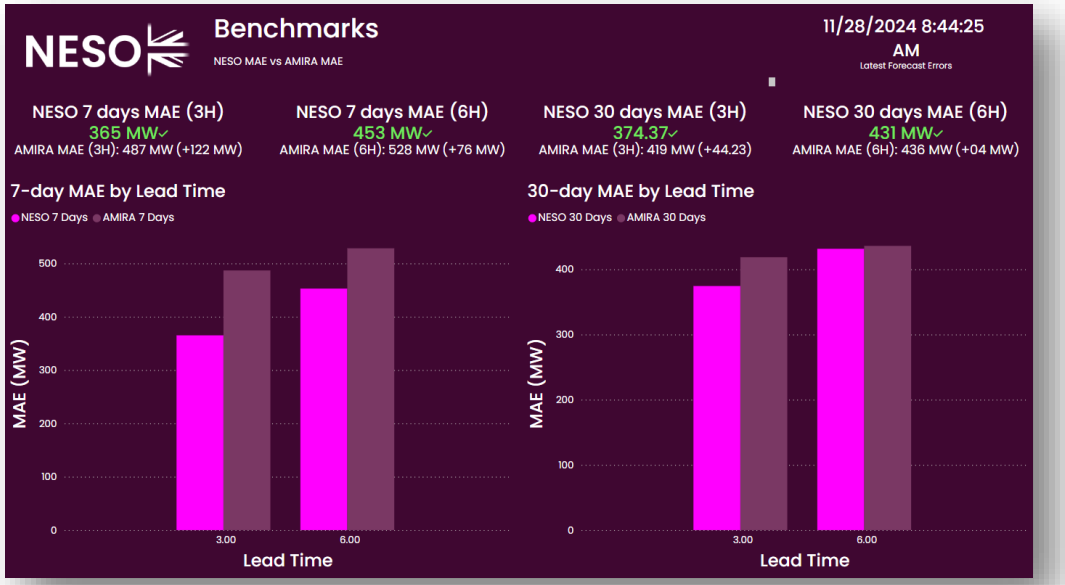
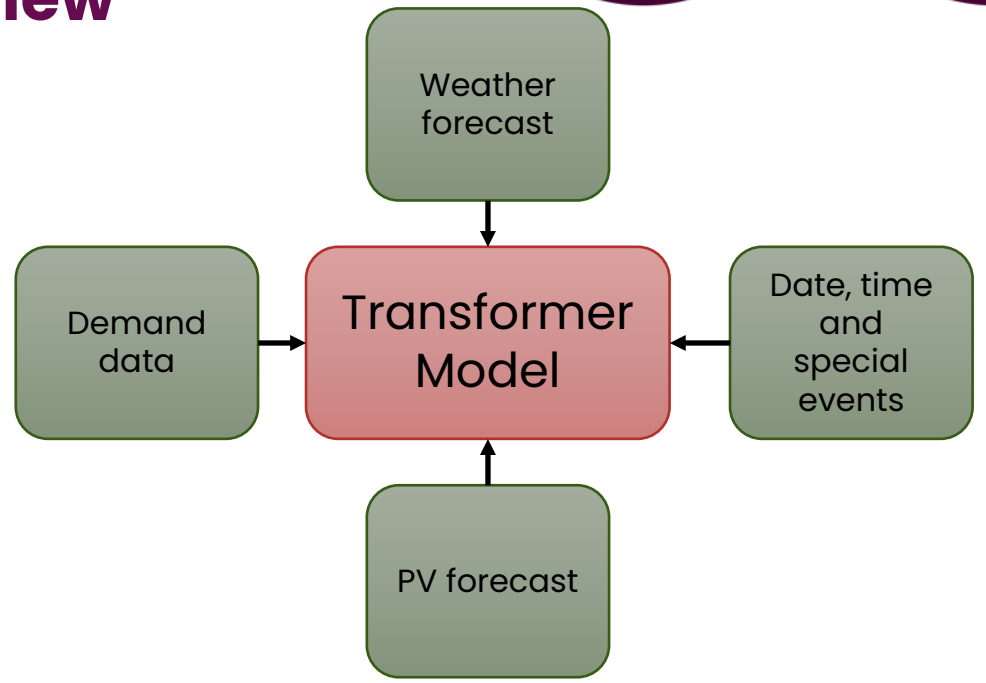
Machine Learning National Demand overview

- The NDF model is a deep learning (Transformer) model trained on 3 years of historical data
- The model uses demand outturn, weather and PV forecasts with a deep learning architecture (200,000 parameters)
- The model is deployed in Azure (AAE) and runs every 30 minutes
- The design is based on large language models (LLMs) which learn interdependencies between elements in a sequence (a.k.a. Attention Mechanism)
- The model looks 7 days in the past and 2 days in the future to probabilistically forecast national demand at 30-minute resolution
- *Note: model is also capable of expanding to other variables (e.g. GSPs, interconnectors, batteries etc.)*

Error metrics dashboard





Key Model Characteristics

- Forecasts National Demand (sum of generation, excl. station load, pumped storage, IC exports)
- 48-hour horizon, settlement period resolution, updating every 30-minutes
- Probabilistic forecasts

Q&A

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Next steps & final thoughts

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Reflecting on today

What we heard:

- ✓ Roadmap for storage & skip rates
- ✓ NESO utilisation of batteries & associated challenges, including optimal volumes
- ✓ Battery impact on current & future ancillary service markets
- ✓ Code modifications – P462 & GC0166
- ✓ National optimisation into dispatch zones
- ✓ Locational procurement, future constraint markets
- ✓ Forecasting & trading data

Topics not covered today:

- ❖ Long duration energy storage
- ❖ CP30

To wrap up today, please provide your thoughts and feedback on today's event, along with suggestions for future events, via the closing Slido poll.

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Future of registration

We are changing the way we manage Registrations for the Balancing Mechanism (BM).

Early in the new year the process will be moving to the **Single Markets Platform (SMP).** This will bring BM Registration in line with Balancing Services and **enable customers to input and update their unit data directly**.

To register for updates on progress and/or the **Future of Registration Webinar** on the morning of **23 January** please scan the QR code below:

Future events 2025

Battery Storage Forum

- How often would you like to meet in 2025?
- What is your preference: Webinars or face to face?

Please use SLIDO to answer!

To wrap up today, please provide your thoughts and feedback on today's event, along with suggestions for future events, via the closing Slido poll.

Departing attendees

Please remember to complete the **feedback form** on the back of your name badge and **drop in the box** on your way out at the **registration desk.**

If you have any further questions, please get in contact with us at box.NC.Customer@nationalenergyso.com.

Thank you for your participation.

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