



Balancing Programme Webinar

26 September 2024

Welcome & Agenda

Time	Agenda Item	Details
13:30 – 13:40	Welcome and Setting the Scene	<ul style="list-style-type: none">• System Transformation – where are we?
13:40 – 14:20	Balancing Systems	<ul style="list-style-type: none">• Balancing systems progress update & future view• Updates to the Legacy Dispatch Algorithm (LDA)• Constraint management using the Open Balancing Platform (OBP)
14:20 – 14:30	Forecasting Systems	<ul style="list-style-type: none">• Forecasting systems progress update & future view• Wind metrics• Wind deliverable on the Platform for Energy Forecasting (PEF)
14:30 – 14:35	Beyond 2025	<ul style="list-style-type: none">• Snapshot of ideas for product development beyond 2025• Next steps to develop & progress ideas
14:35 – 14:55	Q&A	<ul style="list-style-type: none">• Hosted via Slido
14:55 – 15:00	Next Steps	<ul style="list-style-type: none">• Future engagement opportunities
15:00	Close	

Please note: This webinar, including the Q&A, will be recorded and published on the ESO website.



Please post any questions you have for our speakers on Slido - **#BPSeptWebinar2024** - ensuring to list both your **full name and organisation**; this will enable us to follow up with you after the event.



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 ESO 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.



Using Slido, you can also suggest topics for our November Balancing Programme Event in London.



Slido will close at the end of the webinar; if you have any further questions, please do not hesitate to get in contact with us at box.balancingprogramme@nationalgrideso.com

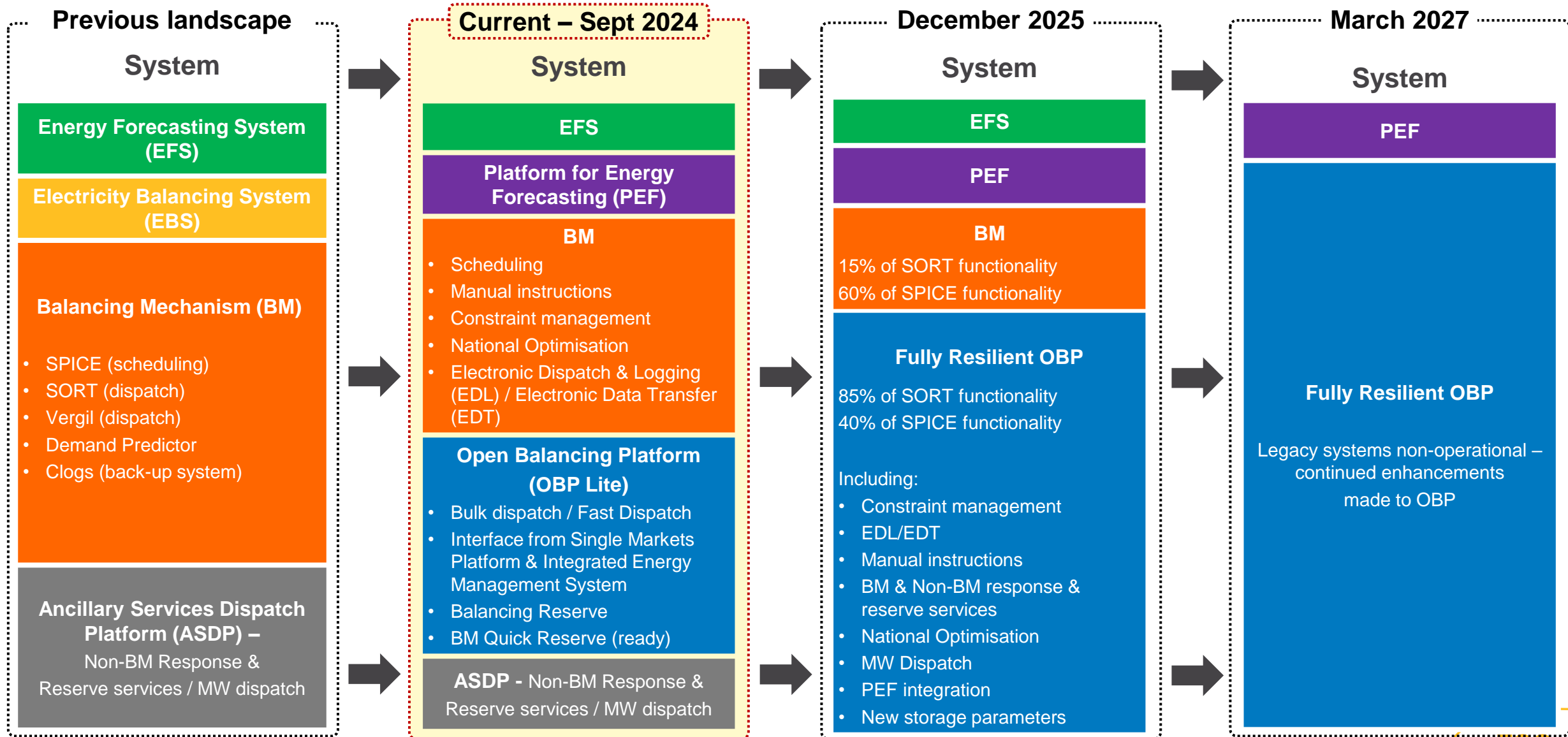
Balancing Programme: Setting the Scene

Brendan Lyons

Balancing Programme Director

System Transformation – Where are we?

#BPSeptWebinar2024



Key Areas of Focus for the Next 12 Months

#BPSeptWebinar2024

OBP Strategic Proven

Enables OBP to become a P1 service with multiple DC and room resilience and a platform that can support production SLAs in a CNI environment.

NBM and New Services + ASDP Retirement

Enables both BM and NBM services to be managed and harmonised on a single platform, unlocking ~£20million in potential benefits per annum.

EDL/EDT and all Instructions + Vergil Retirement

Enables EDL/EDT transition and mastering on OBP of all instructions. A significant technical enabler in decommissioning BM.

Constraints and National Optimisation

Enables mastering of constraints and national optimisation (Enhanced Legacy Dispatch Algorithm) in OBP.

An aerial photograph of a river with white water rapids. The water is a mix of dark green and white foam. On the right side, there are several bright blue, wavy, energy-like streaks that appear to be superimposed on the image. The overall scene is dynamic and energetic.

Balancing Systems Progress Update & Future View

Bernie Dolan, Principal Product Manager
Neil Morgans, Principal Product Manager

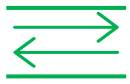
Current Balancing Systems (BM systems & ASDP)

- Most recent improvements & their benefits:



Deliverable: Enhancements to MW Dispatch service

Benefit: Improved situational awareness for service supporting reduced constraint costs & earlier connections



Deliverable: Enabled Greenlink interconnector in BM

Benefit: Supports commissioning of 500MW Greenlink interconnector

Open Balancing Platform (OBP)

- Most recent improvements & their benefits:



Deliverable: Improvements to the small BMU zone to resolve algorithm rounding issues

Benefit: Reduce voided instructions to improve utilisation of small BMUs



Deliverable: Integrated Energy Management System (IEMS) interface

Benefit: Enable us to develop constraint management and wind dispatch in OBP



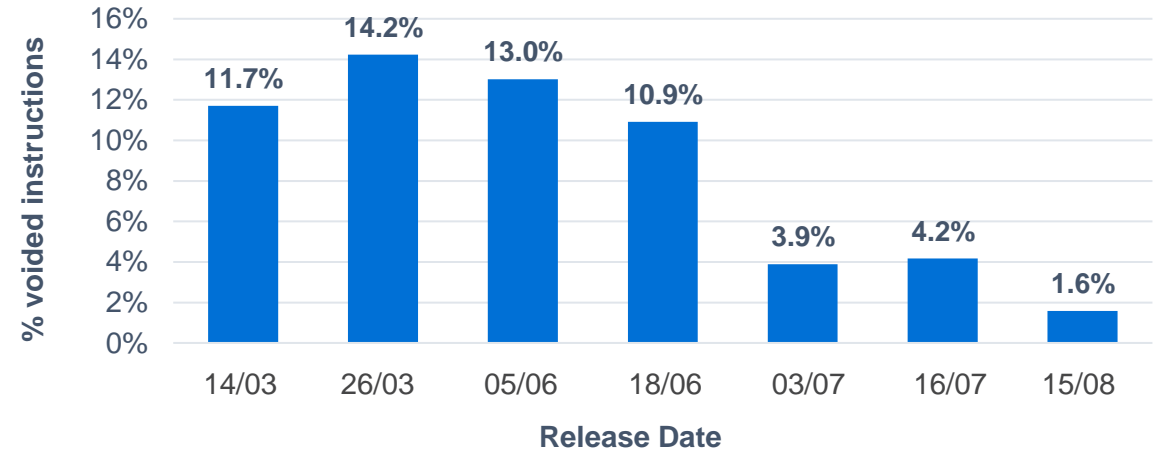
Deliverable: Single Markets Platform (SMP) interface

Benefit: Enable new services in OBP, and improved opportunities for market participation

Voided Instructions & Volume in SMALL BMU Zone since 14 March Release

Release Date (2024)	Test Duration	Total Instructions	Voided Instructions	% Voided Instructions	% Voided Volume
14 Mar	7 days	22364	2618	11.7%	8.3%
26 Mar	50 hours	5214	742	14.2%	No Data
5 Jun	8 Hours	1613	210	13.0%	12.7%
18 Jun	8hrs	1402	153	10.9%	7.3%
3 Jul	64hrs	5090	198	3.9%	1.9%
16 Jul	8hrs	1056	44	4.2%	1.0%
15 Aug	48hrs	4731	75	1.6%	0.5%

% Voided Instructions across releases for SMALL BMU Zone

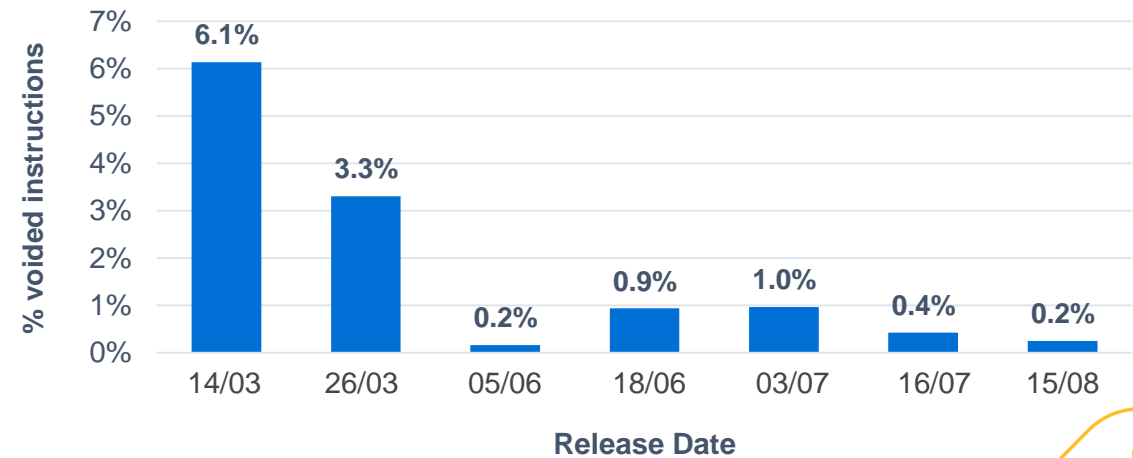


Voided Instructions & Volume in BATTERY Zone since 14 March Release

Release Date (2024)	Test Duration	Total Instructions	Voided Instructions	% Voided Instructions	% Voided Volume
14 Mar	7 days	17000	1043	6.1%	3.5%
26 Mar	50 hours	6385	211	3.3%	No data
5 Jun	8 Hours	1847	3	0.2%	<0.4%
18 Jun	8hrs	1702	16	0.9%	<0.4%
3 Jul	64hrs	15454	149	1.0%	<0.4%
16 Jul	48hrs	8038	34	0.4%	<0.4%
15 Aug	48hrs	6087	15	0.2%	0.01%

Reduction in voided instructions & voided volume supports improved utilisation of assets using OBP

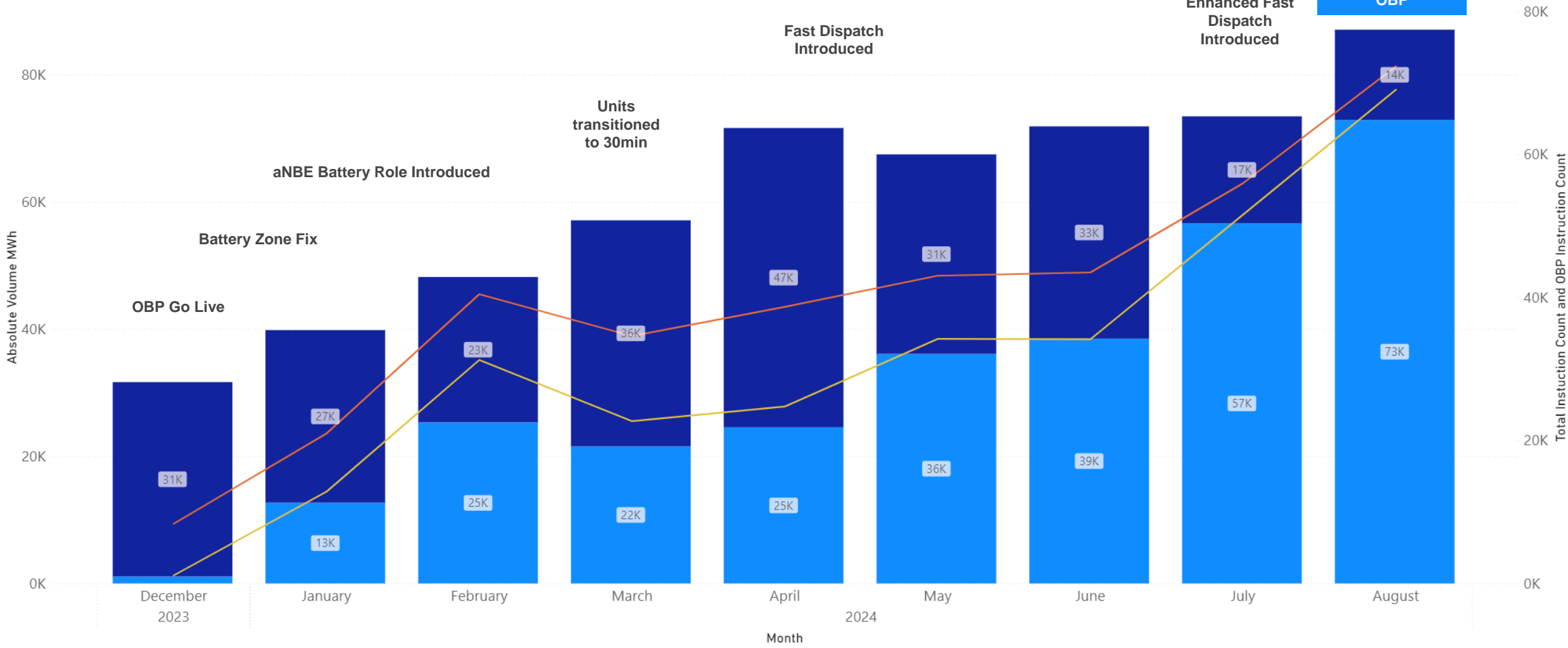
% Voided Instructions across releases for BATTERY Zone



Batteries

Absolute Volume MWh and Instruction Count by Date (Weekly) - Batteries

Detail ● OBP ● Other ● Total Instruction Count ● OBP Instruction Count

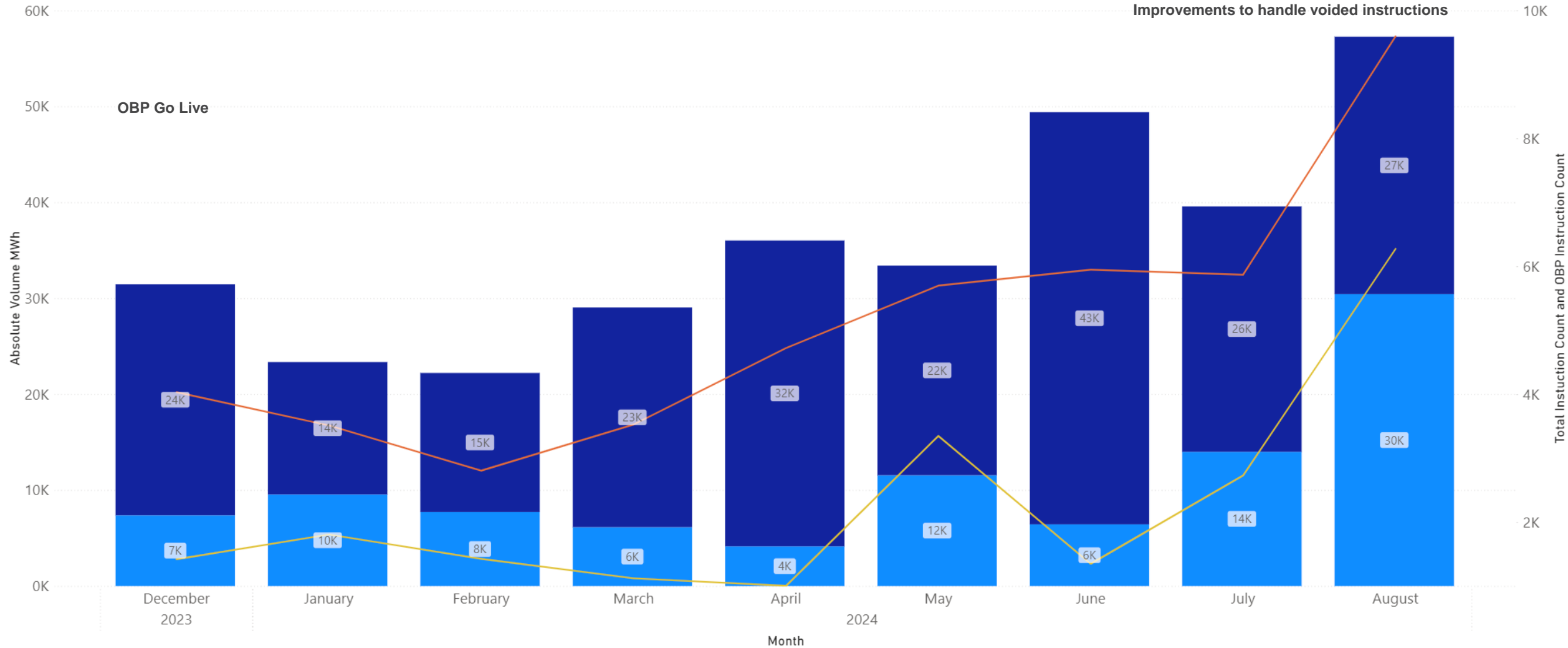


Comparing the 3 months before OBP went live to the latest period - 01 June to 01 September 2024 - the average dispatch volume (MWh per day) of batteries in the BM has increased from **659 to 2,528 (284% increase)**. The number of daily instructions has increased from **217 to 1,869 (761% increase)**.

Small BMUs

Absolute Volume MWh and Instruction Count by Date (Weekly) - Small BMUs

Detail ● OBP ● Other ● Total Instuction Count ● OBP Instruction Count



Comparing the 3 months before OBP went live to the latest period – 01 June to 01 September 2024 - we observe that the average dispatch volume (MWh per day) of small BMUs in the BM has increased from **953 to 1,585 (66% increase)**. The number of daily instructions has increased from **187 to 232 (24% increase)**.



Balancing Systems Release Plan

To be shared during the Balancing Programme webinar on 26/09/24

Legacy Dispatch Algorithm Overview & Current Limitations



The Legacy Dispatch Algorithm (LDA) provides dispatch advice per BMU and zone.

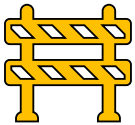


However, the LDA has limitations, such as:

- It cannot advise on dispatch that crosses 0MW.
- It relies on current MIL (Maximum Import Limit) and Maximum Export Limit (MEL) declarations for advice up to 4 hours ahead.



As a result, the LDA cannot currently provide adequate dispatch advice for the battery zone, which means the advice is calculated manually.



Options to enhance the LDA are constrained by current parameters for limited durations assets.

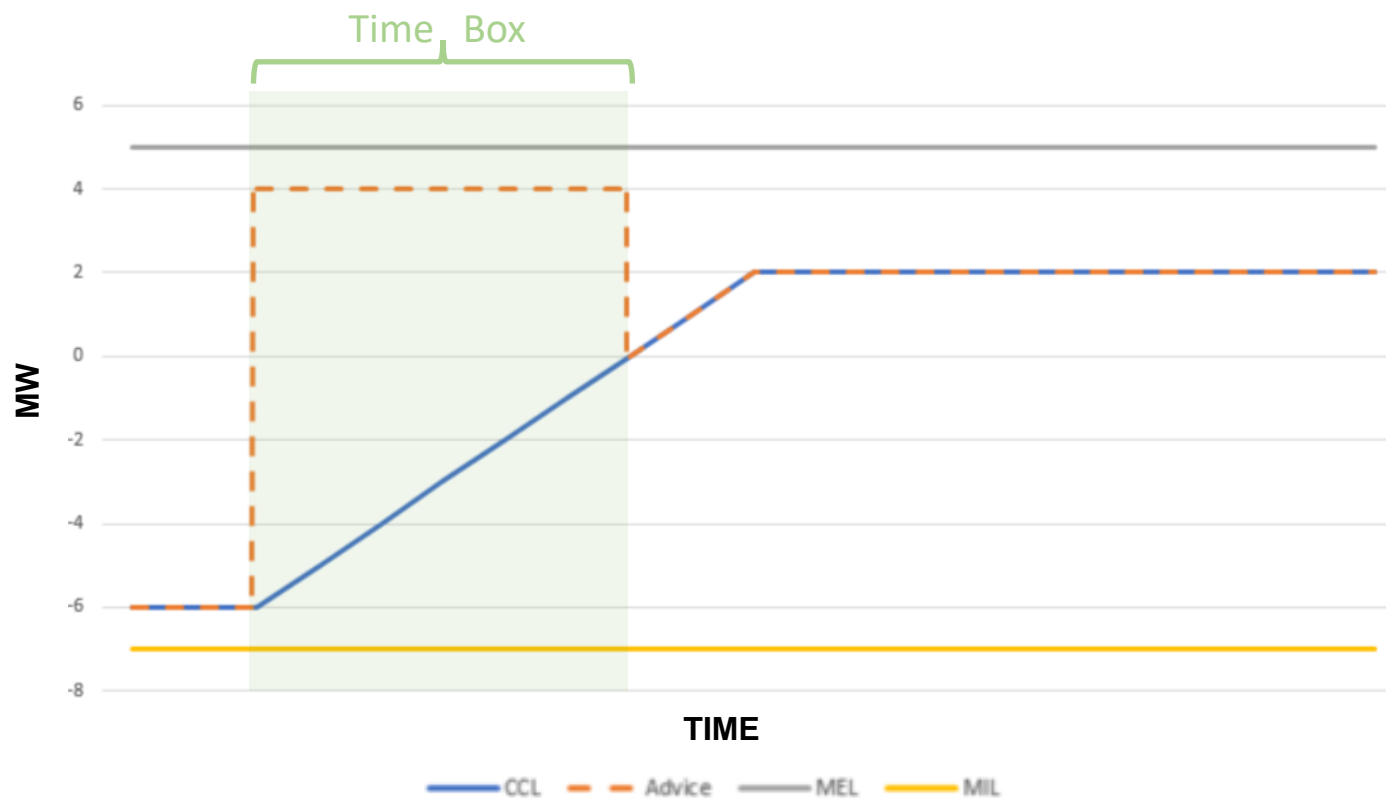


Therefore, a temporary solution has been developed to improve advice while awaiting the conclusion of GC0166.

LDA Changes for BM Release - Q3 FY 24/25

In the October BM release, we will be updating LDA to enable advice for the battery zone by introducing:

- Time-limited, bi-directional advice for batteries, crossing zero in the full range between MIL and MEL.
- A parameter which governs duration of battery advice.
- Logic to restrict advice to the Capped Committed Level (CCL) after the specified duration.



Before and After Example: Overnight High Wind

	BEFORE	AFTER		
	01:55	01:55		
	Desp	Desp		
BM Zones	North1	4060		
	NWind1	8910	9910	Reduction in volume of wind bids advised
	South1	3570	3570	
	SWind1	4690	4690	
	Small B	50	50	
	BM STOR	0	0	
	I-Conn	2530	2530	
	Pump S	-1220	-1220	
	Battery	-20	-1030	Import ~1GW
	Total	22570	22560	Advice at CCL

Testing & Benefits



Testing against historic data was conducted to evaluate the advice provided by the updated LDA.



Various scenarios were tested, including different levels of battery participation in the BM, as well as different constraint and margin levels.



In all 40 scenarios tested, the updated algorithm provided lower cost advice.

Next Steps



A new National Optimiser in OBP is set to replace the LDA in 2025.



The National Optimiser will be developed using a modern coding language, allowing for easier resolution of the limitations present in the LDA.



The National Optimiser will be designed with flexibility in mind, ensuring its adaptability to future developments in the electricity industry, including the parameters agreed through GC1066.

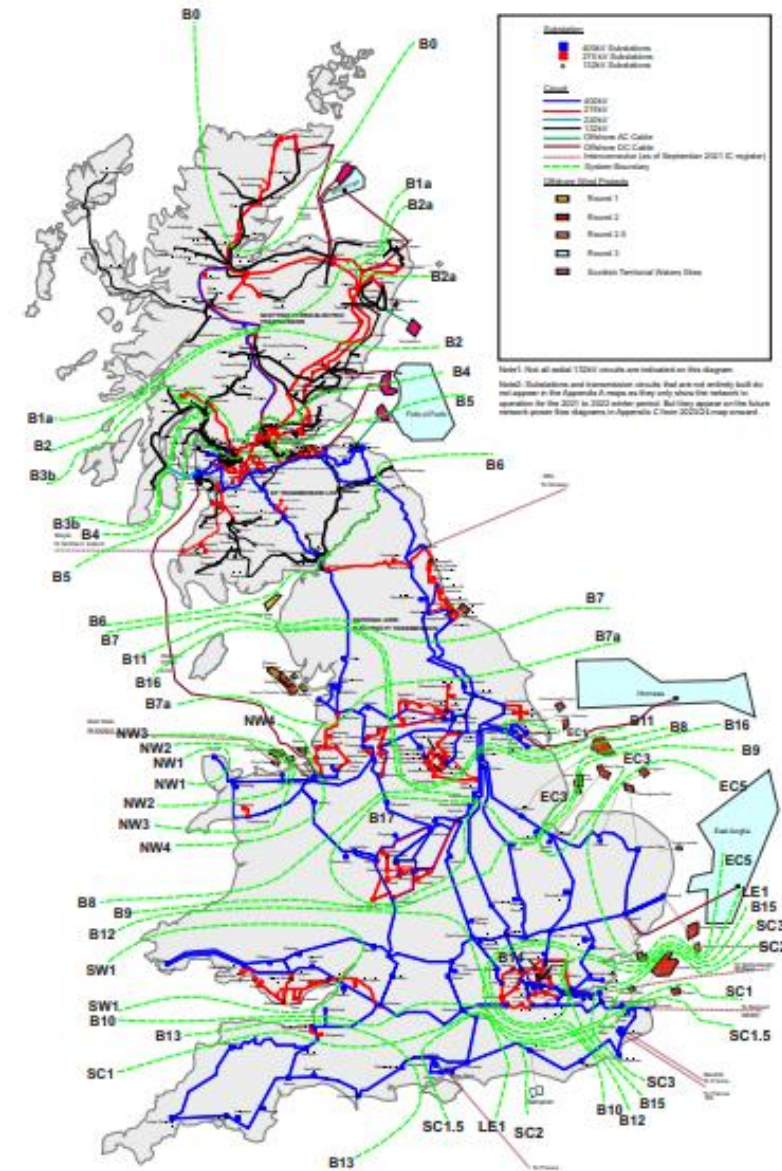
Transmission System Constraints & their Importance

The Transmission System has several constraints meaning that the flow of power must be limited from one location to another.

- **Thermal** – if the power flow exceeds a certain limit lines can expand and cause flashovers.
- **Voltage** – if the flow is not correct voltage levels exceed safe limits.
- **Stability** – if a fault occurs this can cause generators to become unstable and can result in a cascading effect leading to a blackout.

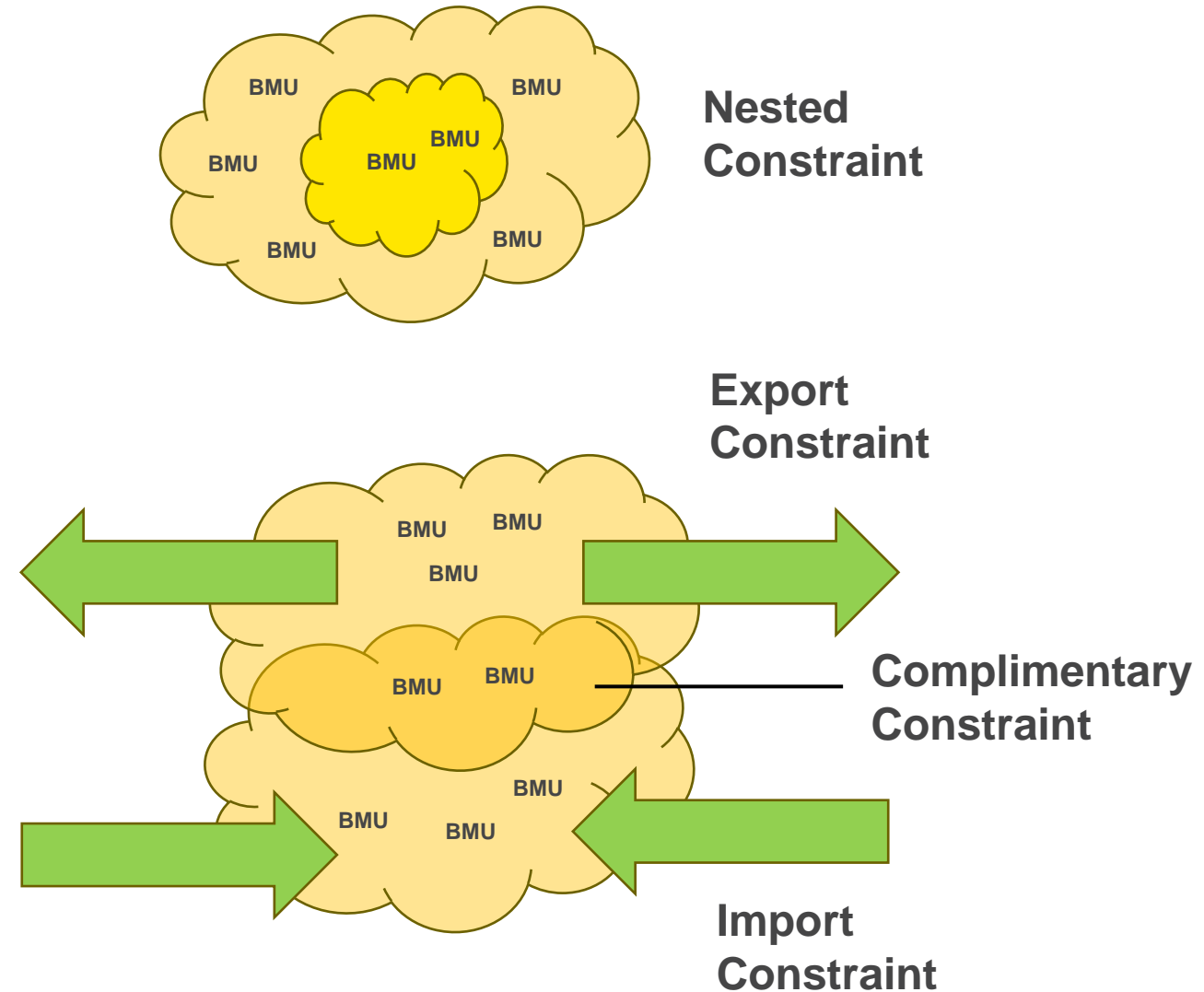
The ESO models these limits as flows across boundaries (see image from the ESO Ten Year Statement).

Figure A3: GB Transmission System Boundaries



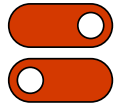
Modelling Constraints

- Our Network Analysis teams have defined approx. 300 constraints to consider.
- The constraints that may be active are highly dependent on the generation and demand pattern.
- The active constraints change throughout the year and throughout the day, and at Day Ahead our Network Analysis teams advise on which constraints may be “biting”.
- Typically, on a given day, the Control Room will be monitoring closely about 35 of the 300 possibilities.
- A given BMU or non-BMU can be in several constraints (including being in an export and import constraint at the same time).
- Some constraints have approx. 300 units attached.

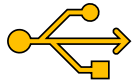


Balancing Programme Approach

The Balancing Programme intends to tackle the problem of constraints in phases:



Constraint Management - Q4 FY 24/25 - moving the process from BM systems to OBP, whilst improving it.



National Optimisation - Q1 FY 25/26 - which includes constraints advice in OBP.



Pathfinder - Q3 FY 25/26 - support for implementing the pathfinder solutions.



Interface to new real-time transmission analysis systems (Network Control Management System - NCMS) – Q4 FY25/26 - OBP to ingest live updates from “look ahead” facilities from online analysis tools.



Innovation projects - For example “Forecasting the Risk of Congestion” - [Forecasting the Risk of Congestion | ENA Innovation Portal \(energynetworks.org\)](https://www.energynetworks.org/innovation/forecasting-the-risk-of-congestion).

Constraint Management



Key function:

- Enable the control room to visualise how a constraint develops into the future if it is broken, and meter how close to the limit we are.
- Use OBP to call off BMUs to resolve the constraint.
- Improve modelling of BMUs within a constraint when solving for energy.



Compared to current constraint management using BM systems:

- Control room have to manually mark a BMU as being inside a constraint & not available for a BOA.



What benefits will Market Participants see?

- Improved dispatch of units behind a constraint.
- Relaxing the restrictions on using a BMU for energy.



Will Market Participants see any technical / operational differences?

- More use of BMUs within a constraint.

Constraint Management Workflow

Sum of Expected Operating Level (EOL) within the Constraint minus Constraint Demand

The warnings are driven from the margin % (which is a backend calculation, not visible to the users):

- Yellow is displayed where the % is $0 < \text{margin} \% \leq 10$
- Red is displayed where the % is $\text{margin} \% \leq 0$

Constraint ID	Direction	Transfer	Const limit	Change of...	Mins to change	Margin	Time to breach
SCOTTEX-1	Export	1500	1400	200	-	-100	Now
SCOTIMP-2	Import	1200	1200	200	01:30	0	Now
SCOTTEX-3	Export	1350	1450	200	02:20	100	00:03:20
SCOTIMP-4	Import	1200	1300	200	02:55	100	00:04:30
SCOTTEX-5	Export	900	1250	200	10:30	350	00:32:12
SCOTTEX-6	Export	800	1600	-	10:50	800	00:40:22
SCOTIMP-7	Import	800	1300	120	14:20	-500	01:22:40
SCOTIMP-8	Import	800	1300	120	15:50	-500	02:32:50

Constraint Limit will change by 120MW in 15 mins 50 seconds

If you took no actions on this constraint, the constraint limit will breach in 40 mins

Constraint Management Workflow

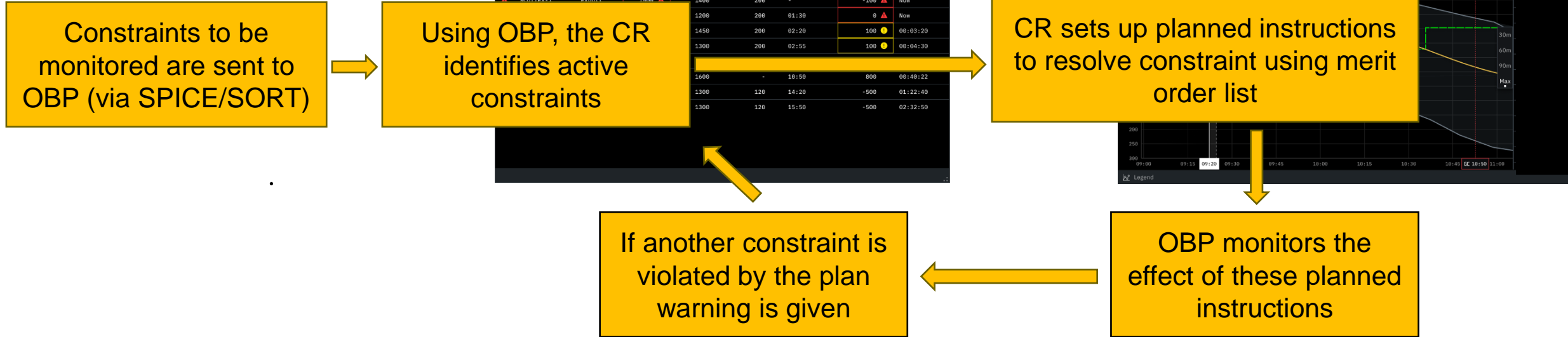


In the future, users can view a relative view i.e., Constraint Limit is represented at 0MW with the transfers & flows being relative to 0

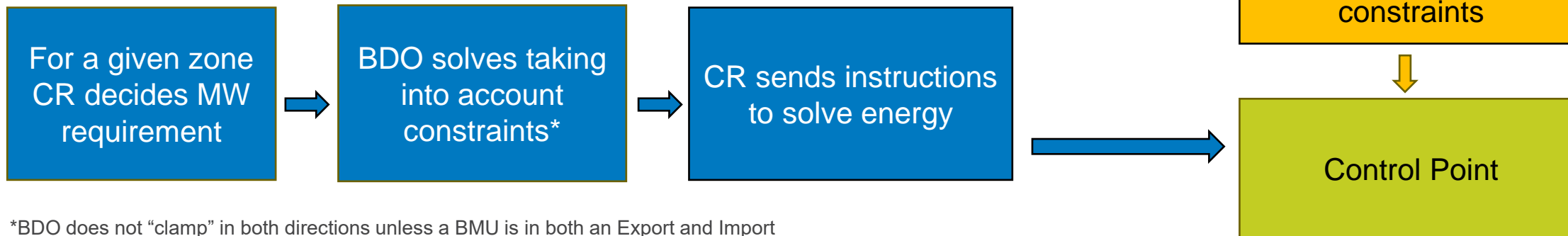
List view of all the units within that constraint. In the future, we want to link this to Unit Library, or maybe include a price stack / requirement optimisation panel

An Indicative Example

Constraint Journey



Energy Journey



*BDO does not “clamp” in both directions unless a BMU is in both an Export and Import

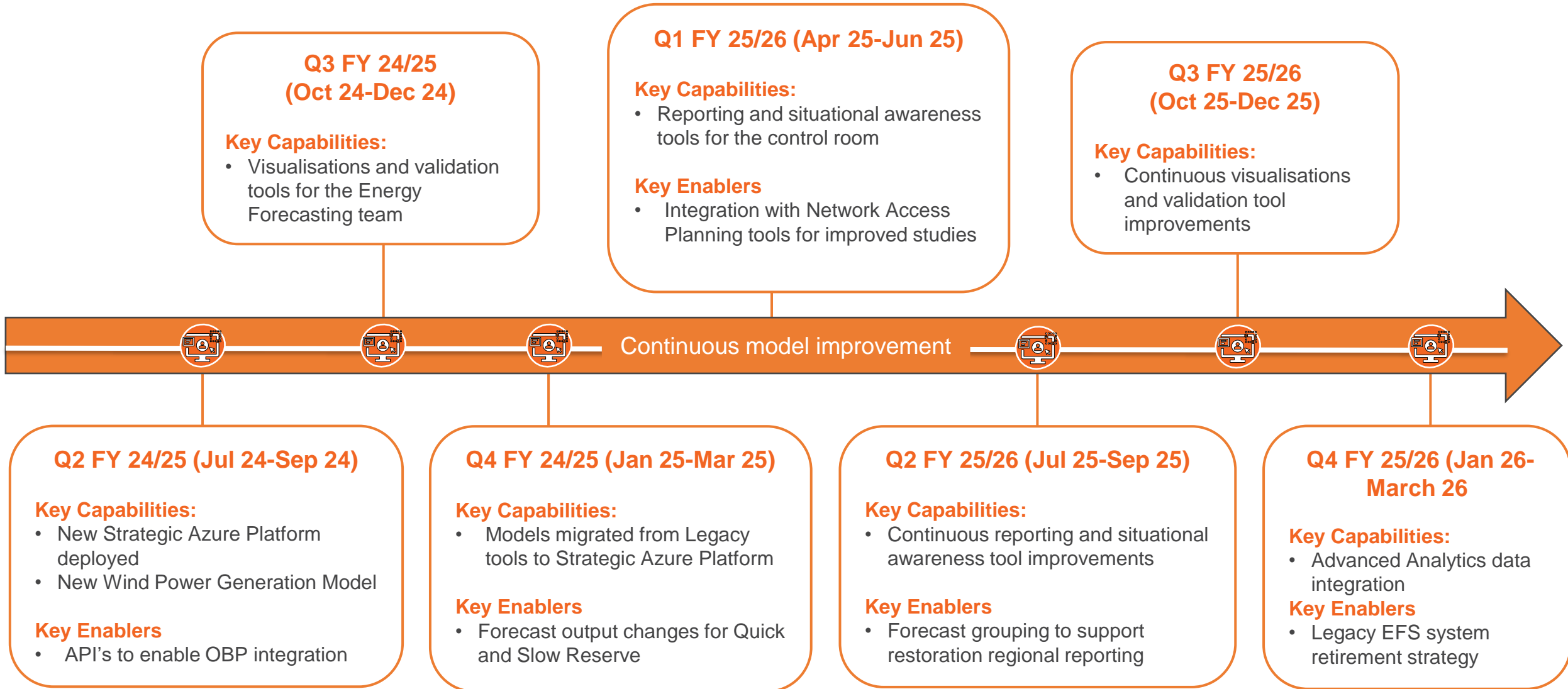
Abbreviations: CR – Control Room, BDO – Bulk Dispatch Optimiser

Forecasting Progress Update & Future View

Richard Sykes, Product Manager

Platform for Energy Forecasting (PEF) Release Plan

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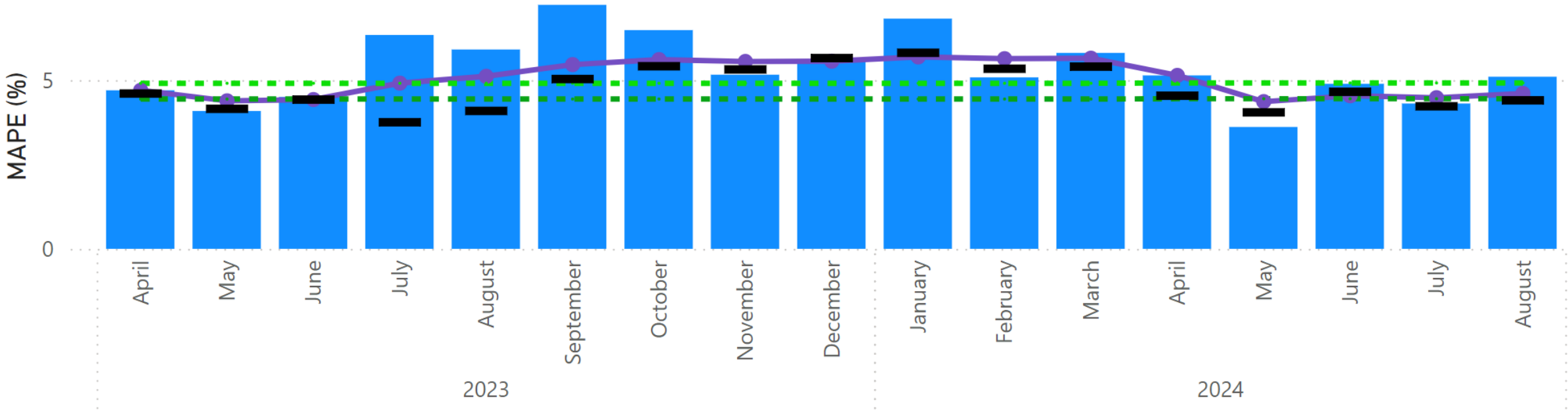


Our Metrics for Wind (1C)

Measures the average absolute error between day-ahead forecast and outturn wind generation for each half hour period as a percentage of capacity for BM wind units.

Metered Wind Forecast error - tracking vs target by month*

Metric ● 1C ● Cumulative ● Meeting ● Exceeding — Meeting (monthly)

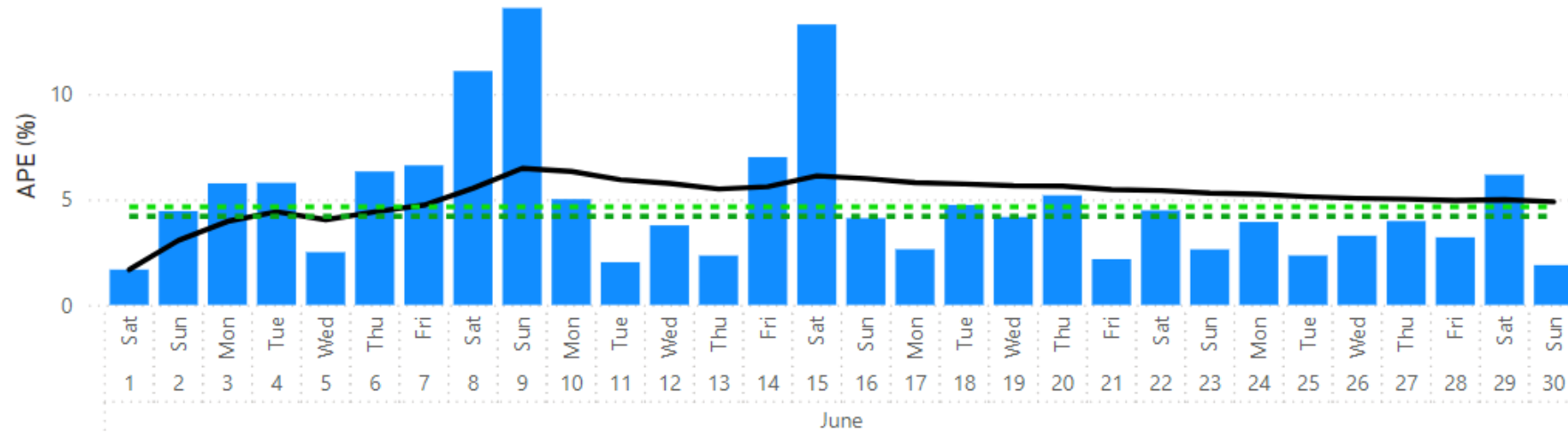


*MAPE – Mean Absolute Percentage Error

Influence of Poor Performance Days

Metered Wind Forecast error - tracking vs target by day

Metric ● 1C ● Cumulative ● Meeting ● Exceeding

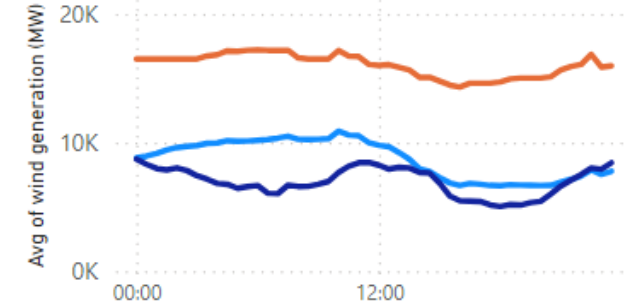


A focus on identifying the root cause of poor performing days such as:

- Quality and variety of weather data
- Quality of outage data provided to the ESO

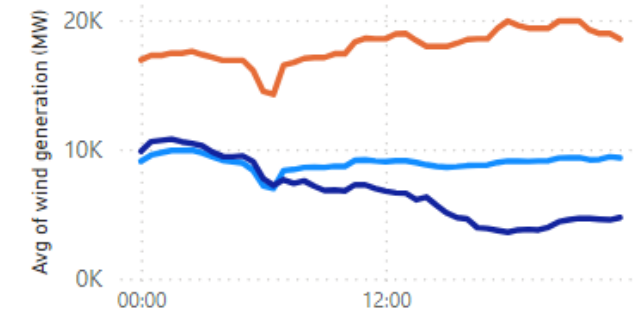
Metered wind - 1C - 08/06/2024

● Forecast ● Settlement ● Capacity non BOA



Metered wind - 1C - 09/06/2024

● Forecast ● Settlement ● Capacity non BOA

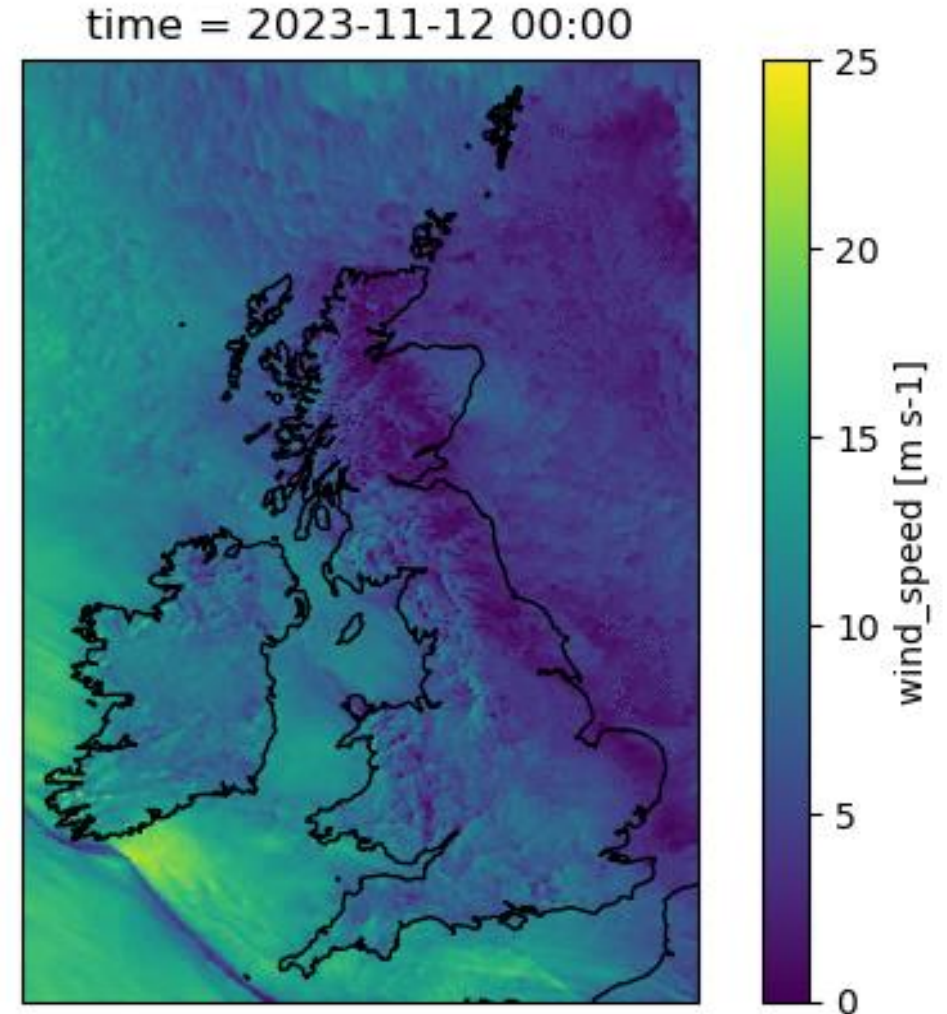


Things are about to Change!

PEF-Azure is our new flexible and scalable platform, to enable the development of new forecasting products, following modern data science and software development best practice.

The model in the initial release will be similar to the 'power curve' model currently used in EFS, but will benefit from some initial improvements:

- Access to far richer weather forecast data, from 6 industry-leading weather forecast models
- More frequent forecast updates (every hour, up from 8 per day)
- Flexibility to quickly add new wind farm locations
- Ensemble forecasting, where a range of equally-likely weather scenarios are used to support risk-based decision making (e.g., constraints, margins, reserve)



The underlying Met Office forecast data during Storm Debi (Nov. 2023)

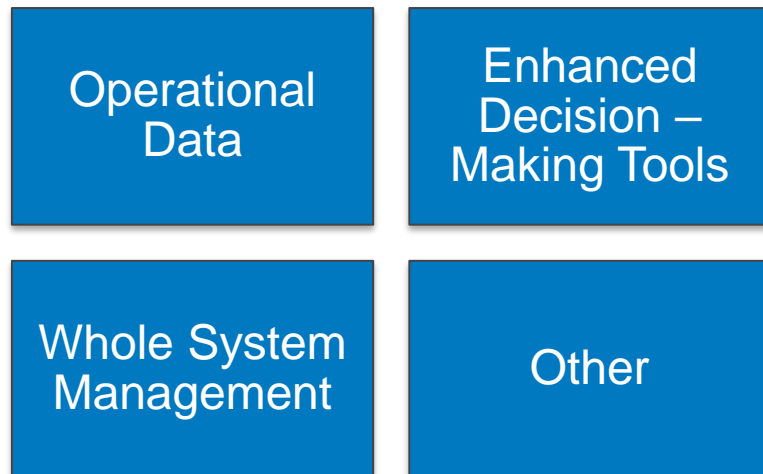
A photograph of a person with blonde hair, wearing a denim jacket, with their arms raised in the air. They are standing in a field at sunset or sunrise, with a large crowd of people and tents in the background. The scene is illuminated by warm, golden light from the low sun. There are some decorative white wavy lines in the upper left and a glowing purple and white circular graphic in the lower right.

Beyond 2025

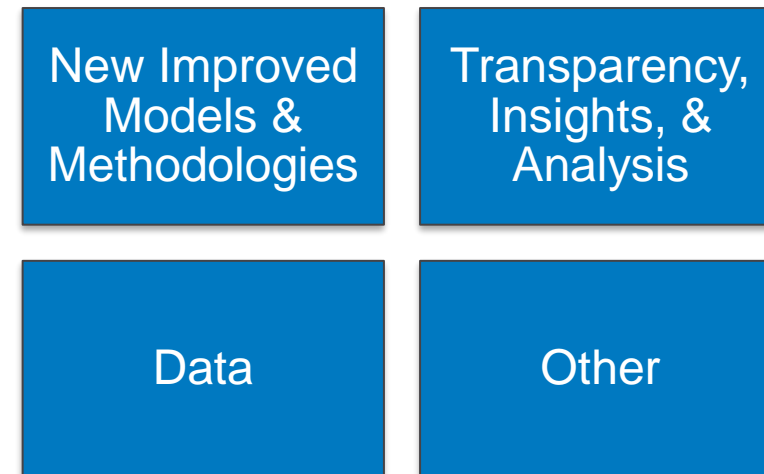
Neil Morgans, Principal Product Manager

- At the June 2024 event we hosted 3 breakout sessions which looked at **product development beyond 2025** in the balancing & forecasting space.
- Participants could:
 - Suggest their own ideas for new capabilities
 - Were requested to give a date for when each new capability was needed
 - Given 3 votes to prioritise capabilities
- We suggested the following themes but emphasised we wanted participants to “free think”.

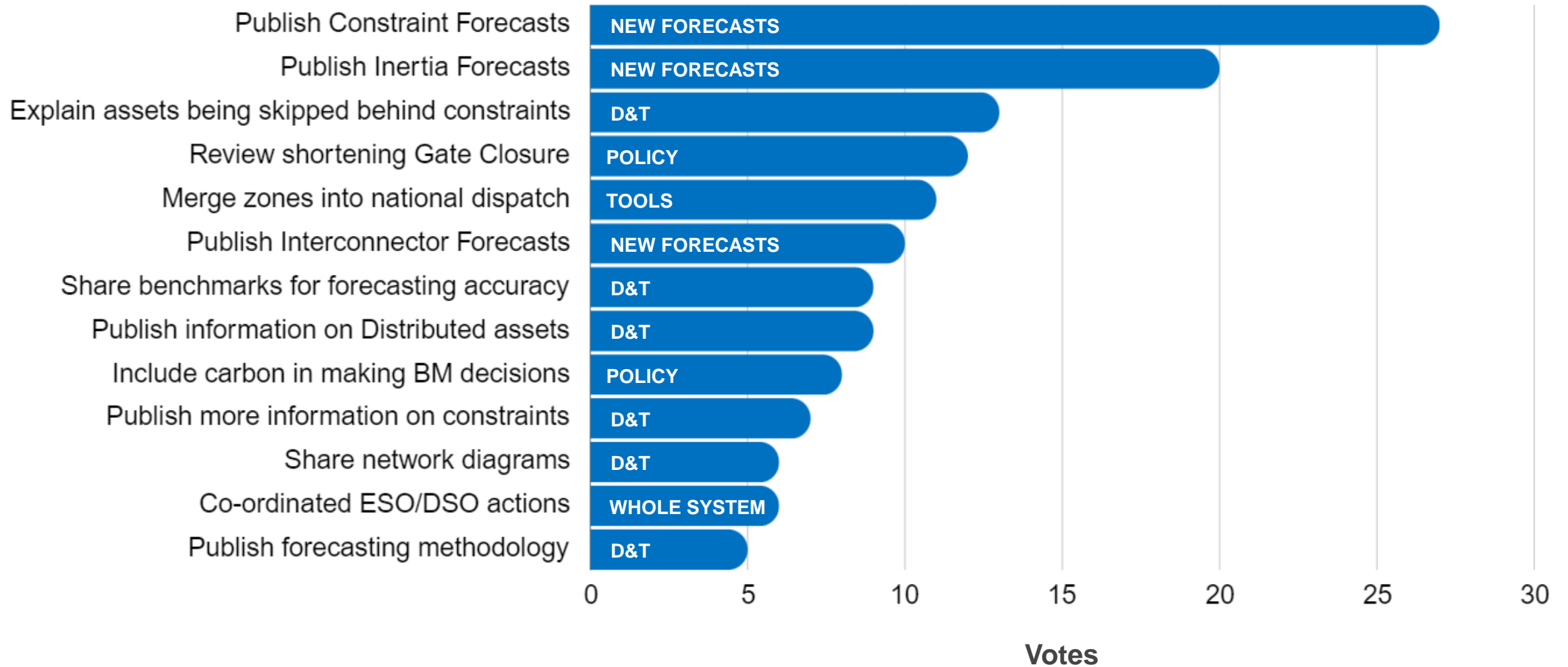
Balancing



Forecasting



Beyond 2025 – Most Popular Suggestions



Abbreviations: D&T - Data & Transparency

Product Development Beyond 2025

Next Steps




- Use our stakeholder working groups & future events to further explore and shape ideas for product delivery beyond 2025 to help in building out our future roadmap.



- Coordinate with wider ESO teams to provide visibility of future plans.



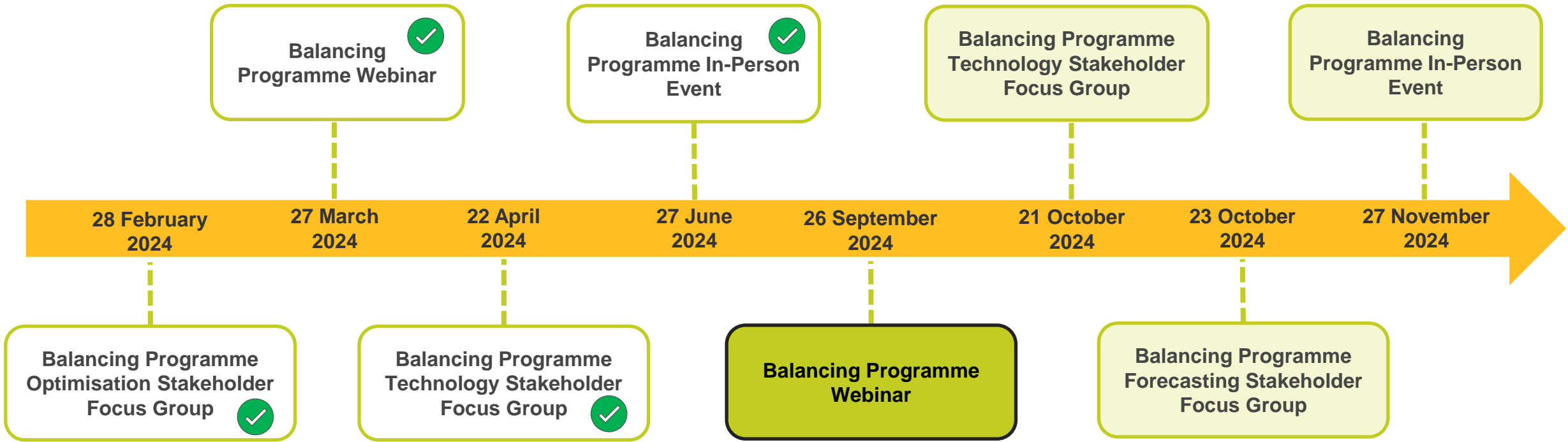
- Share policy suggestions from participants with relevant ESO teams.

A person with blonde hair, wearing a denim jacket, is shown from the side with their arms raised in the air. They are standing in a grassy field at sunset, with a crowd of people and tents visible in the background. The sky is a mix of orange, pink, and purple. There are some decorative elements: a white wavy line above the text, a white horizontal bar below the text, and a glowing purple hula hoop around the person's waist. The bottom of the image has a yellow gradient bar.

Q&A

#BPSeptWebinar2024

Engagement Opportunities . . .



ESO newsletters with Balancing Programme content issued regularly, providing updates between online & in-person events



Offer of 1-1 relationship managers within the Balancing Programme

Next Steps . . .



We welcome your feedback & questions – please get in contact with us at box.balancingprogramme@nationalgrideso.com.



Slides from today's session will be published on our website, along with the webinar recording.



We're becoming NESO on **1 October 2024**; sign up to our weekly newsletter and select **Future of Balancing Services inc. Balancing Programme** to keep up to date. If you don't subscribe, you'll stop hearing from us from **1 October 2024**. Subscribe to our NESO newsletter [here](#).



Sign-up to our Stakeholder Focus Groups for Optimisation, Technology, & Forecasting - [Balancing Programme Stakeholder Focus Groups](#).



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



Balancing Programme Webinar

26 September 2024