Public

Balancing Programme Webinar

26 September 2024

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System Operator

Welcome & Agenda

Time	Agenda Item	Details
13:30 – 13:40	Welcome and Setting the Scene	• System Transformation – where are we?
13:40 – 14:20	Balancing Systems	• 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	• Forecasting systems progress update & future view • Wind metrics • Wind deliverable on the Platform for Energy Forecasting (PEF)
14:30 – 14:35	Beyond 2025	• Snapshot of ideas for product development beyond 2025 • Next steps to develop & progress ideas
14:35 – 14:55	Q&A	• Hosted via Slido
14:55 – 15:00	Next Steps	• Future engagement opportunities
15:00	Close	

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Q&A via Slido

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 webinar.

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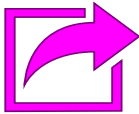
Out of scope questions will be forwarded on to the appropriate ESO team or expert for a direct response. We may ask you to contact us by email to ensure we have the correct contact details for the response.

Using Slido, you can also suggest topics for our **27 November 2024** Balancing Programme Event in London.
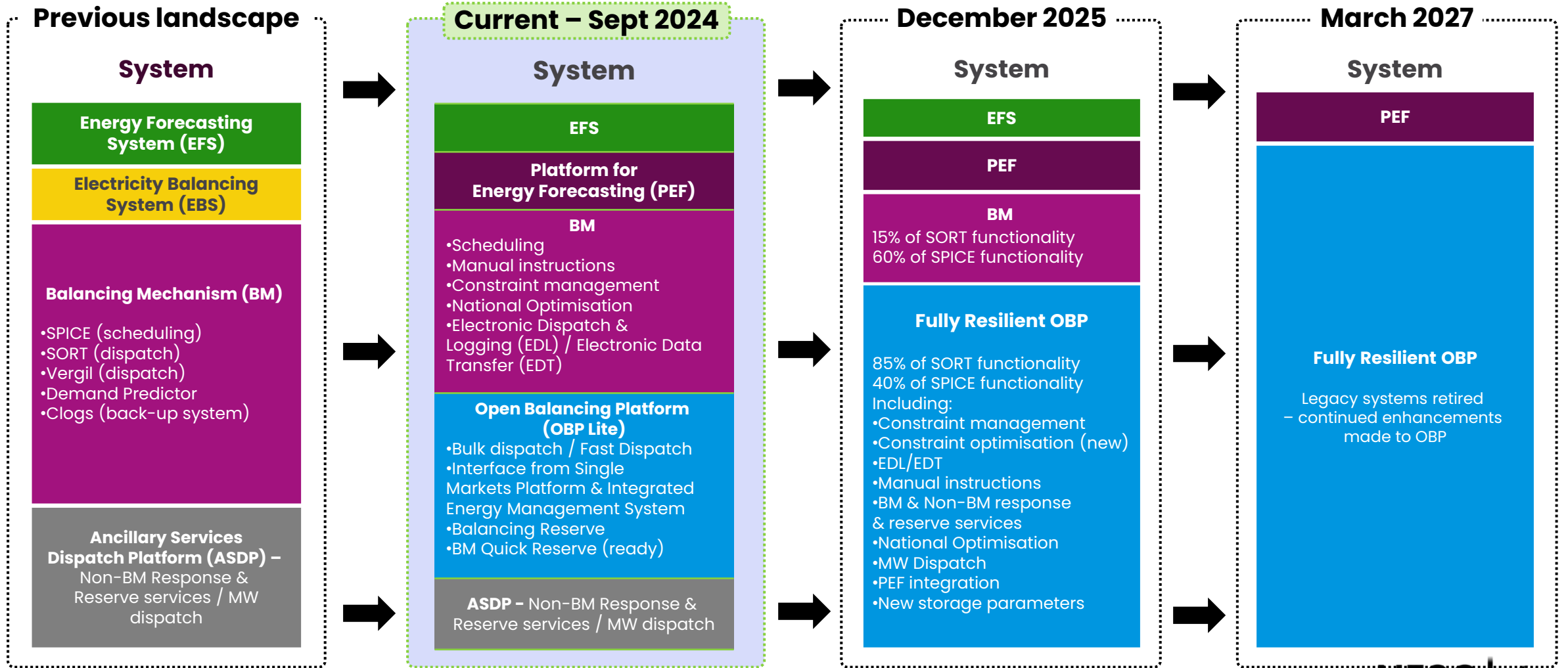
Slido will close at the end of the webinar; if you have any further questions, please get in contact with us at **box.balancingprogramme@nationalenergyso.com.**

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Balancing Programme: Setting the scene

Brendan Lyons,

Balancing Programme Director

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System Transformation – where are we?

Previous landscape

System

Energy Forecasting System (EFS)

Electricity Balancing System (EBS)

Balancing Mechanism (BM)

•SPICE (scheduling)
•SORT (dispatch)
•Vergil (dispatch)
•Demand Predictor
•Clogs (back-up system)

Ancillary Services Dispatch Platform (ASDP) – Non-BM Response & Reserve services / MW dispatch

Current – Sept 2024

System

EFS

Platform for Energy Forecasting (PEF)

BM
•Scheduling
•Manual instructions
•Constraint management
•National Optimisation
•Electronic Dispatch & Logging (EDL) / Electronic Data Transfer (EDT)

Open Balancing Platform (OBP Lite)
•Bulk dispatch / Fast Dispatch
•Interface from Single Markets Platform & Integrated Energy Management System
•Balancing Reserve
•BM Quick Reserve (ready)

ASDP – Non-BM Response & Reserve services / MW dispatch

December 2025

System

EFS

PEF

BM
15% of SORT functionality
60% of SPICE functionality

Fully Resilient OBP

85% of SORT functionality
40% of SPICE functionality
Including:
•Constraint management
•Constraint optimisation (new)
•EDL/EDT
•Manual instructions
•BM & Non-BM response & reserve services
•National Optimisation
•MW Dispatch
•PEF integration
•New storage parameters

March 2027

System

PEF

Fully Resilient OBP

Legacy systems retired – continued enhancements made to OBP

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Key Areas of Focus for the Next 12 Months

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.

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Balancing Systems Progress Update & Future view

Bernie Dolan, Principal Product Manager

Neil Morgans, Principal Product Manager

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Progress across Balancing Systems since June 2024

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

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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 & 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%

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% Voided Instructions across releases for SMALL BMU Zone
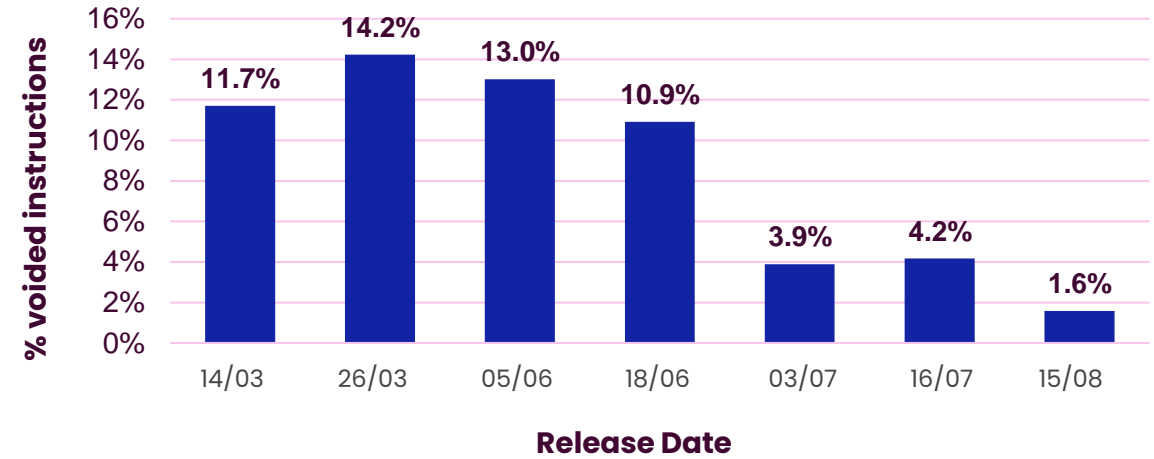
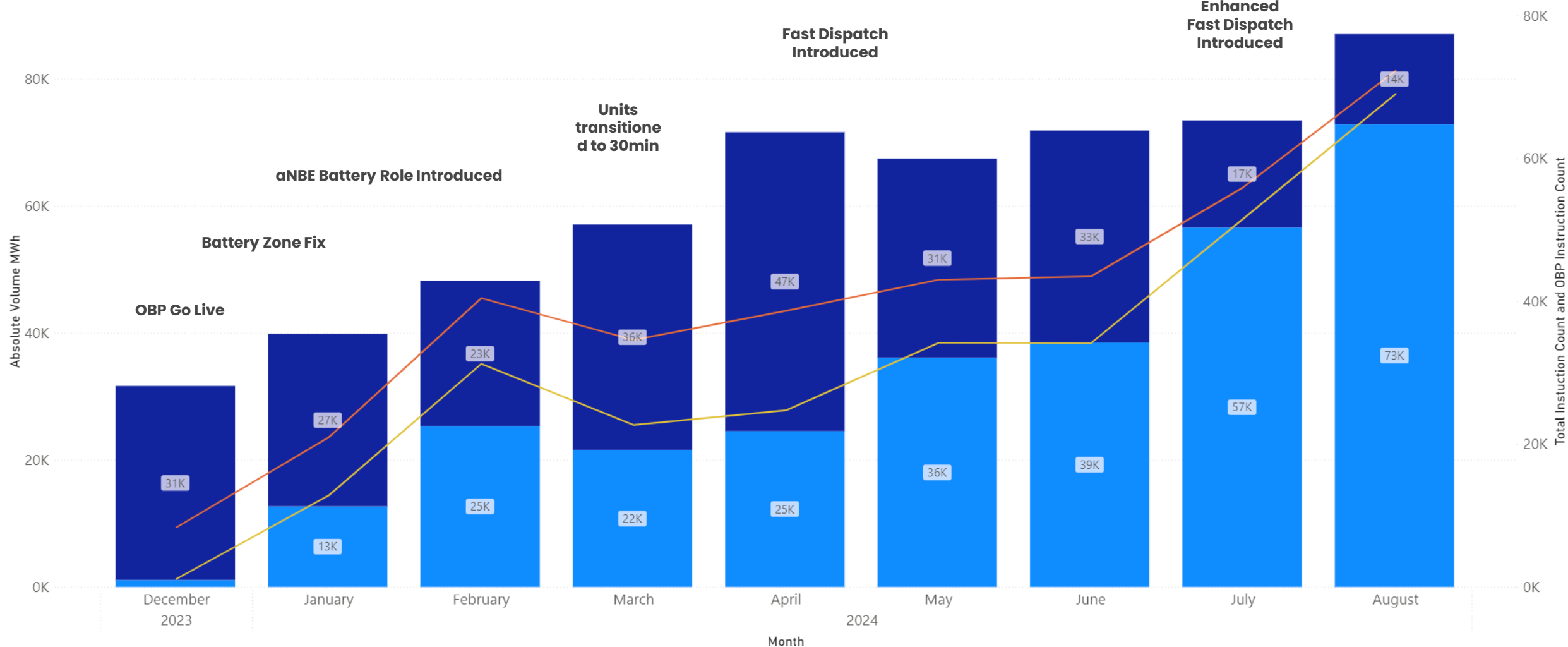Reduction in voided instructions & voided volume supports improved utilisation of assets using OBP

% Voided Instructions across releases for BATTERY Zone
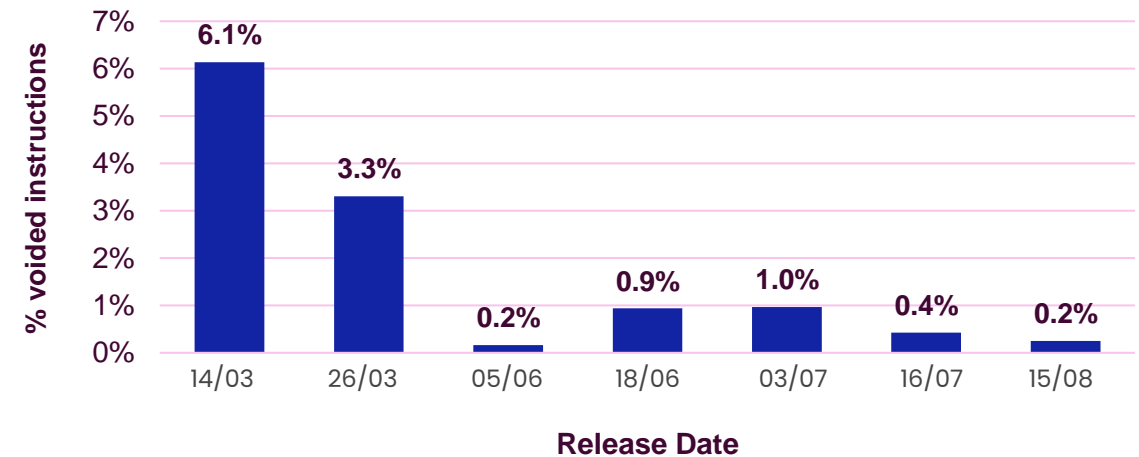
Batteries

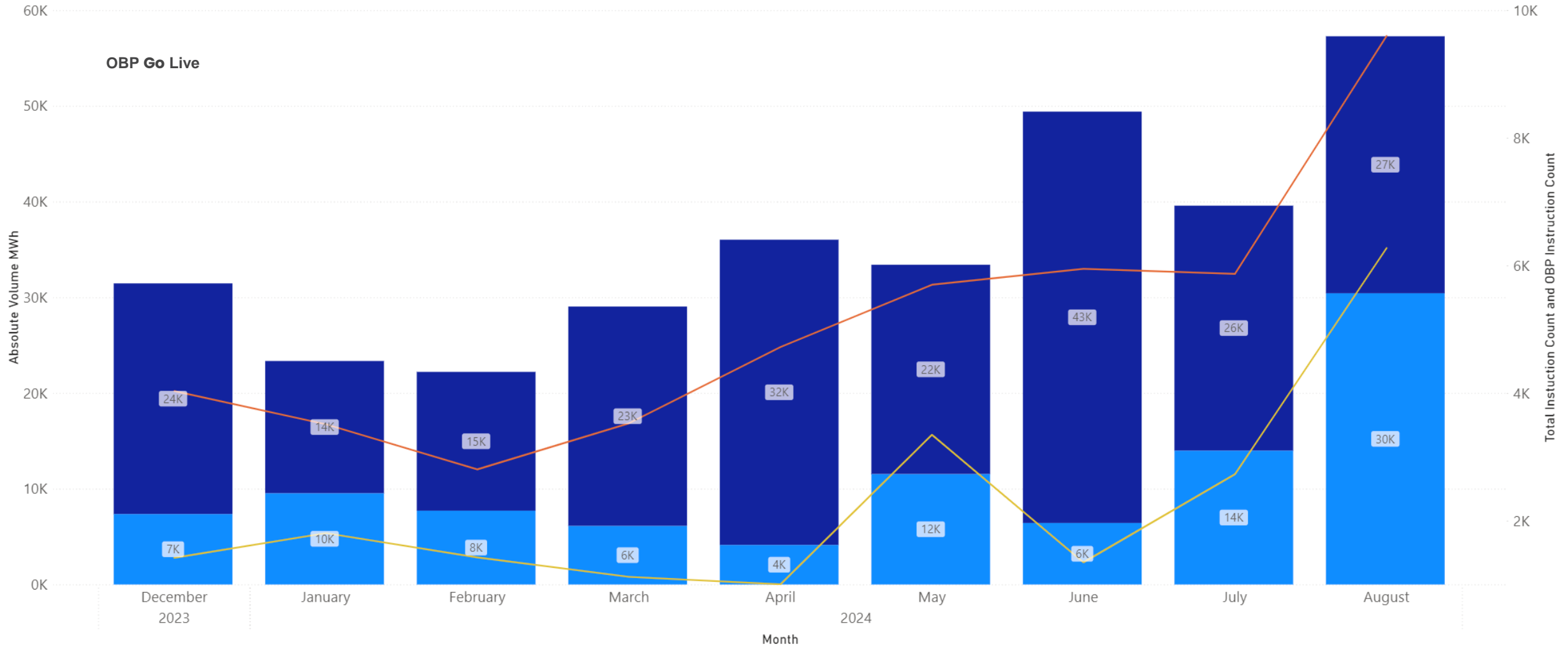Absolute Volume MWh and Instruction Count by Date (Weekly) - Batteries

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).**
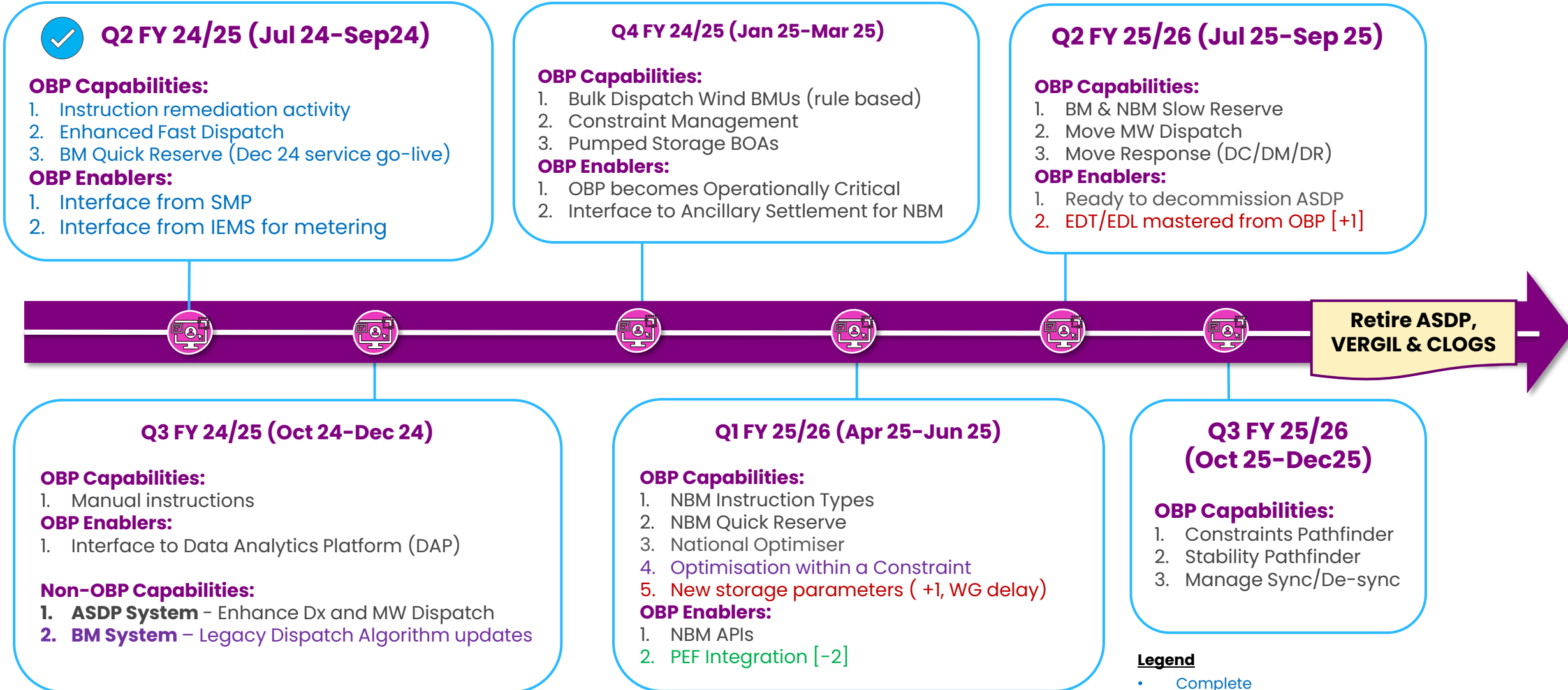
10

Small BMUs

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

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

Improvements to handle voided instructions

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).**

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Balancing Systems Release Plan

✓ Q2 FY 24/25 (Jul 24–Sep24)

OBP Capabilities:
1. Instruction remediation activity
2. Enhanced Fast Dispatch
3. BM Quick Reserve (Dec 24 service go-live)

OBP Enablers:
1. Interface from SMP
2. Interface from IEMS for metering

Q4 FY 24/25 (Jan 25–Mar 25)

OBP Capabilities:
1. Bulk Dispatch Wind BMUs (rule based)
2. Constraint Management
3. Pumped Storage BOAs

OBP Enablers:
1. OBP becomes Operationally Critical
2. Interface to Ancillary Settlement for NBM

Q2 FY 25/26 (Jul 25–Sep 25)

OBP Capabilities:
1. BM & NBM Slow Reserve
2. Move MW Dispatch
3. Move Response (DC/DM/DR)

OBP Enablers:
1. Ready to decommission ASDP
2. EDT/EDL mastered from OBP [+1]

Retire ASDP, VERGIL & CLOGS

Q3 FY 24/25 (Oct 24–Dec 24)

OBP Capabilities:
1. Manual instructions

OBP Enablers:
1. Interface to Data Analytics Platform (DAP)

Non-OBP Capabilities:
1. **ASDP System** - Enhance Dx and MW Dispatch
2. **BM System** – Legacy Dispatch Algorithm updates

Q1 FY 25/26 (Apr 25–Jun 25)

OBP Capabilities:
1. NBM Instruction Types
2. NBM Quick Reserve
3. National Optimiser
4. Optimisation within a Constraint
5. New storage parameters (+1, WG delay)

OBP Enablers:
1. NBM APIs
2. PEF Integration [-2]

Q3 FY 25/26 (Oct 25–Dec25)

OBP Capabilities:
1. Constraints Pathfinder
2. Stability Pathfinder
3. Manage Sync/De-sync

Legend
- Complete
- Moved to a later date (no. of quarters moved)
- New addition to the release plan
- Moved to an earlier date (no. of quarters moved)
- No change

Abbreviations: **DC:** Dynamic Containment **DM:** Dynamic Moderation **DR:** Dynamic Regulation **BOA:** Bid Offer Acceptance
DX: Dynamic Response **WG:** Work Group for GC0166 **CLOGS:** Contingency Logging System **VERGIL:** Versatile Graphical Instruction Logger

Legacy Dispatch Algorithm Overview & Current Limitations

The Legacy Dispatch Algorithm (LDA) provides dispatch advice per BMU and zone.
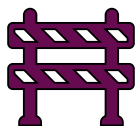
However, the LDA has limitations, such as:
- It cannot advise on dispatch that crosses 0MW.
- It relies on current MIL (Maximum Import Limit) and Maximum Export Limit (MEL) declarations for advice up to 4 hours ahead.

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.

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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.
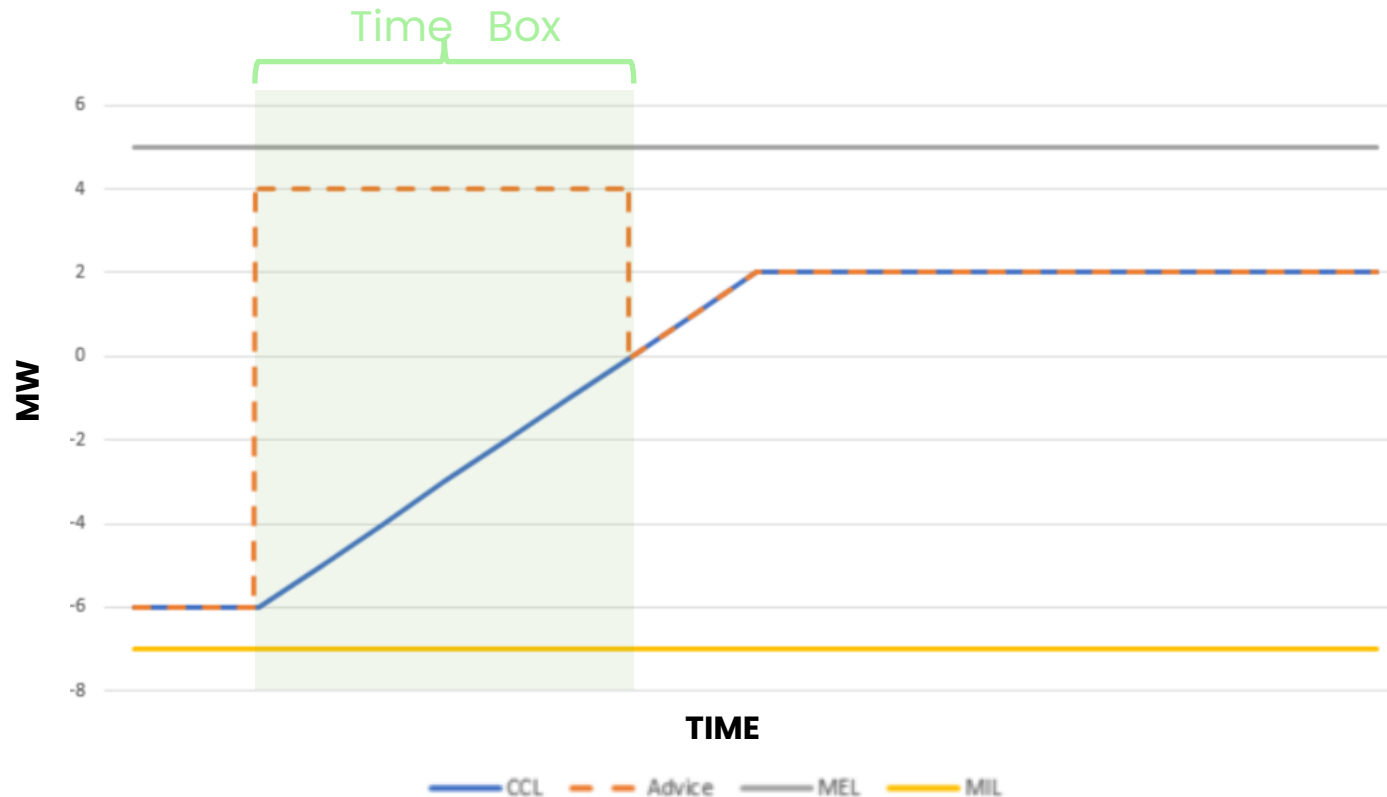
Before and After Example: Overnight High Wind

BM Zones

	BEFORE	AFTER
	01:55	01:55
	Desp	Desp
North1	4060	4060
NWind1	8910	9910
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
Total	22570	22560

Reduction in volume of wind bids advised

Import ~1GW

Advice at CCL

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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.

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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

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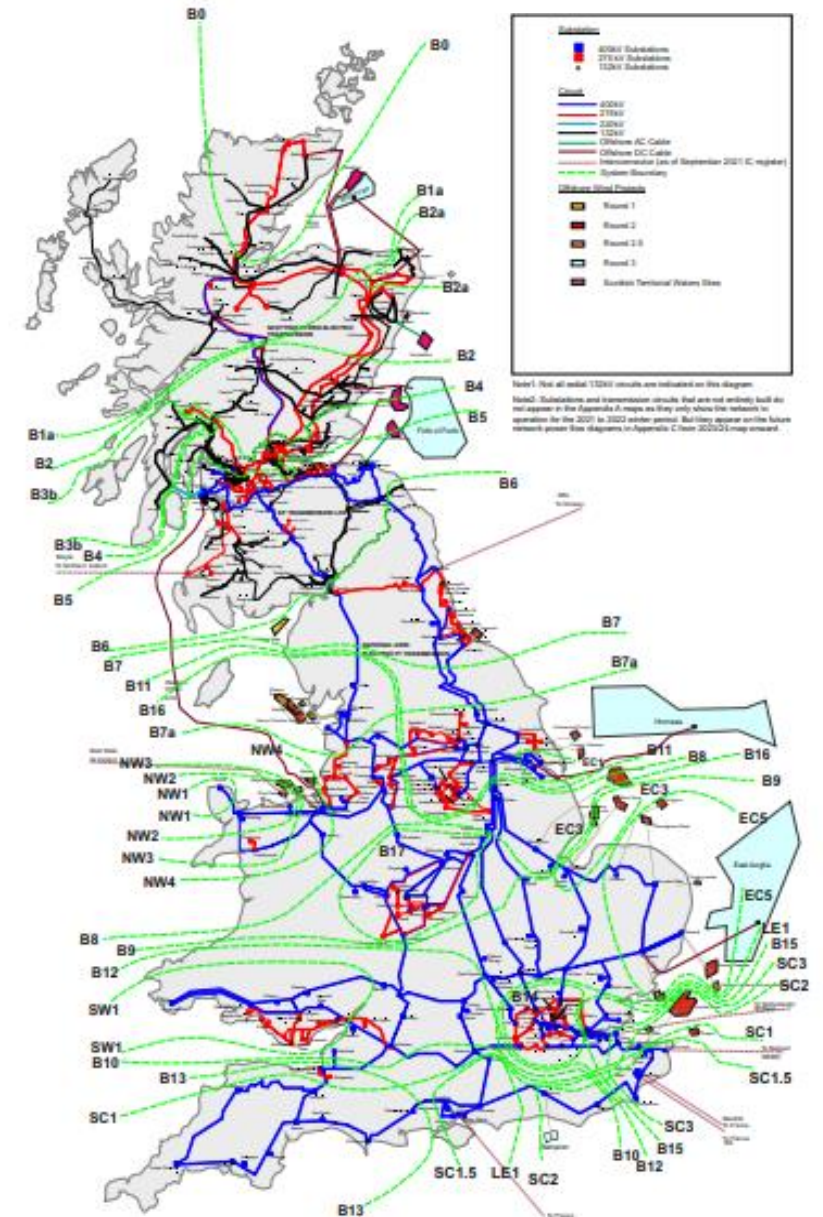
Modelling Constraints

- 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).

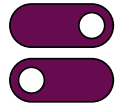- Some constraints have approx. 300 units attached.
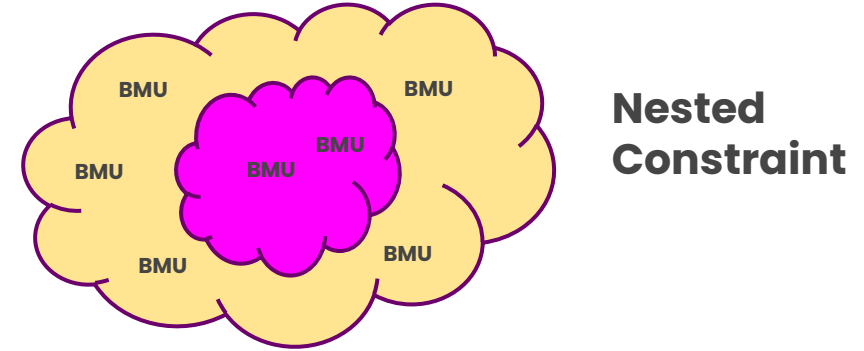
Nested Constraint
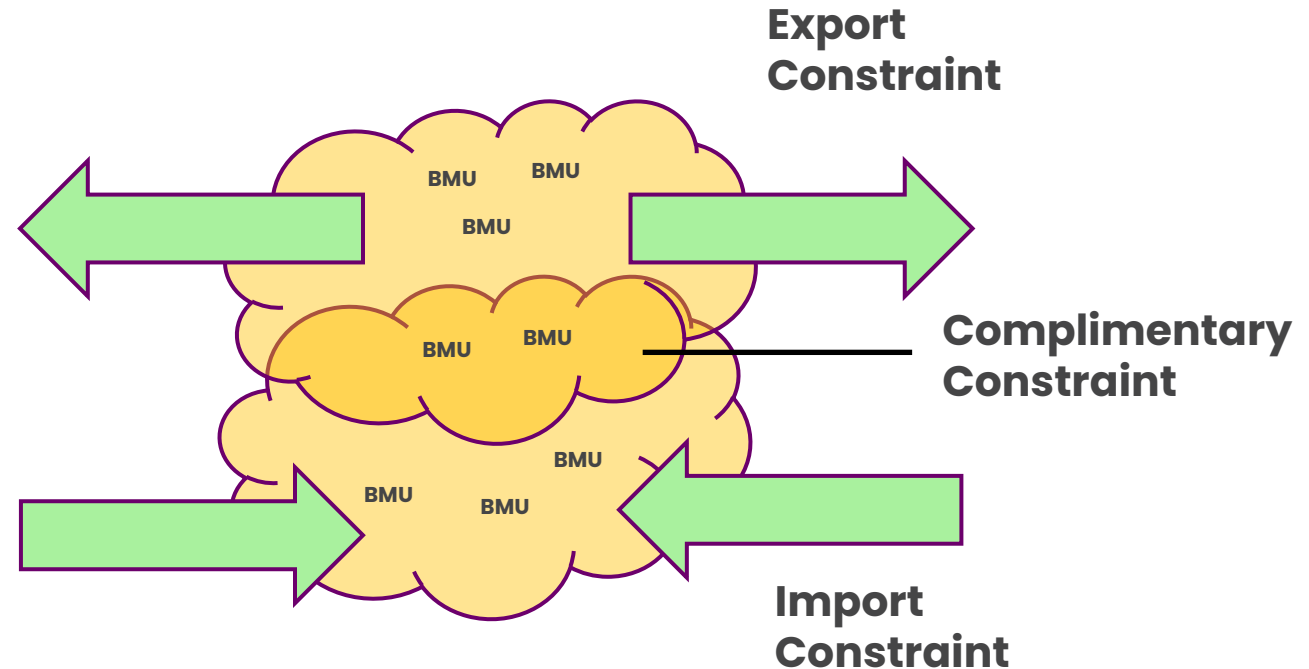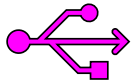
Export Constraint

Complimentary Constraint

Import Constraint

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.

Optimisation within a Constraint – Q1 FY 25/26 – using an optimiser to move units inside a constraint.

**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).
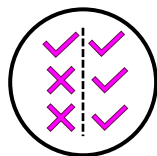
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Constraint Management
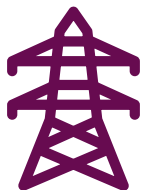
Key function:

- 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.

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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 < but <= 10
- Red is displayed where the % is <=0

Constraints

Constraints Overview

Items per page: 10 ∨   1-10 of 50 items   1 ∨   of 1 pages   < >

	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

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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
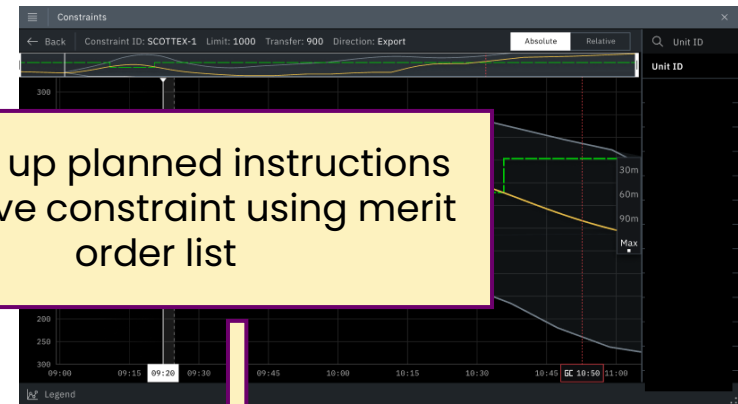

Key constraint information

Time now

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An Indicative Example

Constraint Journey

| Constraints to be monitored are sent to OBP (via SPICE/SORT) | → | Using OBP, the CR identifies active constraints | → | CR sets up planned instructions to resolve constraint using merit order list |

| If another constraint is violated by the plan warning is given | ← | OBP monitors the effect of these planned instructions |

| Control room sends instructions to solve constraints |

Energy Journey

| For a given zone CR decides MW requirement | → | BDO solves taking into account constraints* | → | CR sends instructions to solve energy | → | Control Point |

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

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

Forecasting Progress Update & Future view

Richard Sykes,

Product Manager

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Platform for Energy Forecasting (PEF) Release Plan

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 24/25 (Oct 24-Dec 24)

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

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

Key Capabilities:
- Continuous visualisations and validation tool improvements

Continuous model improvement

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:
- Models migrated from Legacy tools to Strategic Azure Platform

Key Enablers
- Forecast output changes for Quick and Slow Reserve

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
- Legacy EFS system retirement strategy

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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)
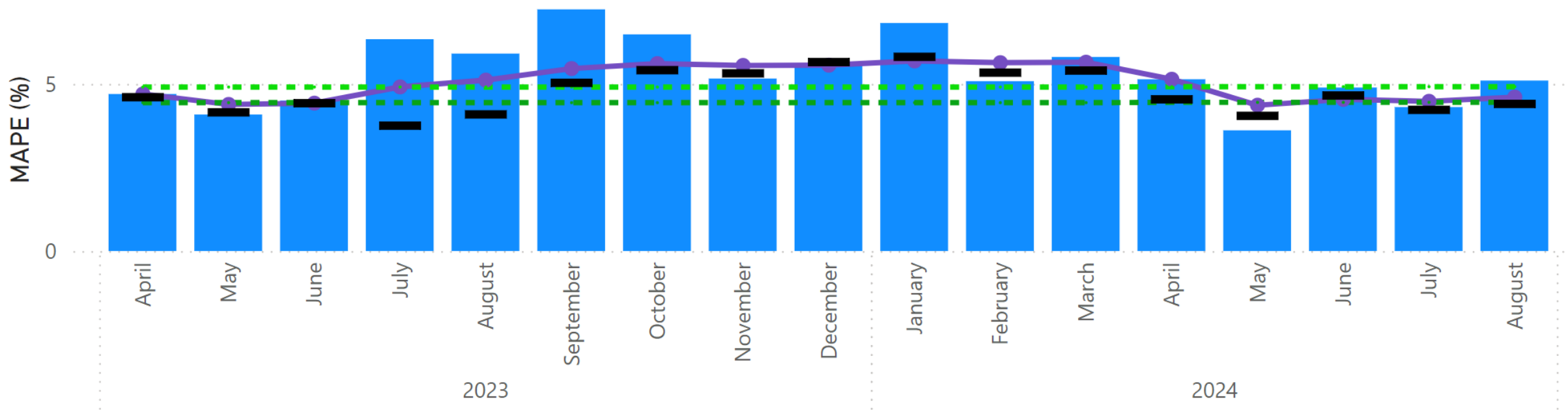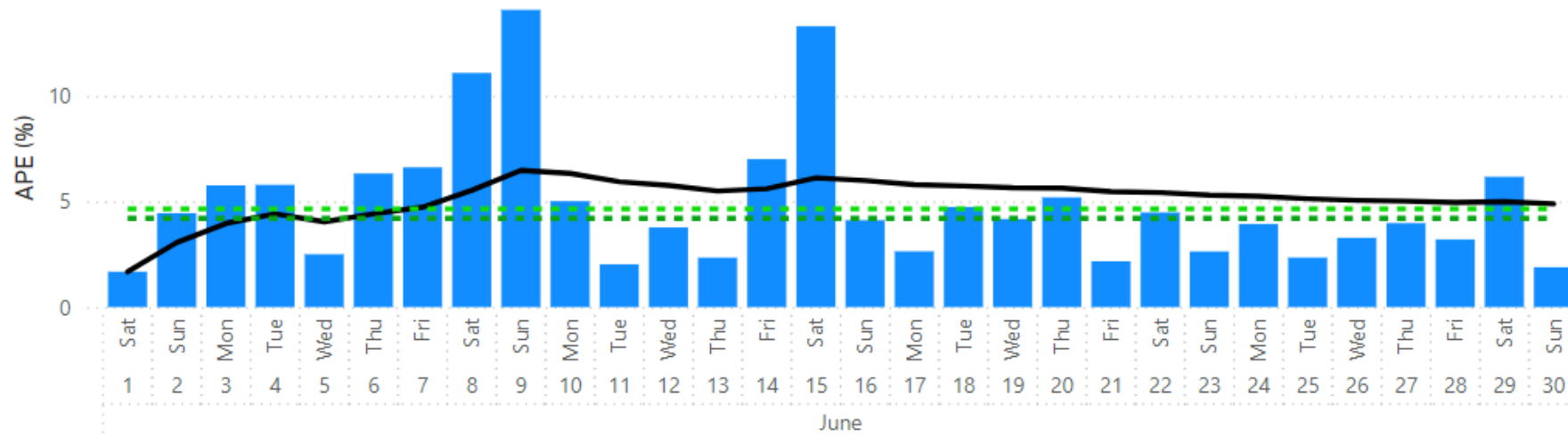

*MAPE – Mean Absolute Percentage Error

Influence of Poor Performance Days

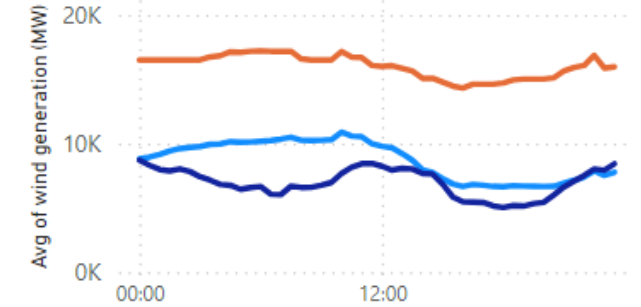Metered Wind Forecast error – tracking vs target by day

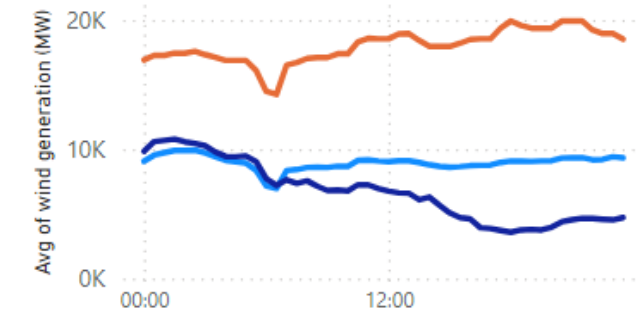Metric ● 1C ● Cumulative ● Meeting ● Exceeding

Metered wind – 1C – 08/06/2024
● Forecast ● Settlement ● Capacity non BOA

Metered wind – 1C – 09/06/2024
● Forecast ● Settlement ● Capacity non BOA

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

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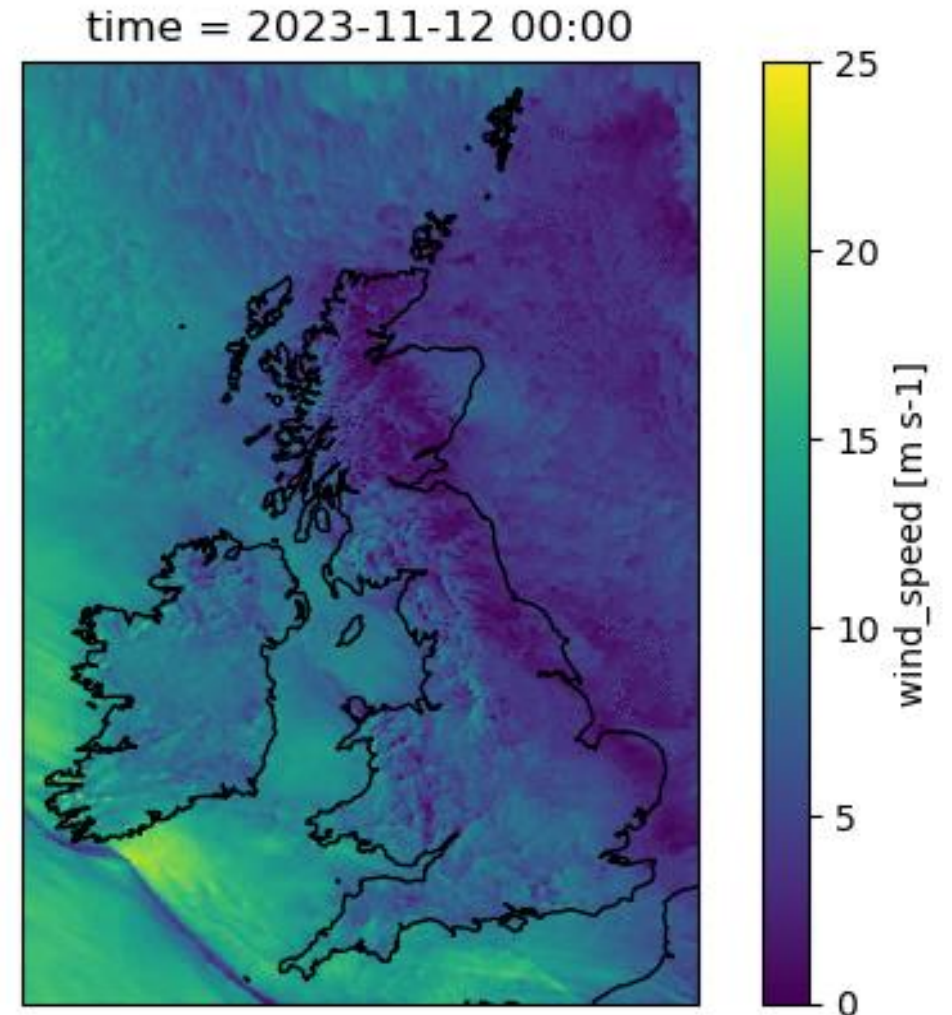
The underlying Met Office forecast data during Storm Debi (Nov. 2023)

Beyond 2025

Neil Morgans,
Principal Product Manager

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Product Development Beyond 2025

- 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

Balancing

Operational Data	Enhanced Decision – Making Tools
Whole System Management	Other

Forecasting

New Improved Models & Methodologies	Transparency, Insights, & Analysis
Data	Other

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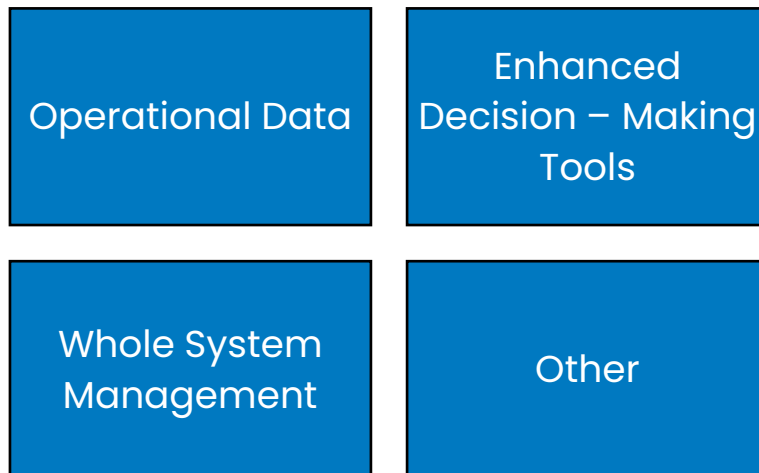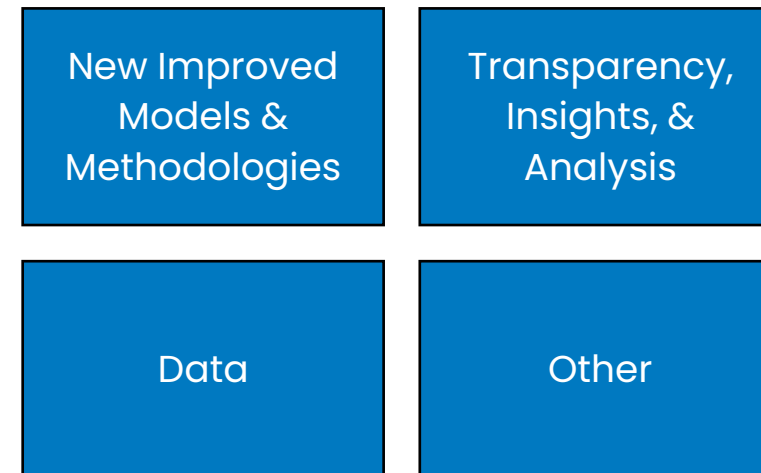
Beyond 2025 – Most Popular Suggestions

Suggestion	Category	Votes
Publish Constraint Forecasts	NEW FORECASTS	27
Publish Inertia Forecasts	NEW FORECASTS	20
Explain assets being skipped behind constraints	D&T	13
Review shortening Gate Closure	POLICY	12
Merge zones into national dispatch	TOOLS	11
Publish Interconnector Forecasts	NEW FORECASTS	10
Share benchmarks for forecasting accuracy	D&T	9
Publish information on Distributed assets	D&T	9
Include carbon in making BM decisions	POLICY	8
Publish more information on constraints	D&T	7
Share network diagrams	D&T	6
Co-ordinated ESO/DSO actions	WHOLE SYSTEM	6
Publish forecasting methodology	D&T	5

Votes

Abbreviations: D&T - Data & Transparency

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Product Development Beyond 2025

Next Steps

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

- Share policy suggestions from participants with relevant ESO teams.
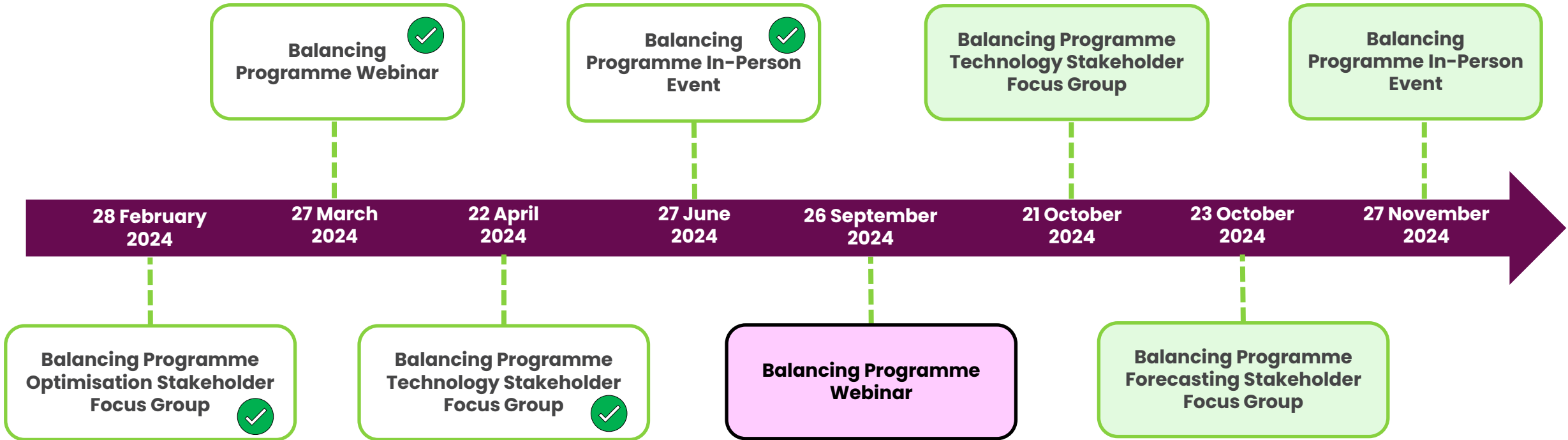
- Use our stakeholder working groups & future events to further explore and shape ideas for product delivery beyond 2025 to help in building out our future roadmap.

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Q&A

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Engagement Opportunities . . .

Balancing Programme Webinar ✓

Balancing Programme In-Person Event ✓

Balancing Programme Technology Stakeholder Focus Group

Balancing Programme In-Person Event

| 28 February 2024 | 27 March 2024 | 22 April 2024 | 27 June 2024 | 26 September 2024 | 21 October 2024 | 23 October 2024 | 27 November 2024 |

Balancing Programme Optimisation Stakeholder Focus Group ✓

Balancing Programme Technology Stakeholder Focus Group ✓

Balancing Programme Webinar

Balancing Programme Forecasting Stakeholder Focus Group

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

Offer of 1-1 relationship managers within the Balancing Programme

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Next Steps . . .

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

Subscribe to our new NESO newsletter **here**. We're becoming NESO on **1 October 2024;** please 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**.

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

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.

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