Balancing Programme Event

27 June 2024

ESO

Welcome

#BPJune2024

Q&A Session via Slido

Please post any questions you have for our speakers on Slido - #BPJune2024 - 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.

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

Enhancing Energy Storage in the BM

Sign up to our webinar on the **24 July** where we will give an update on our work on Enhancing Energy Storage in the BM and we will share the outputs of the work LCPDelta have been doing to help us improve dispatch transparency in our operations

This webinar is aimed at all energy providers interested in skip rates and will cover

- Introduction to the skip rate challenge the ESO and industry are facing
- Stakeholder feedback gathered by LCPDelta
- Methodology to calculate skip rates (redefined as uneconomic dispatch)
- Results from the independent analysis report undertaken by LCPDelta
- Recommendations and conclusions of the analysis
- Next steps
- Q&A

https://events.teams.microsoft.com/event/397bd340-f388-4a62-a853-ae7911d7e989@f98a6a53-25f3-4212-901c-c7787fcd3495

REVEAL Innovation Project – Get Involved

REVEAL is a innovation project which will improve our ability to carry out trials. The project is currently in Phase 4 and is building a live trials environment (sandbox).

- Pathway to more efficient and effective trials
- Building a more collaborative and transparency approach with the industry

We are currently looking for a testing partner

Specifically, the partner will support test integration with the proof of concept:

- Receive data submissions/declarations
- Send dummy instructions (example instruction, not to be executed)

Please speak to either Leon Walker or Philippa Banks for more detail. They will be available throughout the day and located at our carousel.

Welcome & Agenda

#BPJune2024

Time	Title	
09:30 – 09:45	Welcome & Setting the Scene	• Delivering for you and society • Developing our future plans • Partnerships
09:45 – 10.05	Current Systems Progress Update & Future View	• ASDP & BM Roadmap overview • PEF Strategy and Roadmap
10.05 – 11.00	Open Balancing Platform (OBP) Progress Update & Future View	• OBP Roadmap overview • EDL/EDT Migration
11.00 – 11.25	**Break**	
11.25 – 12.10	Breakout Session 1,2 or 3	1. OBP Optimisation & Fast Dispatch Demo 2. New Projects & Innovation 3. Beyond 2025
12.15 – 13:00	Breakout Session 1,2 or 3	
13:00 – 13.45	**Lunch**	
13.45 – 14.30	Breakout Session 1,2 or 3	
14.35– 15.35	Customer Listening Session	• Improving our collaboration with you
15.35 – 15.50	**Break**	
15.50 – 16.20	Q&A	
16.20 – 16.30	Next Steps & Closing Remarks	

Balancing Programme – Setting the Scene

Brendan Lyons, Balancing Programme Director

Delivering for you and Society

#BPJune2024

1. Manage increased **number of market participants**

2. Quickly **adapt** to new requirements, innovation and services

3. Enable **level playing field** for new flexibility services

4. Optimise **balancing cost**

Several key areas of current focus out to 2025 for the Balancing Programme

Successful delivery of several releases of the Open Balancing Platform inc. **Bulk Dispatch & Fast Dispatch** , & enablement of **Balancing Reserve** and the **30-minute rule**

Improved EDL/EDT processing through **industry collaboration** and upgrade of current BM systems with **additional memory and CPU resources**

Successful delivery of a **2nd release of the MW Dispatch** Service on the Ancillary Service Dispatch Platform, supporting improved constraint management in the UKPN area

Removal of Electricity Balancing System from all operational processes in the Control Room, & currently in the process of **removing hardware**

Successful **strategic review of ESO forecasting estate** resulting in decision to decouple forecasting products from legacy forecasting tools earlier than originally planned

Summer 2024 - Deploy several improvements to the small BMU zone to **resolve outstanding rounding issues**

Summer/Autumn 2024 - Build out **cross programme integration** – e.g., SCADA, Single Markets Platform and Data & Analytics Platform.

Autumn 2024 – MW Dispatch and ASR service enhancements delivered in ASDP unlocking further consumer value

Winter 2024 - Deliver the capability to **dispatch all units manually** from the Open Balancing Platform

Winter 2024 - deliver a **2nd Data Centre** providing enhanced resilience to the Open Balancing Platform

Developing our Future Plans

Collaborating with you on what **‘beyond 2025’** looks like will be a key focus of today’s event

OBP and PEF Strategic Platforms

Data

Zero Carbon System Operability

Whole Energy System Management

Review of Electricity Market Arrangements

Partnerships

Over 450 stakeholders engaged with the Balancing Programme representing **over 170** organisations & growing!

7 Balancing Programme stakeholder newsletters, providing programme updates between events; **6** separate news updates e.g., OBP performance, 30-minute rule etc.

4 in-person Balancing Programme Engagement Events & **2** webinars – most recent November event received an average feedback score of **8.3/10**

10 external stakeholder focus groups hosted for topic specific discussions re: balancing technology, optimisation, storage, & forecasting

We recognise there is still more to do . . .

Energy Transition is a shared objective

Tremendous opportunities but complex challenges

New approach to collaboration

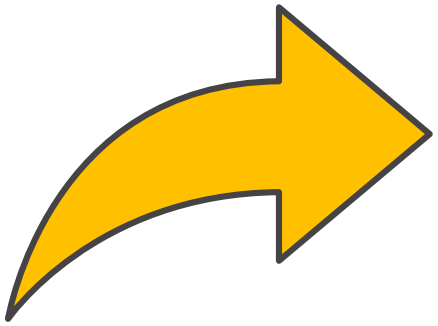
Delivering for you and society

Drive the transformation to a fully decarbonised electricity system by 2035 which is reliable, affordable and fair for all

Today's Areas of Focus

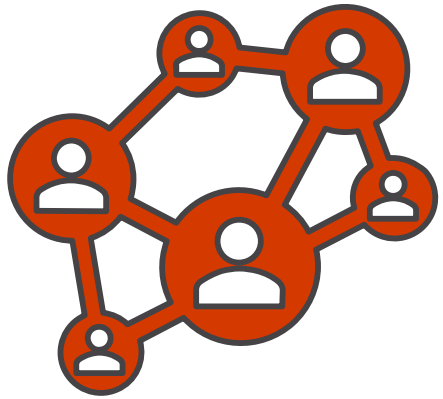
Delivery

Outline our planned product delivery, and the impact / benefit of these system changes for you



Future Plans

Identifying the emerging themes beyond 2025 to deliver a net-zero system by 2035



Partnerships

Understanding what future engagement and effective partnering looks like for you

Current Systems Update

Neil Morgans, Principal Product Manager

Balancing Programme – Current Systems

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Balancing Mechanism Key Systems – To be replaced by OBP

System **O**peration **R**eal **T**ime

Includes: Demand Prediction, Dispatch Advice, Issuing Instructions, Ancillary Service Management

Scheduling **P**rocess **I**n A **C**ontrolled **E**nvironment

Includes: Scheduling, System Operating Plan, Margin Analysis, Data Processing and Profiling

Versatile **G**raphical **I**nstruction **L**ogger

Single and multi dispatch

Contingency **L**ogging **S**ystem

Contingency system for logging of telephone instructions

Energy **B**alancing **S**ystem **– Now Retired**

Non-BM – Enduring services to be migrated by OBP

Ancillary **S**ervices **D**ispatch **P**latform

Supports the following Non BM services:
- *Fast Reserve*
- *Short Term Operating Reserve*
- *MW Dispatch*
- *Dynamic Response*

Forecasting – PEF Replacing EFS

Energy **F**orecasting **S**ystem

Legacy forecasting system

Platform for **E**nergy **F**orecasting

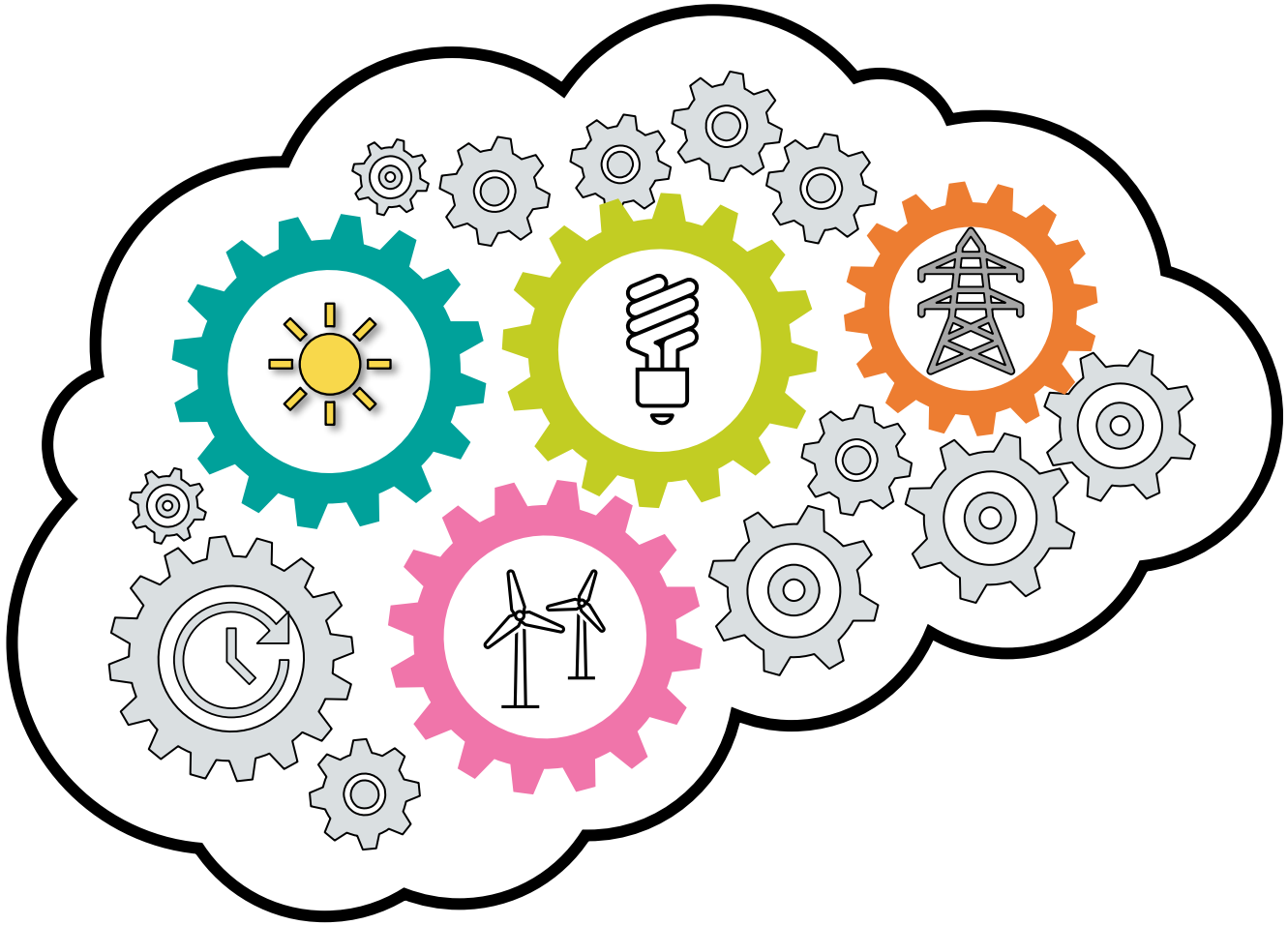
Strategic cloud platform

Current Balancing Systems – FY25 Q1/Q2/Q3 Releases

Functional Area	Overview of Capability	Details	Impact and Benefit
OBP Integration (BM)	Additional Data Feeds	Data Including: Constraint (Q2), All Zonal Data (Q2), Pumped Storage (Q3), Ancillary Service (Q3)	**Enables** constraint management, dispatch all zones & all instructions through OBP
Dynamic Response (BM & NBM)	Arming and Disarming Improvements	Select by GSP Group, Constraint and individual BMU (Q1/Q2), 24/7 Instructions (Q3)	Service **efficiencies** through targeted actions and improved flexibility
Asset Health (BM & NBM)	Performance enhancements and essential maintenance	Includes: Code optimisation to reduce profiling load and server upgrades (Q1/Q2/Q3)	Maintaining system **reliability** ahead of retirement.
MW Dispatch (NBM)	Enhancements to service	Includes: Dynamic Constraint Assignment (Q1), Situational Awareness (Q1/Q3), <1MW Units (Q3)	**Enables** wider participation and use of service, leading to **reduced constraint costs & earlier connection**
Pathfinders (BM)	Stability and Voltage Pathfinder enhancements	Instruction of SCL/inertia independently & static/dynamic voltage independently. (Q2)	**Optimises** use of services by unbundling actions
NCMS – Look Ahead (BM)	Data feeds for Network Control Management System	Data: Projected BMU and Interconnector outputs (Q3)	**Enables** 0-24h look ahead analysis, supporting **secure operation** and reduced control room workload

Forecasting Update

Forecasting Products (Forecasts, Data, Processes and Tools)



- Solar Power Generation
- National Demand
- Grid Supply Point Demand
- Wind Power Generation

Forecasting: What We Publish

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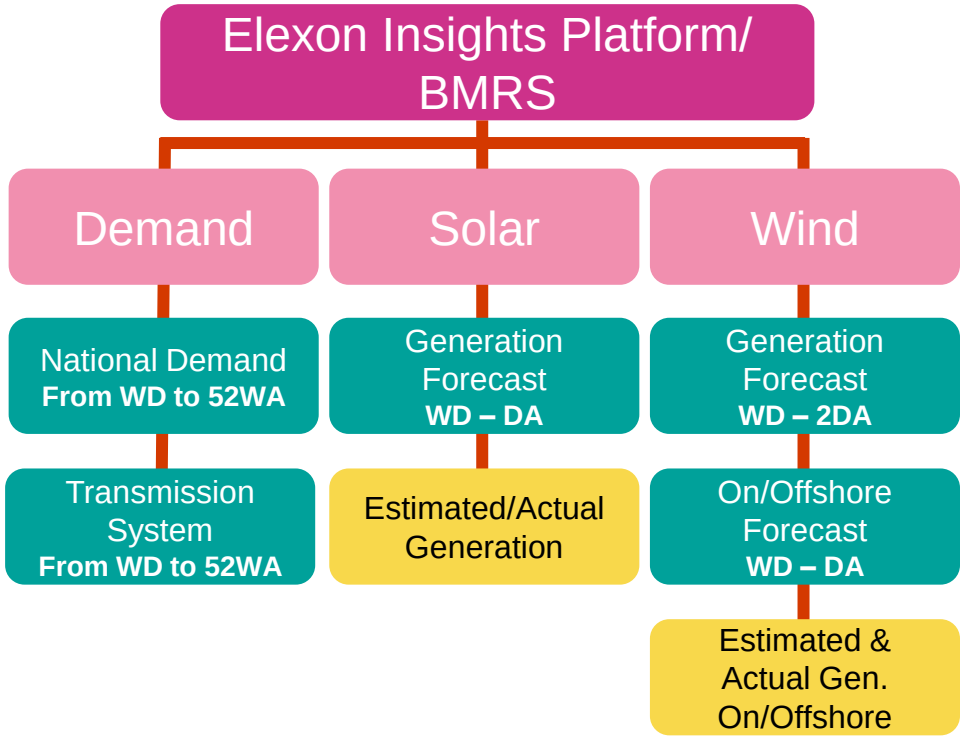
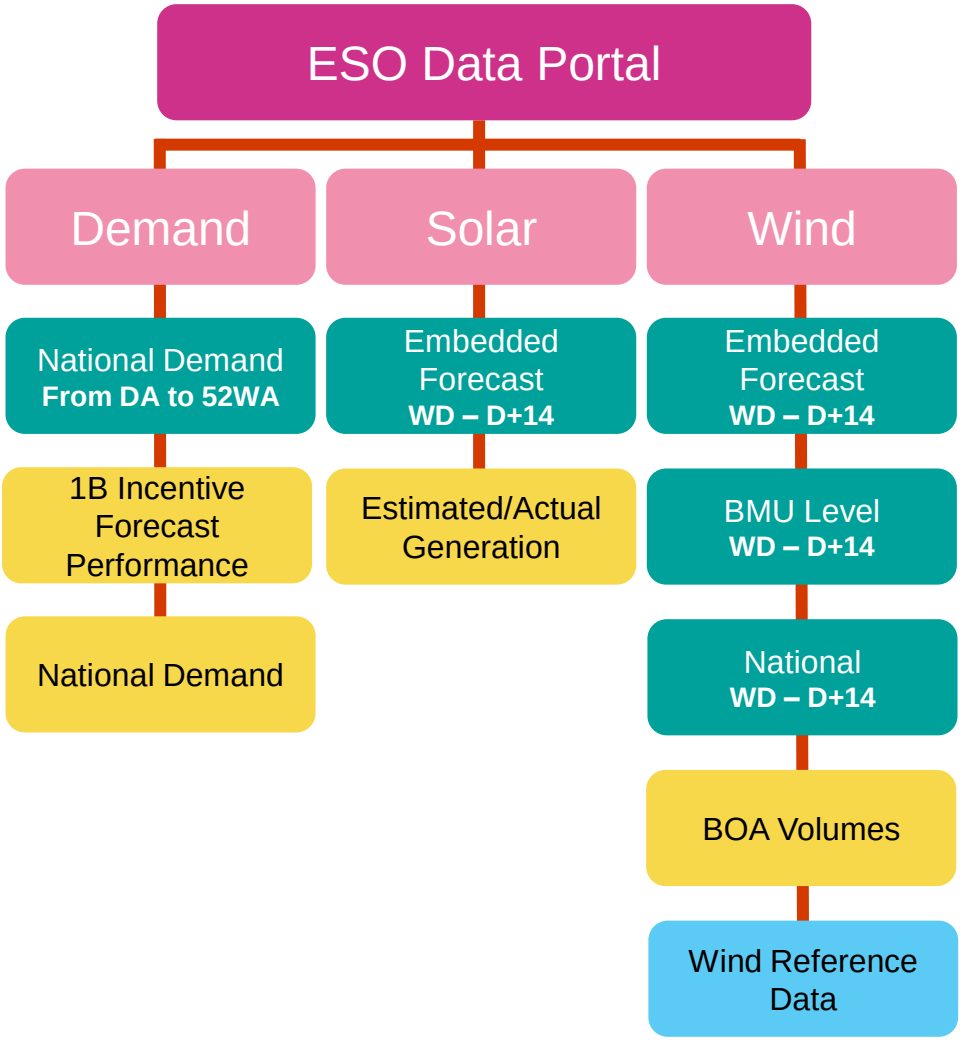




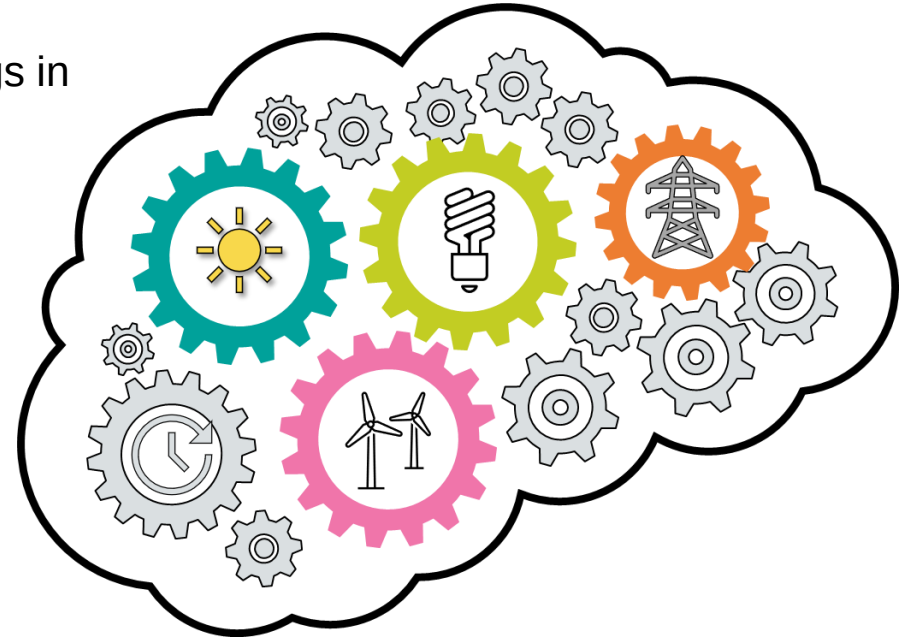
Forecast | Outturn | Other

WD = Within Day
WA = Week Ahead
DA = Day Ahead

Platform for Energy Forecasting (PEF)

Progress in BP2 (since April 2023)

- Improved National Demand Forecasts against benchmark leading to savings in Balancing costs of
  - ~£100m in FY24
  - ~£107m in FY25 (estimated)
- Delivery of the Azure Cloud foundational platform
- Integration of GSP Solar & Wind forecasts into our Balancing systems



What's next:

Development of new Wind Power forecasting models on Azure **(Q2 FY25)**

Migration of Solar, National Demand and GSP forecasts to Azure **(Q3-Q4 FY25)**

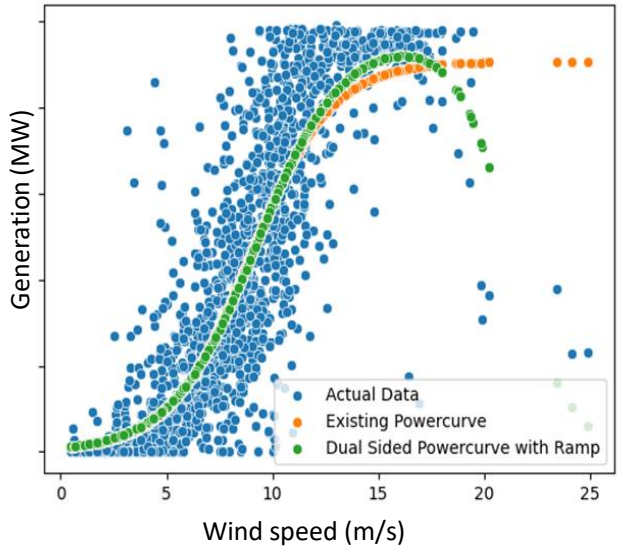
Retirement of our legacy forecasting systems **(Q4 FY26)**

Publication of all Operational-metered Wind forecasts **(Q2 FY25)**

Wind Power Generation – PEF Release 5

R5 will deliver the first forecasting model onto the Azure Platform enabling:

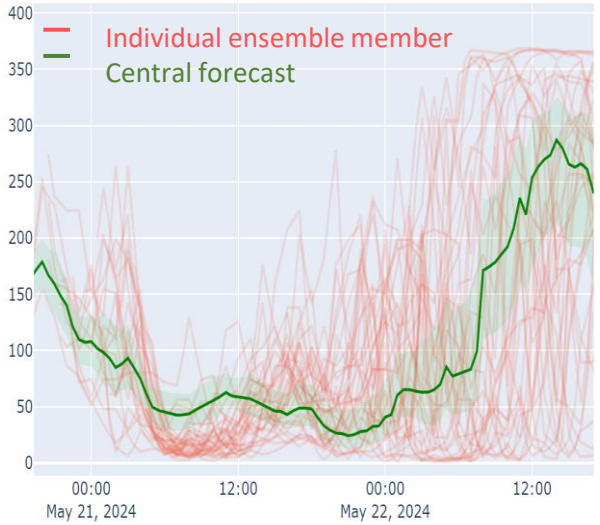
- 24 forecast updates a day (up from 8)
- Quicker development and deployment through automation
- Incorporating richer datasets
- Energy Forecasting Engine: Rapid adaptation & new ML methods



An adapted version of the existing wind model with high wind speed shutdown included (green) and excluded (orange), alongside the observations (blue).

Blended ensemble approach to forecasting:

- Utilising multiple equally likely forecasts
- Enhancing prediction accuracy
- Independent wind model application



A prototype wind power forecast using ensembles, for a single wind BMU. Each individual ensemble member corresponds to a single Met Office weather forecast scenario.

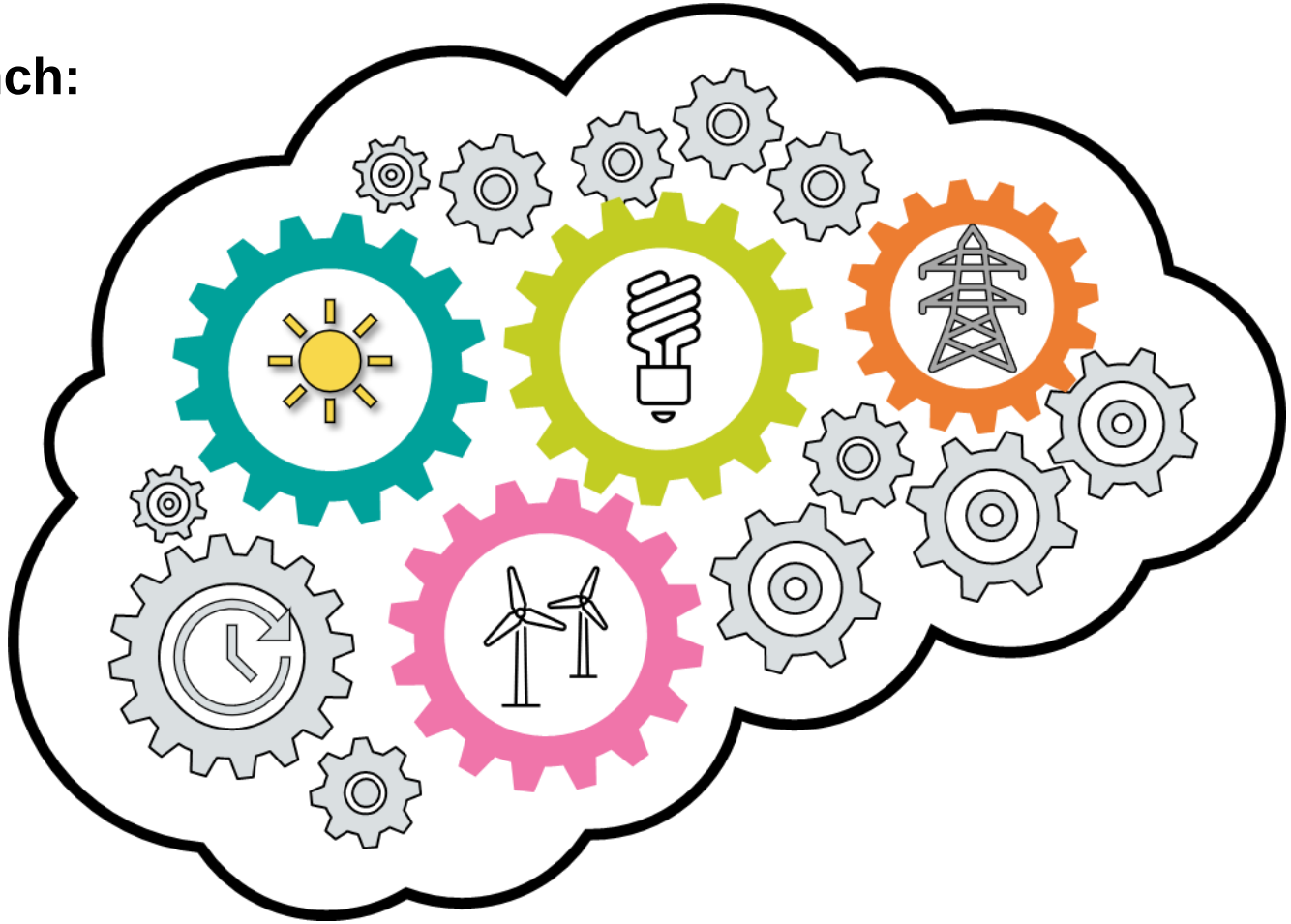
Benefits:

- Feeds many use cases such as dispatch, reserve and response decisions
- Enables future integration wind, solar and demand forecasts

Get Involved

- **Forecasting Stakeholder Group Relaunch:**
  Register here

- Beyond 2025 Break-out Session



Open Balancing Platform Progress Update & Future View

Bernie Dolan, Principal Product Manager
Nisha Bhamidimarri, Senior Delivery Manager

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OBP Delivery Since Last Industry Event

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Release 1.0.6 – 26 March 2024

- Improved High Price identification
- 13 tickets released to production
- **OBP's first Hands On release**

Release 1.1.1 – 14 May 2024

- Foundational changes to integrate with legacy BM system to support Wind, Interconnector, Constraints and National Demand data
- Performance enhancements for Fast Dispatch & Target Mode
- Multiple other fixes and enhanced logging for de-bugging
- 45+ tickets released into production

Release 1.1.3 – 18 June 2024

- Mark invalid draft/pending instructions due to changed status (e.g. redeclaration to a lower MEL, inactive EDL etc.)
- Improved handling of linked instructions to allow for dynamic parameters if cancelled
- Enablement of all zones in OBP in readiness for future roadmap
- Security and non-functional enhancements on microservices
- 120+ tickets released into production

Release 1.0.5 – 13 March 2024

- **Balancing Reserve Go Live (in OBP)**
- High Price Fix discovered in test not seen in production
- Battery Volume (MDVE/I) calculation based on 30 Minute MEL rule
- Automatic restriction for inter-trips
- Visual enhancements to unit library
- Improved optimisation when ramping
- 135+ tickets released into production

Release 1.1.0 – 30 April 2024

- **Fast Dispatch**
- Battery handling improvements (Restriction timeout, removal to accommodate industry practice)
- Ability to edit Restrictions
- Enhancements to Unit Library & Requirement Editor UI
- 110+ tickets to be released into production

Release 1.1.2 – 05 Jun 2024

- Improved price curve handling (Non-convex price curves, "backward" price curve to reduce high price instructions due to PN Step Changes)
- Improved Linked instruction visualization in Unit Library
- Improvedd display for MEL/MIL step changes
- 65+ tickets released into production

Abbreviations

MDVE/I: Max Delivery Volume Export/Import **BOD:** Bid Offer Data **MEL/MIL:** Max Export/Import Level **PN:** Physical Notification **EMX/I:** Expected Max Export/Import
EDL: Electronic Dispatch Logging (ESO/Provider Integration for instructions and redeclarations)

Open Balancing Platform Release Plan Timeline

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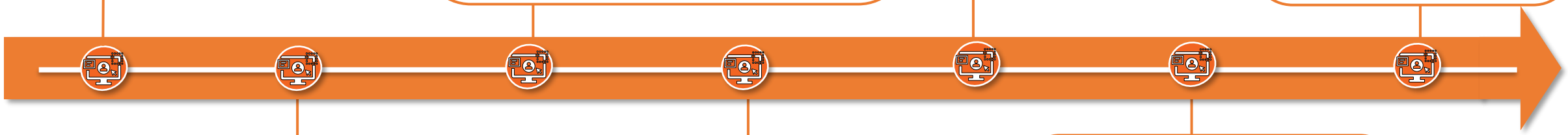
Legend

- Moved to an earlier date (no. of seasons moved)
- Moved to a later date (no. of seasons moved)



Summer 2024

Capabilities:
1. BM Quick Reserve (note added to OBP service catalogue but goes live later)

Enablers
1. Interface from Single Market Platform
2. Interface from SCADA for metering [+1]

Autumn 2024

Capabilities:
1. Manual instructions

Enablers
1. Interface to Data Analytics Platform

Winter 2024

Capabilities:
1. New storage parameters
2. Bulk Dispatch Wind BMUs (rule based)
3. Constraint Management
4. Pumped Storage BOAs

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

Spring 2025

Capabilities:
1. NBM Instruction Types

Enablers
1. NBM APIs
2. EDT/EDL mastered from OBP

Summer 2025

Capabilities:
1. NBM Quick Reserve
2. BM Slow Reserve
3. NBM Slow Reserve

Autumn 2025

Capabilities:
1. Move MW Dispatch
2. Move Response (DC/DM/DR)

Enablers
1. Ready to decommission ASDP

Winter 2025

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

Enablers
1. PEF Integration

Abbreviations

EDT: Electronic Data Transfer **DC:** Dynamic Containment **DM:** Dynamic Moderation **DR:** Dynamic Regulation **ASDP:** Ancillary Services Dispatch Platform **BOA:** Bid Offer Acceptance **PEF:** Platform for Energy Forecasting

Batteries

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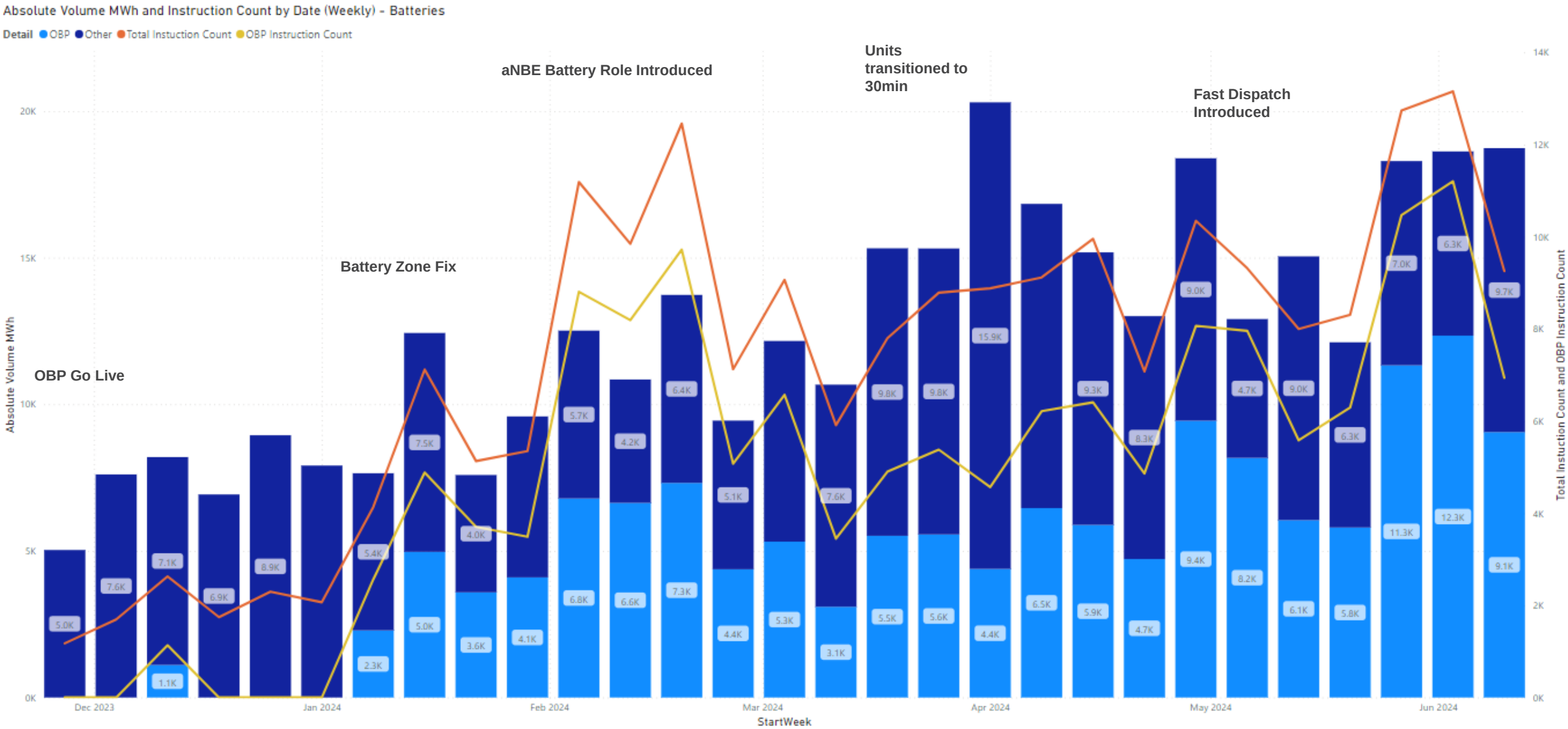

Small BMUs

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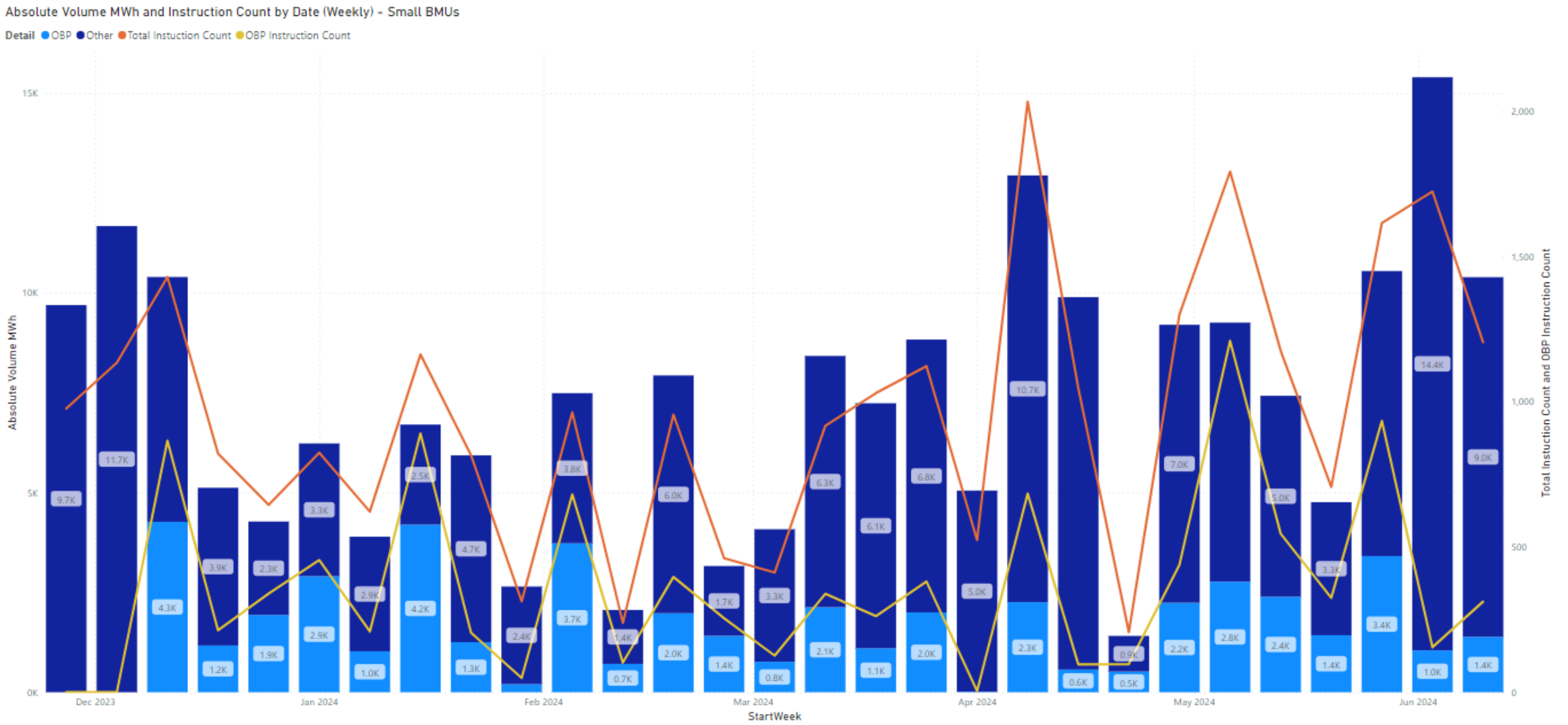

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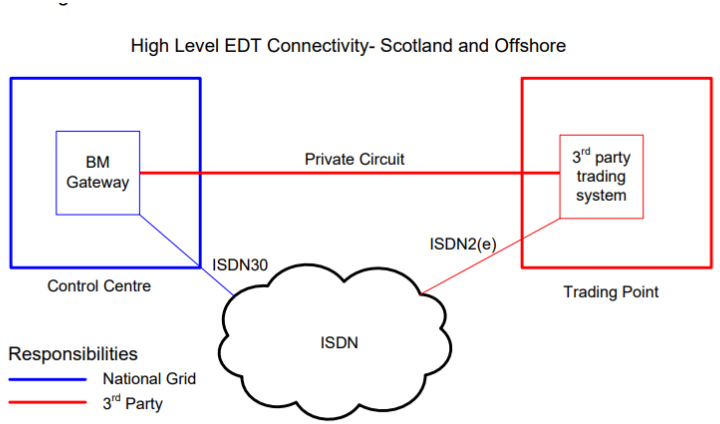
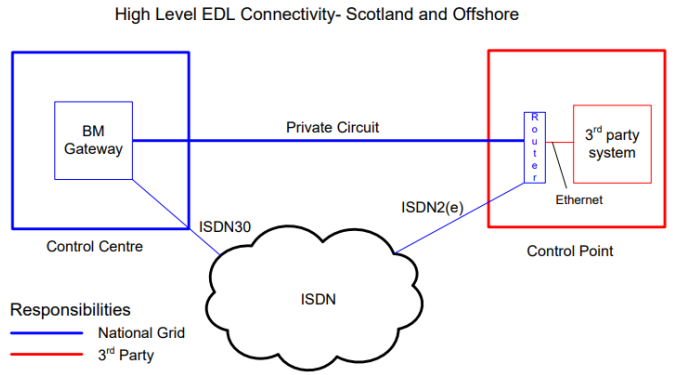
EDT/EDL - Concepts

- **EDT** (Electronic Data Transfer)
  - Declarations ahead of gate closure
  - Trading Agents send Files to BM File System
  - Files can contain declarations for multiple BMU; each BMU validated individually

- **EDL** (Electronic Dispatch Logging)
  - Redeclarations from Control point agents during gate
  - BOA and BM AS Instructions and Status
  - Some Pumped Storage Telemetry
  - BM connects to Control Point (real-time data exchange)

- **WA API** (Wider Access API) is a modern interface using APIs; CDSA (a middleware platform in CNI DC) transforms and presents as EDT / EDL to BM





EDT/EDL – Transition Overview

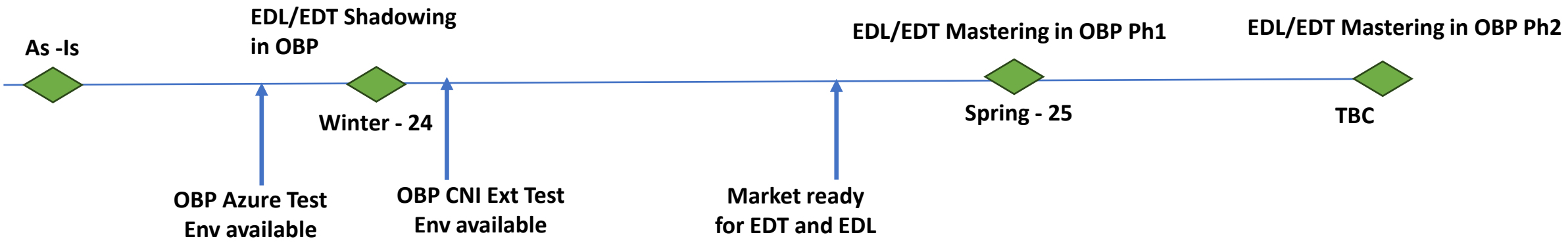
- **Shadowing** – a de-risking test phase whereby OBP EDT / EDL interfaces can be tested with live inbound data presented by BM
- **Cut-over Dry Run** – a series of de-risking activities whereby the ability of Market Participants to exchange EDT / EDL with OBP is proven ahead of cut-over
- **Cut-over Phase 1** – the point at which OBP becomes the master system processing EDT / EDL, using existing network into the legacy data centre
- **Cut-over Phase 2** – the network transition of EDT / EDL connections into the strategic data centres
- **Onboarding** – the proving of new Trading Agents and Control Points which includes using a dedicated Market Participant Testing environment

Roadmap

	EDT	EDL	EDT	EDL	EDT	EDL	EDT	EDL
Primary System	BM		BM	BM	OBP	OBP	OBP	OBP
OBP receiving data via	JMS Messages from BM		JMS Messages from BM Files from BM via RCP (only for Shadowing)	JMS Messages to/from BM Socket connection to BM for Submission only	Files from TA	OBP to connect to Control Points	Files from TA	OBP to connect to Control Points
TA/CP Connecting to/from	BM		BM		OBP		OBP	
TA/CP WAN connectivity	War/Wok		War/Wok		War/Wok		SDC/WDC	
WAAPI sending/ receiving data to/from	BM		BM		OBP		OBP	
Transition	N/A		N/A		BM Outage to transfer all TAs and CP from BM to OBP		Staged cutover of individual TAs and CPs	

Change in state shown by going from black to amber

Market Involvement



Establish contacts list of all EDL/EDT software suppliers

MP EDT BPIT testing

MP EDT BPIT testing

MP EDT BPIT testing

MP EDL BPIT testing

MP EDL BPIT testing

MP EDL BPIT testing

MP EDT/EDL Trial Cutover

TBC

Establish contacts list of all EDL/EDT Participants inc. software supplier

Software Suppliers type testing

OBP Optimisation & Fast Dispatch Demo

Manos Loukarakis, Optimisation Manager
Chi Ho Lam, Product Manager

Optimisation so far

Optimisation Group Timeline & Feedback

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June 2023 (online)

- Initial kick-off / group scope
- Bulk dispatch introduction

November 2023

(Balancing Programme engagement event, London – Optimisation session)

- Control processes structure
- Bulk dispatch optimiser details

February 2024 (online)

- BDO details (costs)
- Fast Dispatch

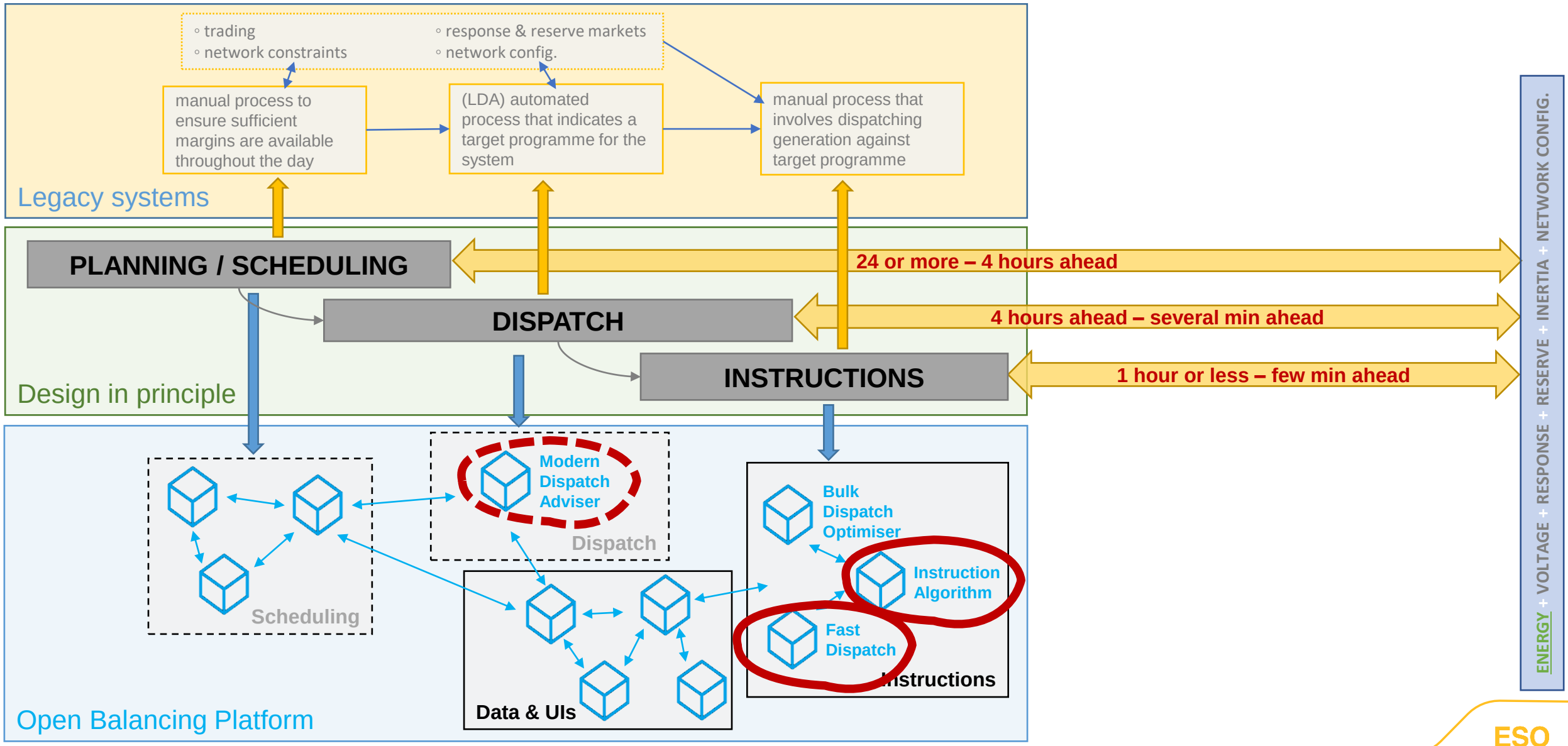
June 2024

(Balancing Programme engagement event, Optimisation session)

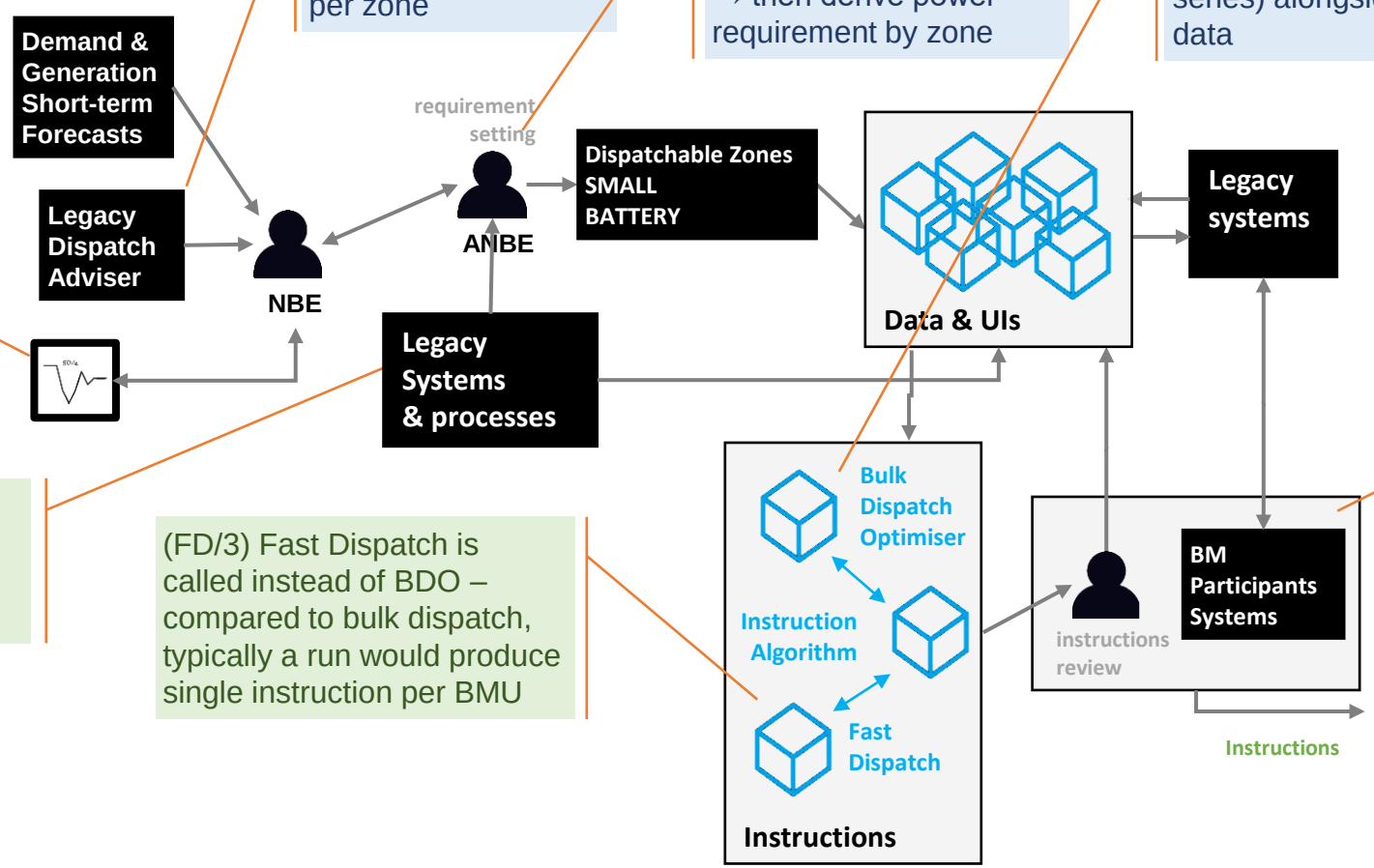
- Fast Dispatch demo
- Instruction algorithm

- Constraints management
- Risk management in control
- Details on dispatch (LDA/MDA)
- More details on documentation
- More on future challengers/problems
- Comparison with other SOs

Context


◦ trading
◦ network constraints
◦ response & reserve markets
◦ network config.
manual process to ensure sufficient margins are available throughout the day
(LDA) automated process that indicates a target programme for the system
manual process that involves dispatching generation against target programme
Legacy systems
PLANNING / SCHEDULING
DISPATCH
INSTRUCTIONS
24 or more – 4 hours ahead
4 hours ahead – several min ahead
1 hour or less – few min ahead
Design in principle
Modern Dispatch Adviser
Dispatch
Scheduling
Bulk Dispatch Optimiser
Instruction Algorithm
Fast Dispatch
Instructions
Data & UIs
Open Balancing Platform
ENERGY + VOLTAGE + RESPONSE + RESERVE + INERTIA + NETWORK CONFIG.

Bulk and Fast Dispatch Workflows



(BD/1) Dispatch software calculates a target energy profile for the system and per zone

(BD/2) Control room engineers review system state and manage risk → then derive power requirement by zone

(BD/3) Control requirement sent to BDO (as a MW time-series) alongside BMU data

(FD/1) Control keeps track of any major deviations in frequency

(FD/2) A simpler UI enables a much simpler and faster requirement definition (MW over specific period – usually in the range of +/-300MW)

(FD/3) Fast Dispatch is called instead of BDO – compared to bulk dispatch, typically a run would produce single instruction per BMU

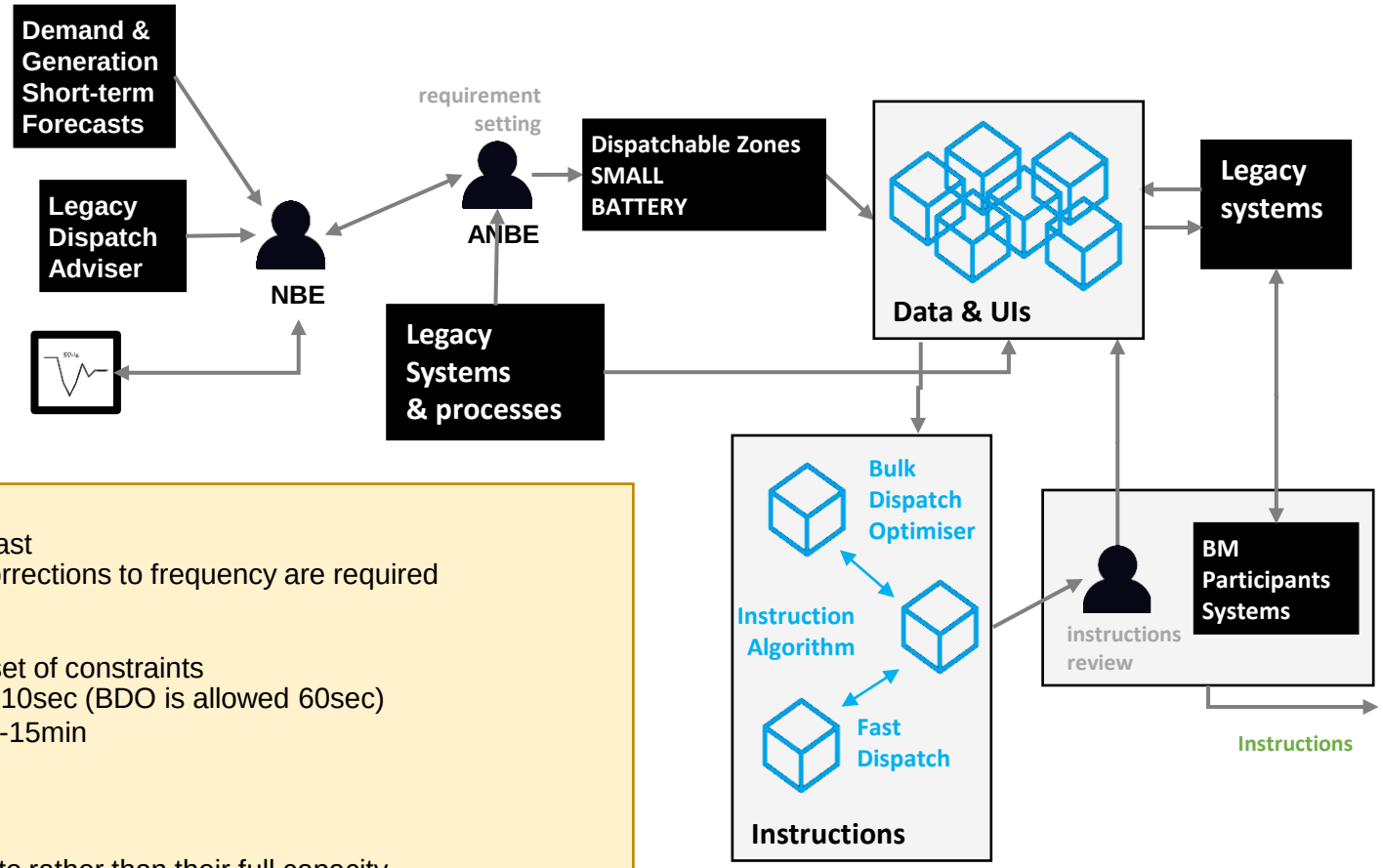
(1) BDO generates a target MW time-series per BMU.

(2) These are then converted to a valid set of BM instructions.

(3) Control room reviews created instructions (high level check to ensure instructions are good)

(4) Instructions are sent out via BM systems.

Key Points on Fast Dispatch



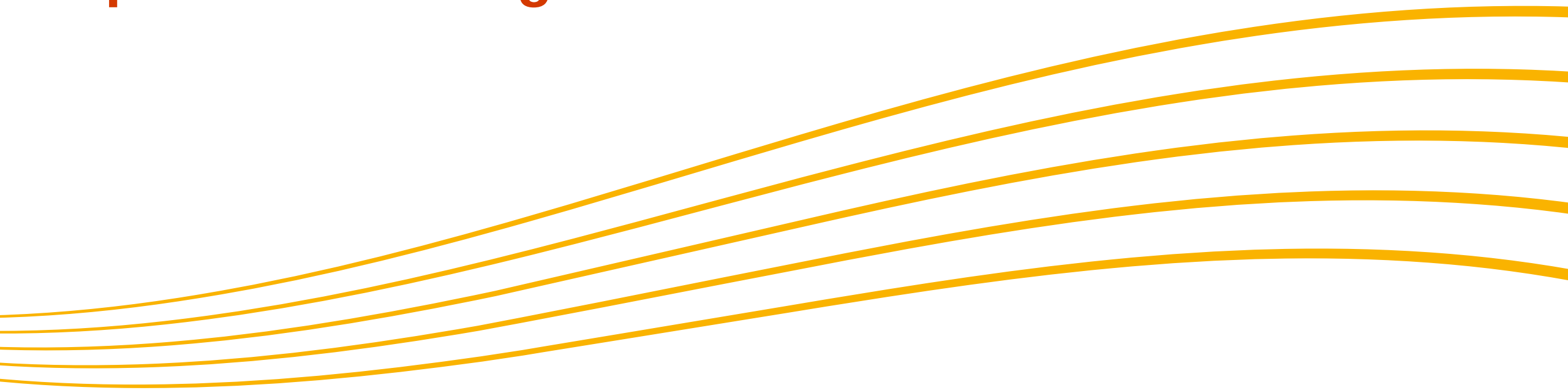
Key function:
- Provide capability to control to dispatch fast
- To be used in cases where immediate corrections to frequency are required

Compared to BDO:
- FD runs on a modified (more restricted) set of constraints
- FD is expected to produce a solution in <10sec (BDO is allowed 60sec)
- FD requirement duration is limited to <10-15min

<u>Points of interest</u>
- Long NTO/Bs may not be dispatched
- Units may be dispatched to their ramp-rate rather than their full capacity.
- Long MZT/MNZTs might not be dispatched unless units already on, or their sync/desync can be delayed or be brought forward.

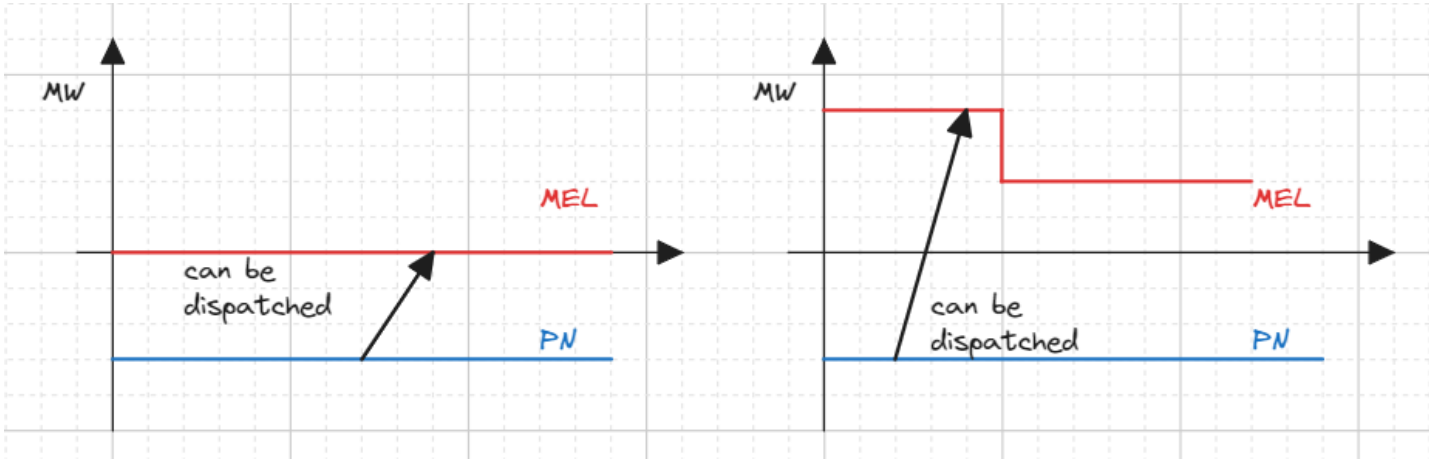
OBP Demo
Target v Fast Dispatch

Updates & Changes



Duration-Limited Assets in Bulk Dispatch

- MDO/B constraints are no longer applied
- Energy volumes dispatched are instead limited by restricting optimisation horizon to 30minutes
- BMU can be dispatched to MEL/MIL for the whole duration



- Implication is that the integral between MEL and PN/CL is the volume that could be exported/imported in a single run.

- MDO/B constraints will be restored once GC0166 comes into effect and relevant data become available through the BM.

Ongoing Work on SMALL Zone

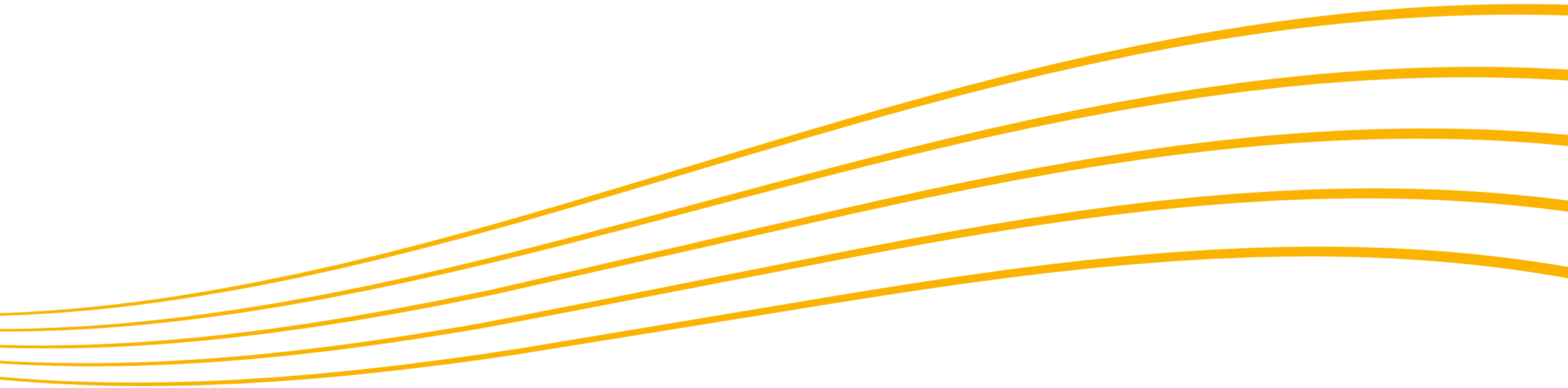
Key issue

… creation of instructions given current BMU PN declarations and dynamic parameters

Steps towards resolution

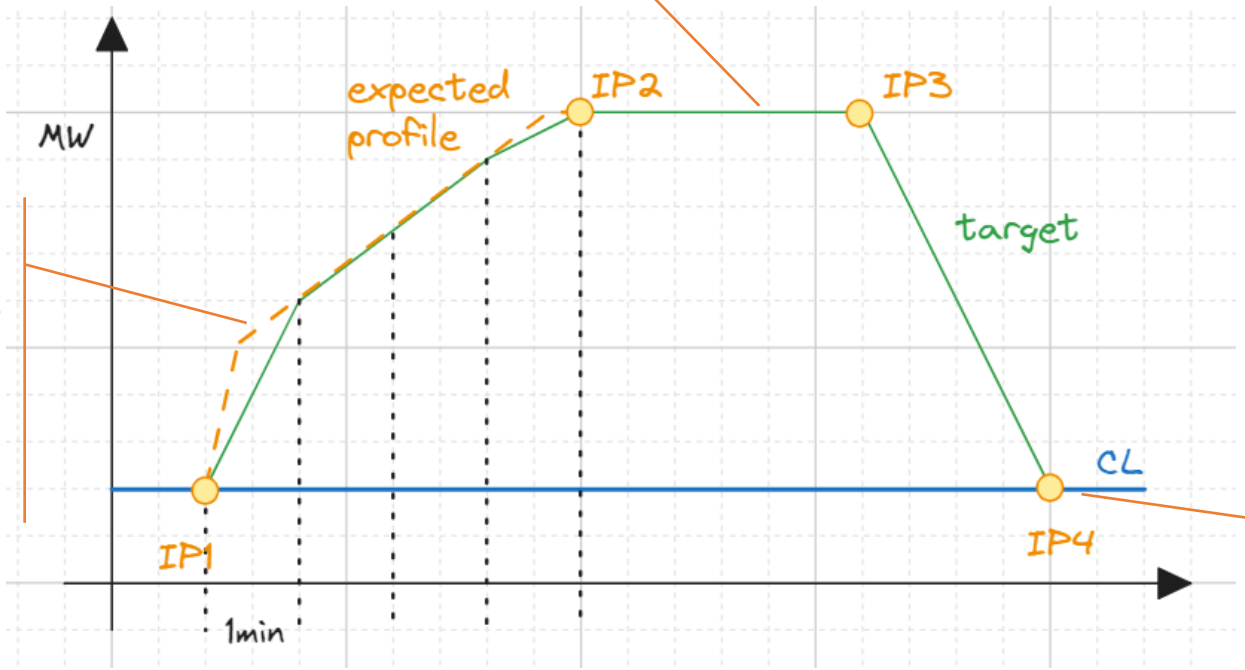
- Instruction creation process improvements & further algorithm logic revisions
- Additional automation & checks before sending instructions
- Application of pre-optimisation price caps
- Moving towards reduced MFTT
- BDO performance improvements

Instruction Creation Process

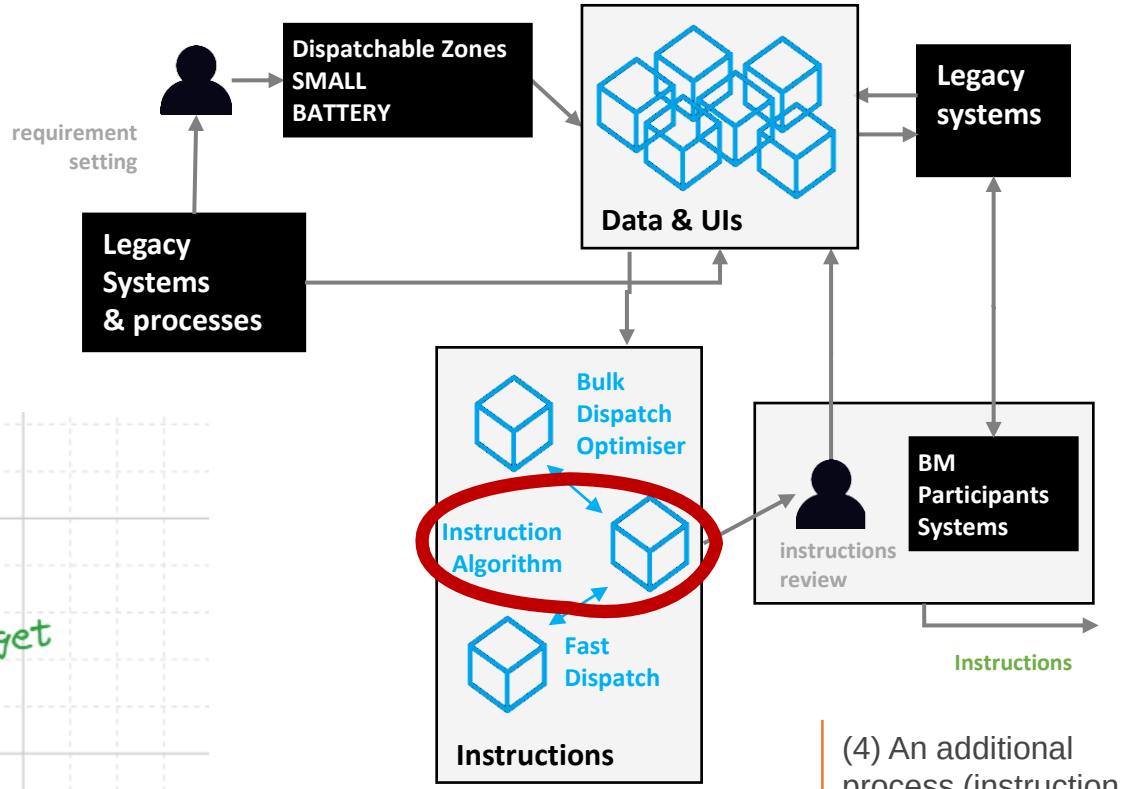


Instruction Creation in OBP

(1) Target profile is what the unit is expected to deliver, assuming it follows ramp-rates



(2) BMUs are dispatched at their ramp-rates, (except from last minute where they are expected to hit the flat within the minute)



(3) Due to limitations of legacy IT systems, instructions sent to BMUs are typically limited to 4 instruction points (IPs).

(4) An additional process (instruction algorithm) converts target profiles to valid instructions

As BSC indicates these should fall on a minute and be an integer MW value.

Current BM Instruction Creation Logic for IPs/BPs/ZPs

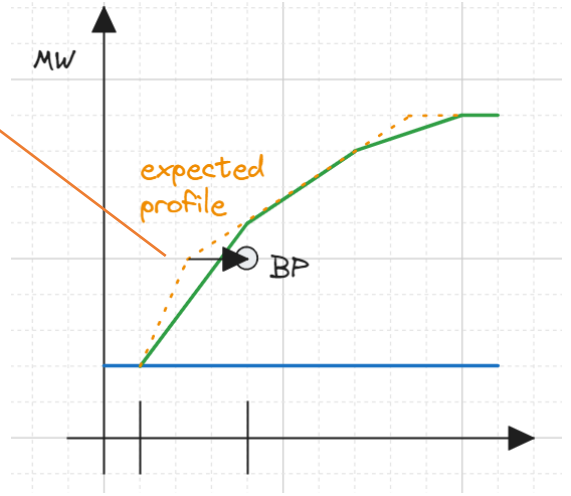
(1) IPs are sent to BMU – note that if interpolated they do not account for the exact volume the unit could deliver

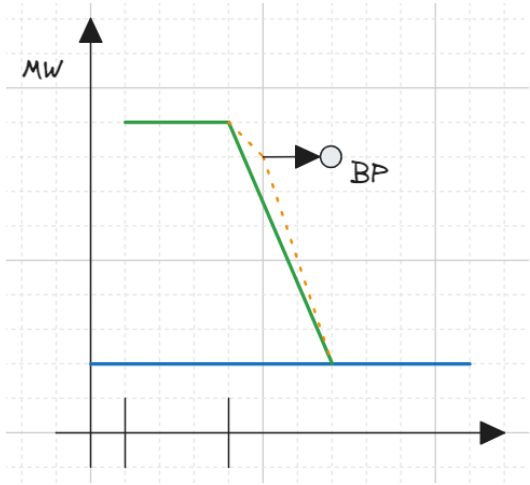
(2) Breakpoints (BPs) are additional points that indicate ramping changes.

BPs are sent to Elexon alongside IPs and are used in settlement.

(3) Zero points (ZPs) are simply a special case of BPs that happen at 0 – remember that ramp-rates are separately submitted for import/export and as such a break point is expected at zero (for bi-directional units).

(4) Following current BM logic, as soon as a ramp-rate BP is crossed, it is reported in the next whole minute.





Current OBP Instruction Creation Logic

(1) Every flat in the generated profile corresponds to a new instruction

[#1] If it is not possible to find an integer point to merge back the first instruction (and all linked to it) will be voided

[#2] Deviations from instruction profile can mean that in some cases we might cross into higher price bands, or unwinding – again instruction voided.

(2) Instructions are created for each flat in sequence

(3) Levels are rounded to integer values – generally within the profile

(4) Adjustments are then done to align with legacy BP creation logic

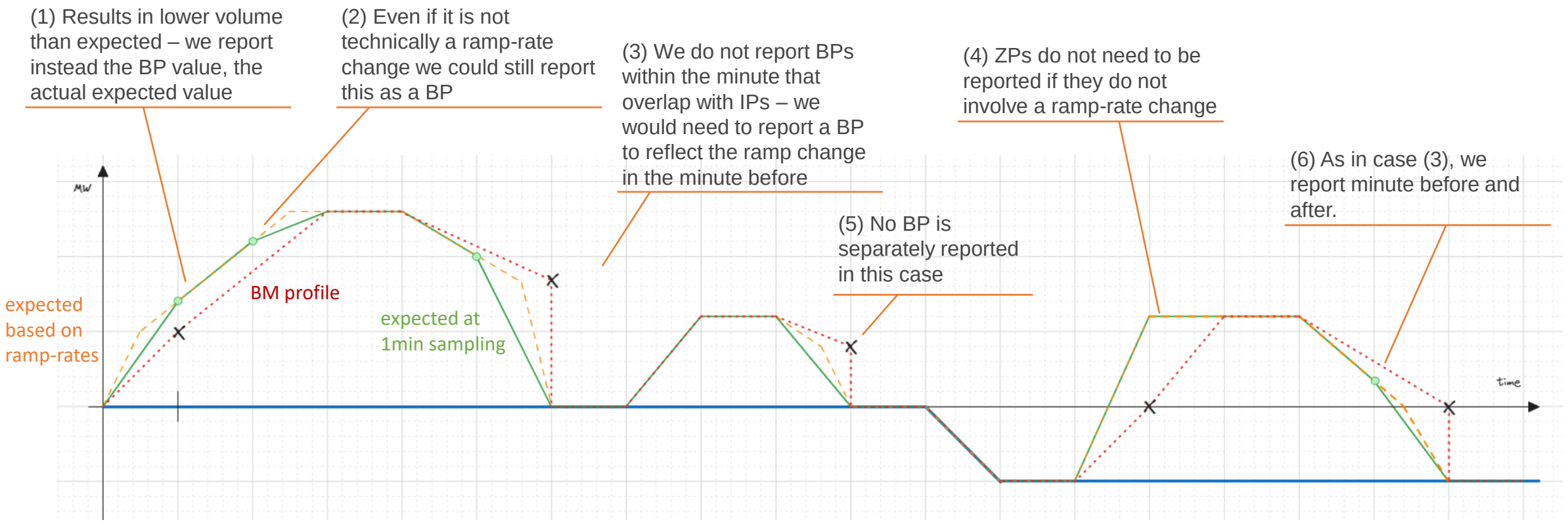
[#3] Rounding and other adjustments may mean that dynamic parameters cannot be strictly adhered to – instruction voided.

Voided instructions are more common for small BMUs which can lead to reduced utilisation of the zone.

While existing BM logic has worked well in the past for large BMUs and manual dispatch actions, they do not work well for smaller BMUs.

We are looking into making adjustments to how the basic instruction creation principles are applied in OBP, to more accurately reflect how BMUs behave on a minutely basis.

BPs and ZPs Profiles of Interest & Proposed Longer-Term Changes



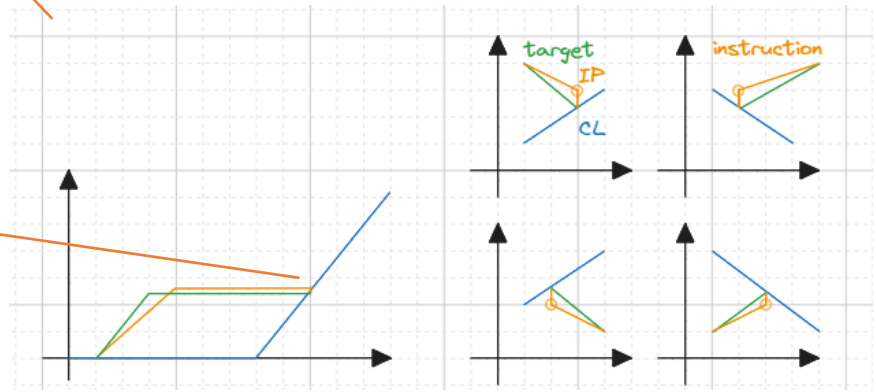
Principle #1: we report as "BPs" the minimum required number of points that enable matching as closely as possible the expected BMU profile post interpolation (these should be all points where we have a change in curve-slope/ramp-rate).

Principle #2: we do not report BPs that occur within the minute (we are not modelling or dispatching at such high accuracy levels).

MW Rounding Rules & Proposed Changes

(1) Current implementation would generally make available BOAs shorter until an integer point is found – it may not always be possible to create an instruction.

(2) Revised implementation would follow a logic existing in BM – rounding up for OFFERs, and down for BIDs.



(3) This can create up to 1MW steps in CL.
In some cases BMUs might not be able to immediately follow such a step, but could adjust profile slightly to account for the volume – which should be small.

Principle #1: Round to a direction that ensures no simultaneous BIDs and OFFERs are created.

Principle #2: Ensure ramping between IPs is possible (by adjusting flat levels as needed)

Principle #3: For BPs round towards CL as a general rule. This ensures profile does not cross e.g. high price bands, but might not always align with ramp-rates. Ensuring the latter, combined with rounding could lead to more significant changes in the final instruction flat level and a deviation from the actual ramping levels.

Note that this largely affects settlement only - where metering errors come into play too - rather than control plans/actions.

Key Questions

Q1: Changes with regards to how Break Points are created.

Q2: Rounding start/end Instruction Points with a small step from integer to CL

Q3: Ramping considerations (ensure ramping between IPs is possible, but relax requirement for BPs), rounding towards CL.

Note that
… changes do not change current settlement process and do not require changes in Elexon systems.
… we are looking to improve upon current BM instruction principles
… the volumes under consideration are expected to be relatively small compared to what is actually dispatched.

New Projects & Innovation

Roya Ahmadi Transition Manager (ESO)
Goran Strbac (Imperial College London)
Sumit Gumber Product Manager (ESO)

Introduction to our Innovation Projects and Plans

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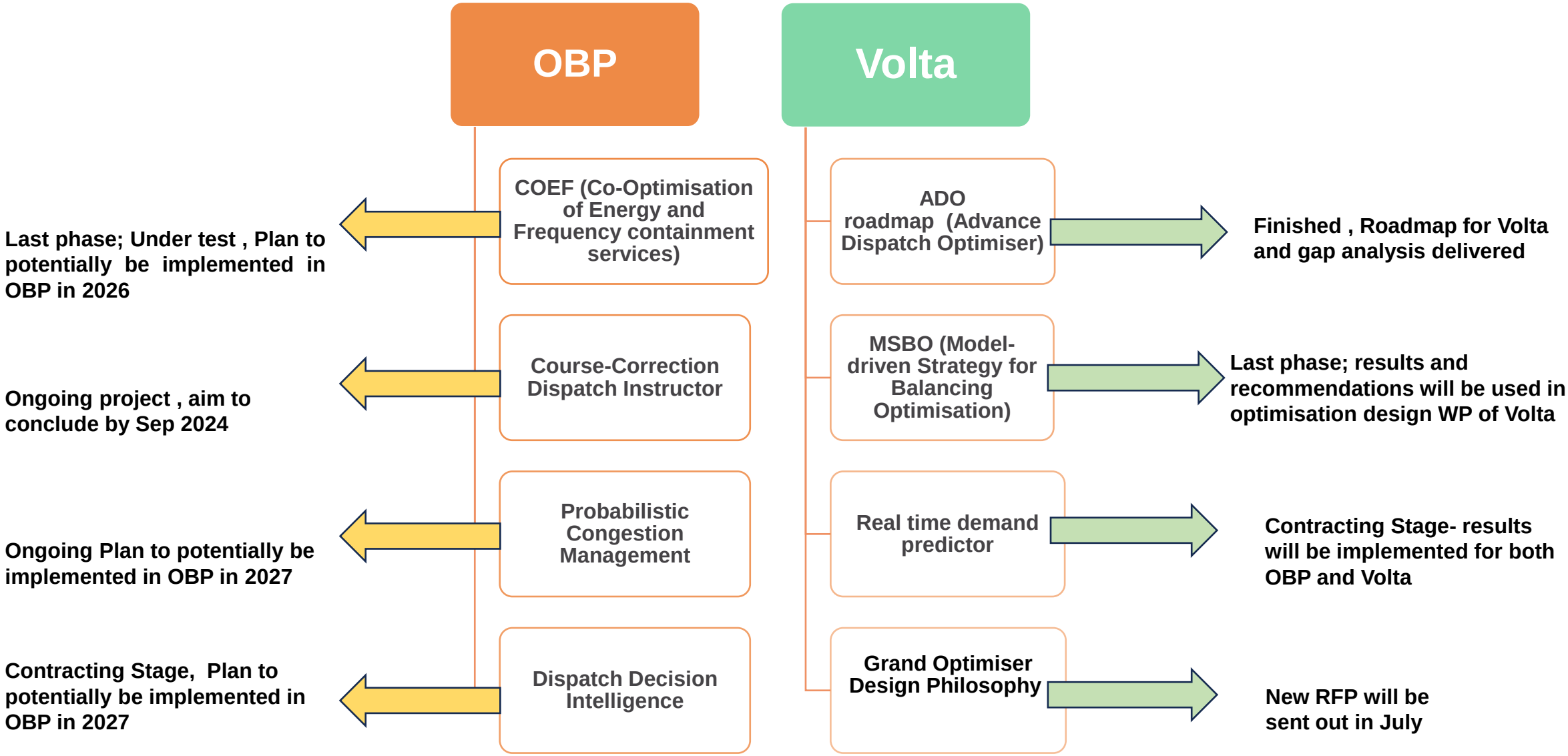
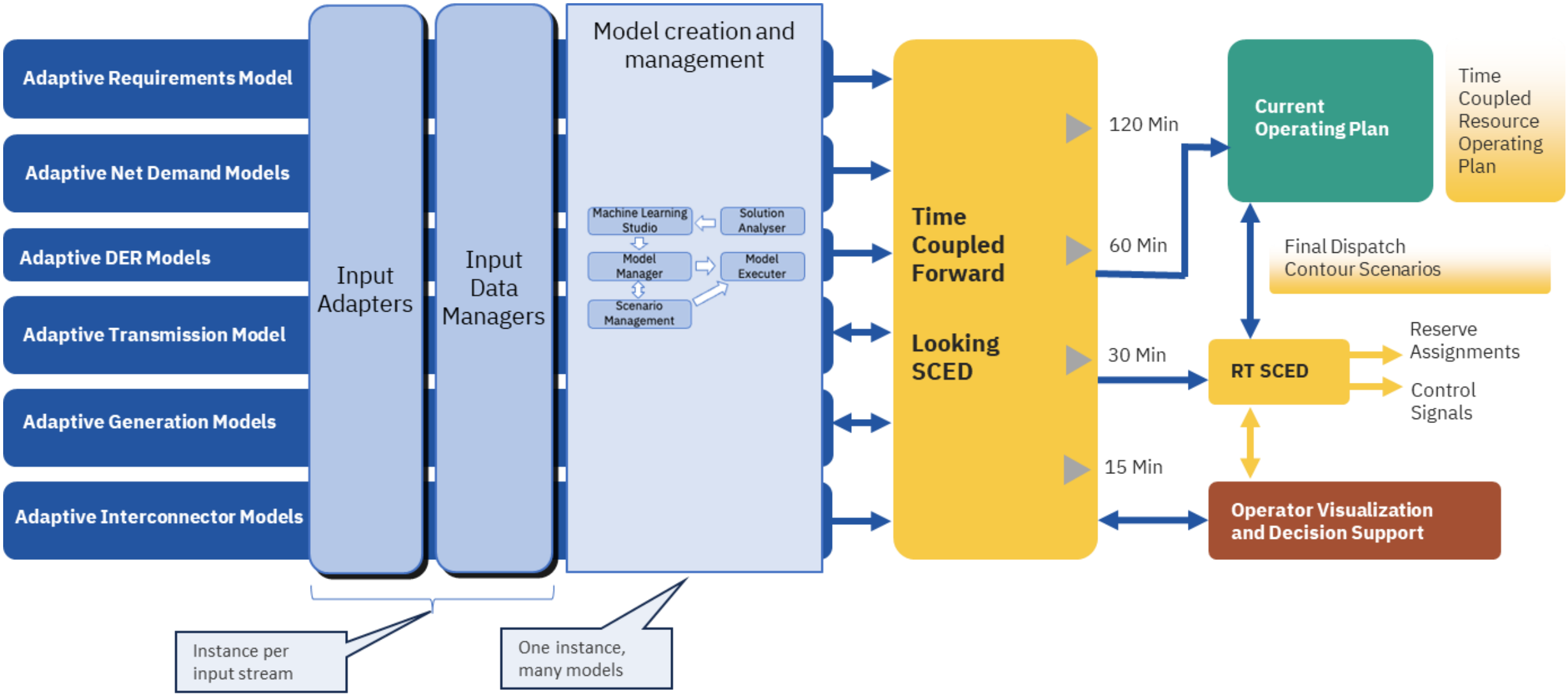


Our North Star for 2030

Volta



Volta Short-Term Plan

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July 2024

- Send out 3 RFPs for first stage projects :

1. Value and Feasibility analysis for input data models
2. Qualitative Benchmarking & Impact Analysis
3. Grand Optimiser Design Philosophy

Sep-Dec 2024

- Wrapping up first stage projects and based on the findings preparing for next projects:

1. Developing New Optimisers
2. Developing Adaptive models

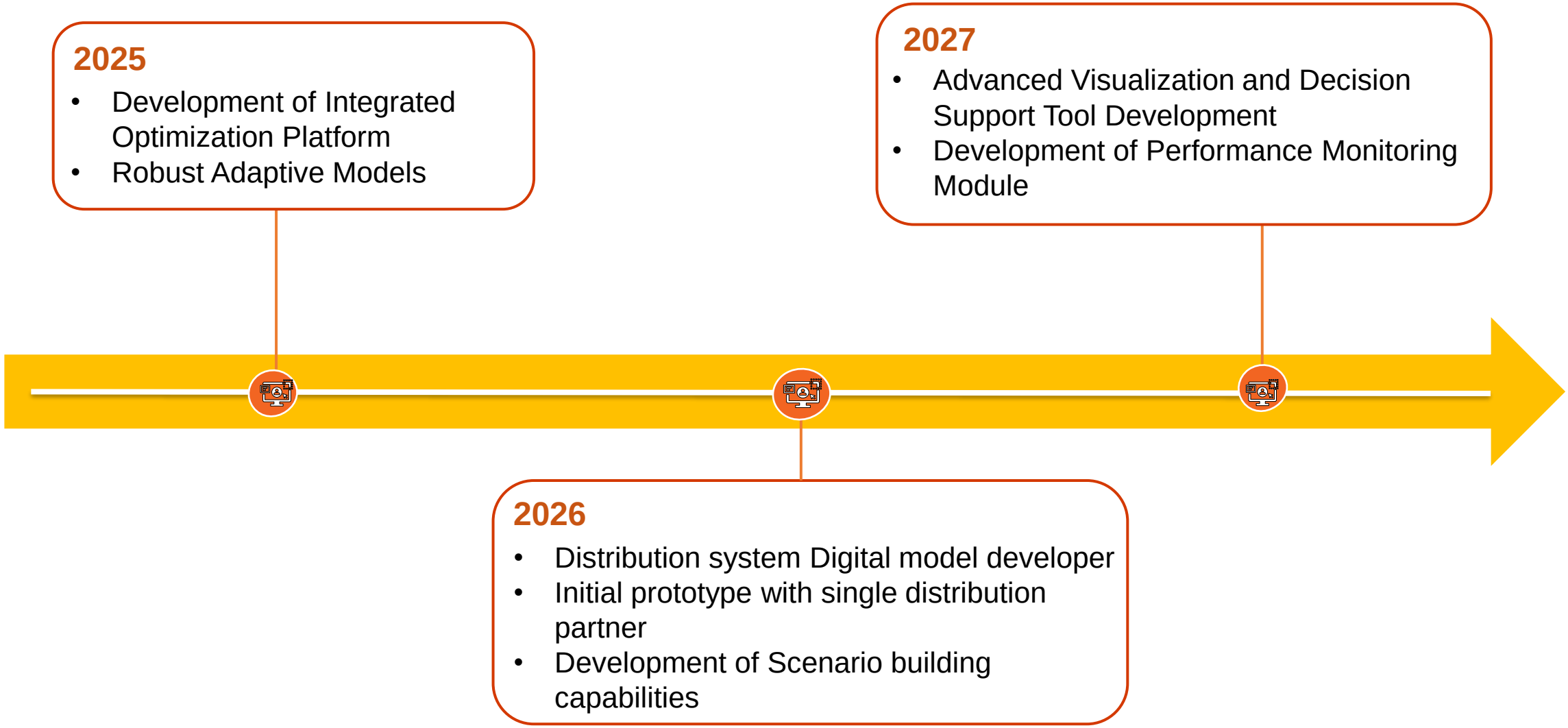
June 2024

- Volta Program Kicked off
- Advisory Group formed
- First project kick off (Real time predictor)

Aug 2024

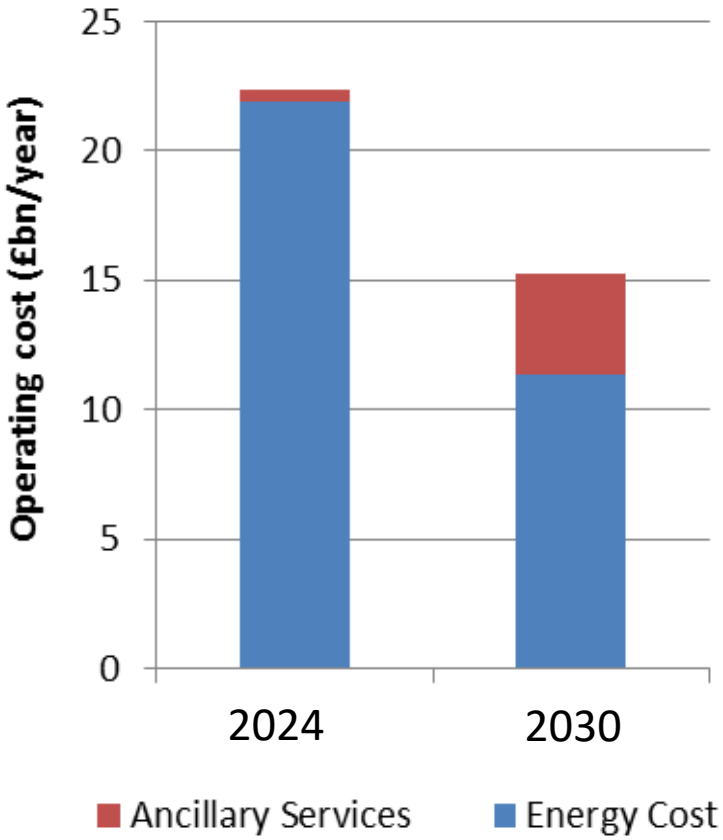
- Forming Academic Board
- Developing Joint 5-year roadmap with Future control room team

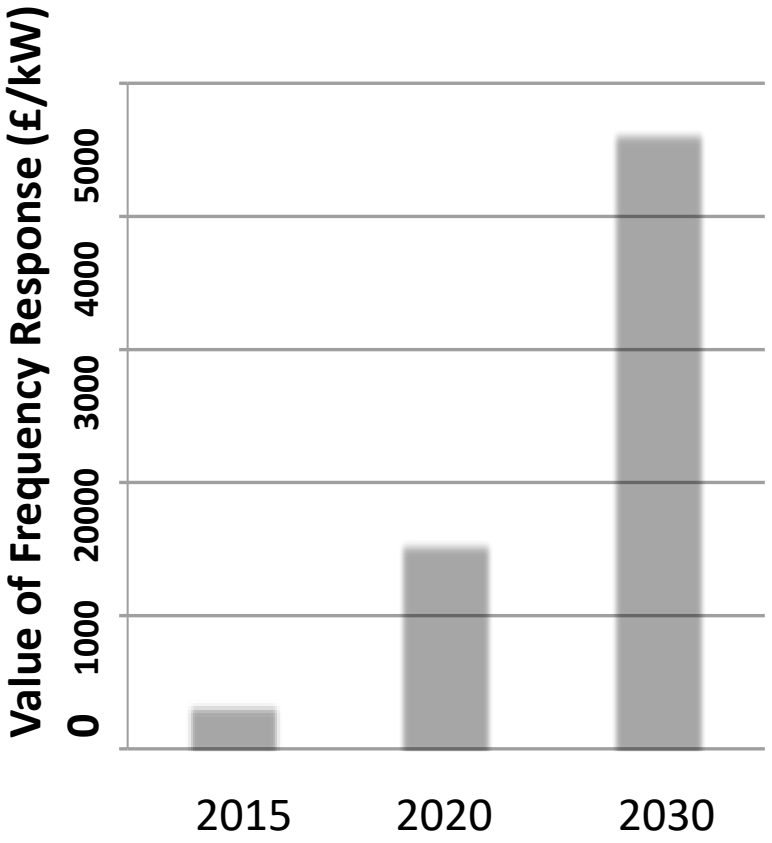
Volta Long-Term Plan



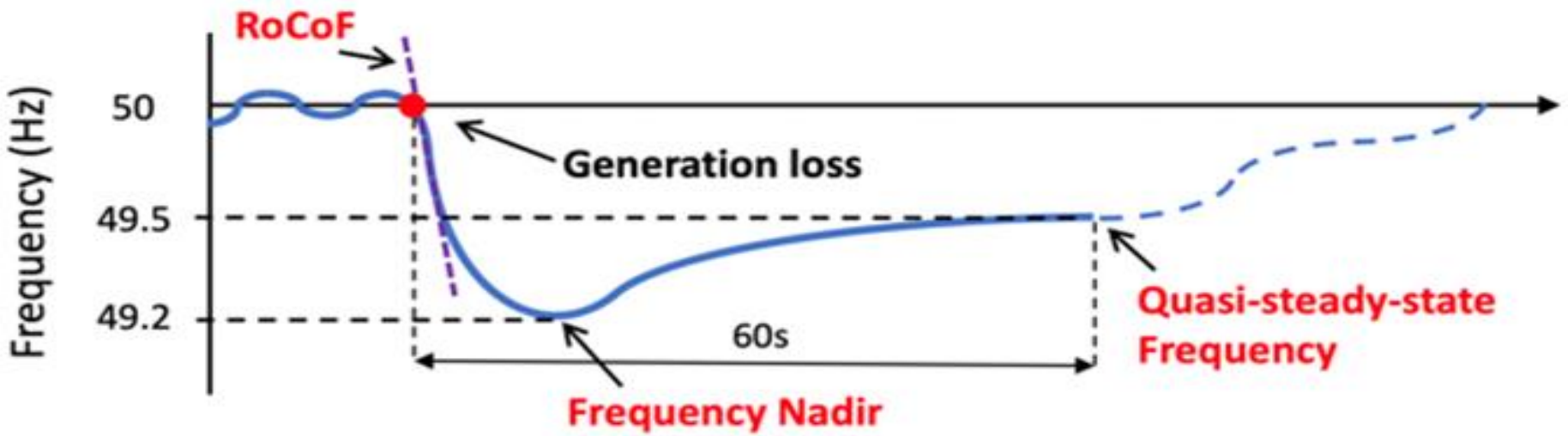
Tool for Co-Optimisation of Energy and Frequency-Containment Services (COEF)

Why do we need this?





Main Goal: Proposing a New Model for Co-Optimisation of Energy and Ancillary Services



Benefits of Co-optimisation of Energy and Ancillary services

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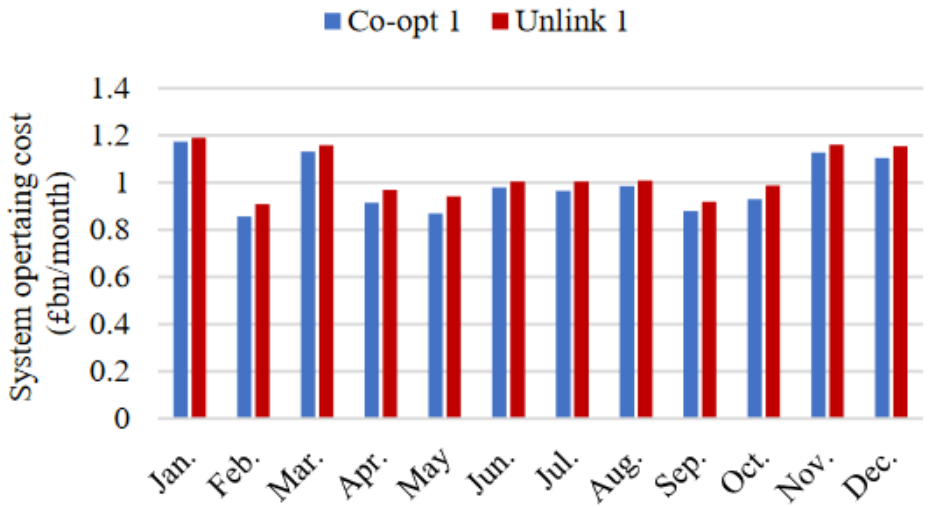
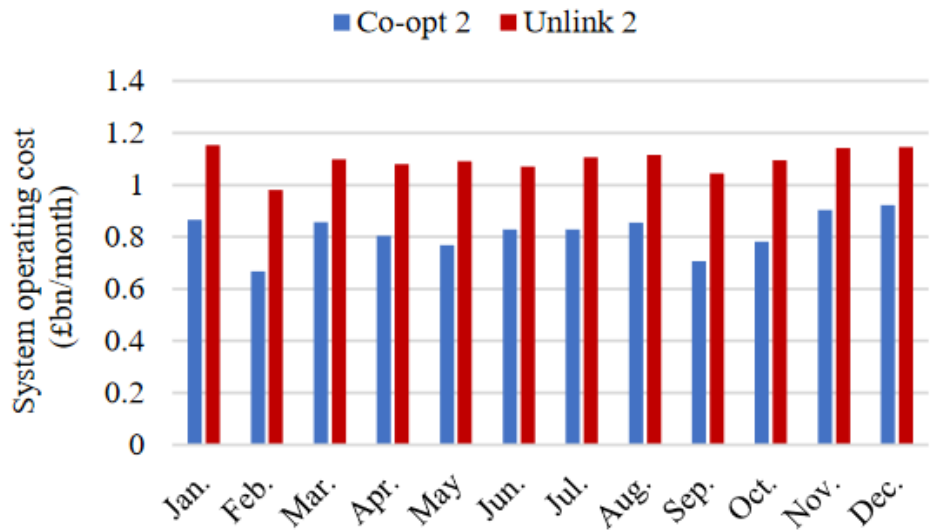
Current cost

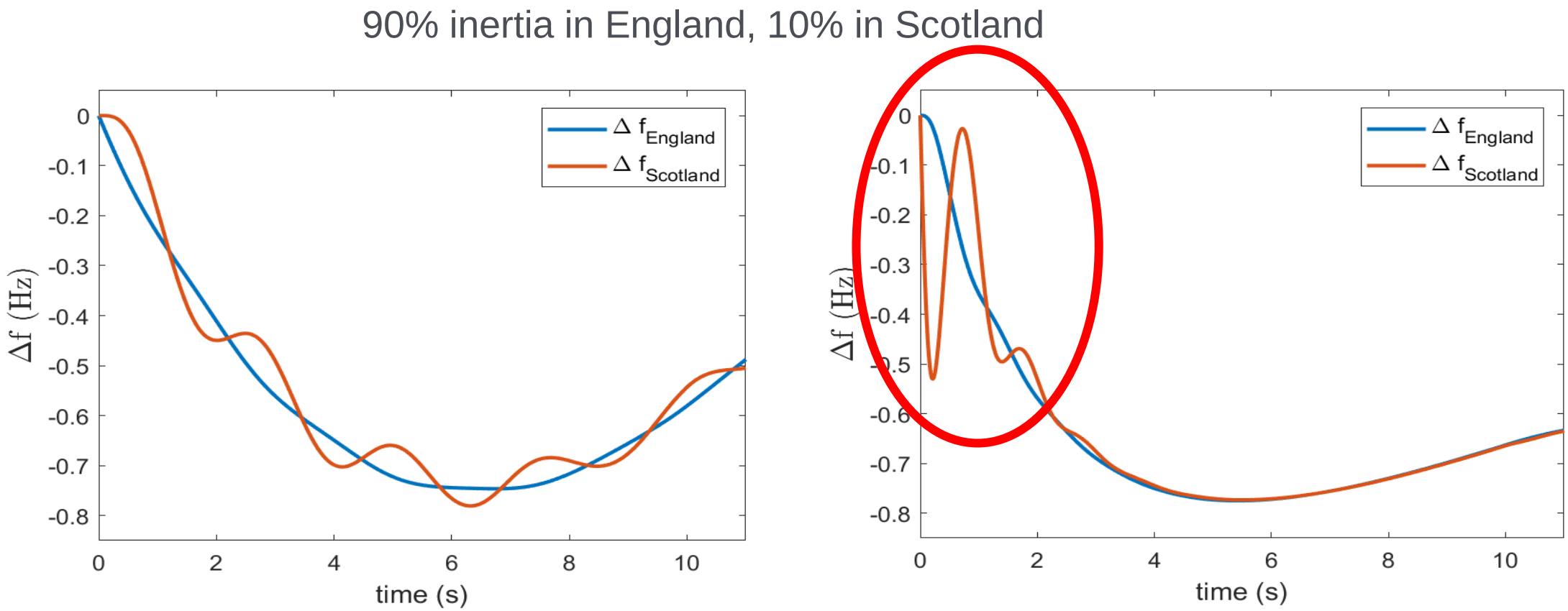


2030 Cost



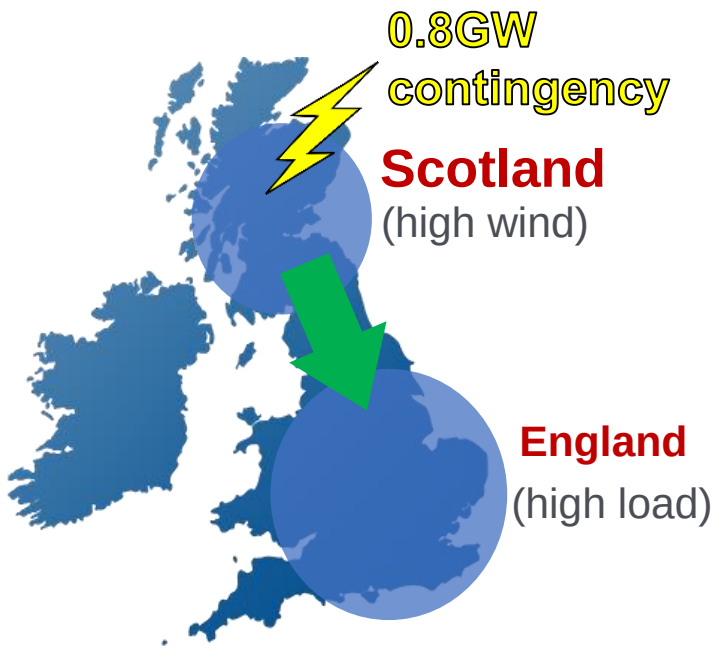
Impact of Fault Location: Contingency in Low-inertia Region

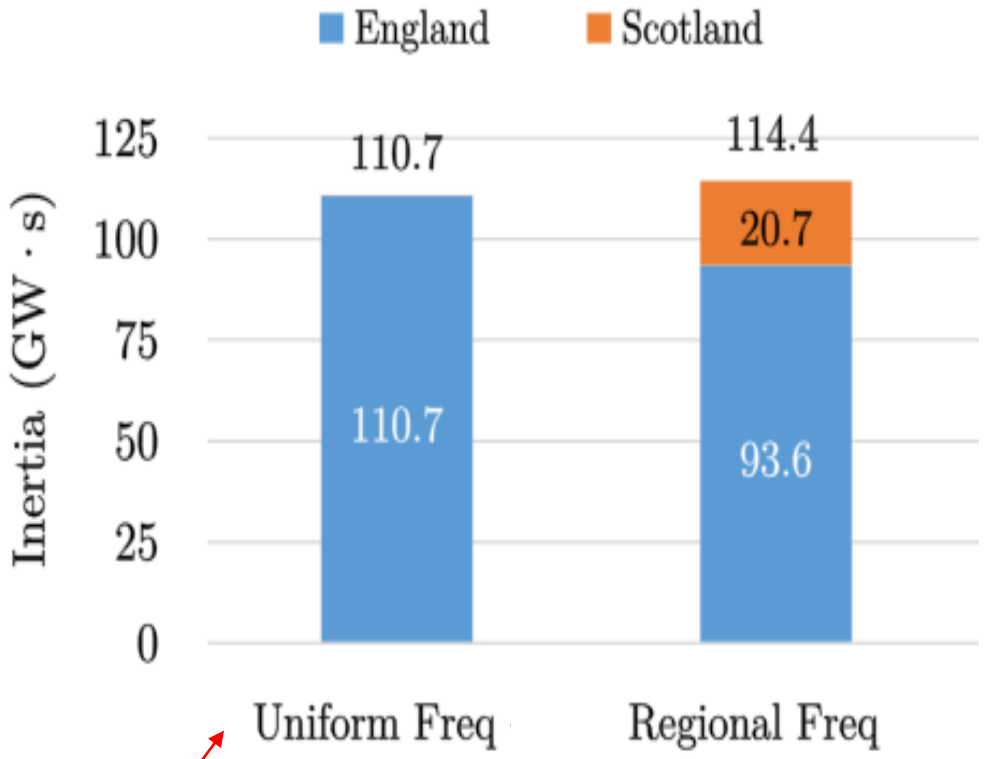
When there is a non-uniform inertia distribution and the faults occur in the low-inertia region



Impact of Fault Location: Contingency in Low-inertia Region

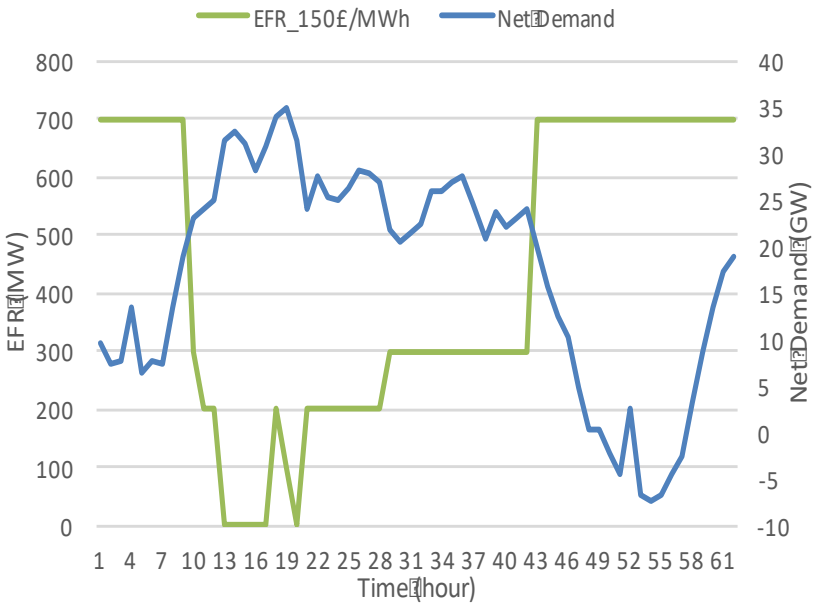
- **Mid-size loss in Scotland** (e.g. 0.8GW)

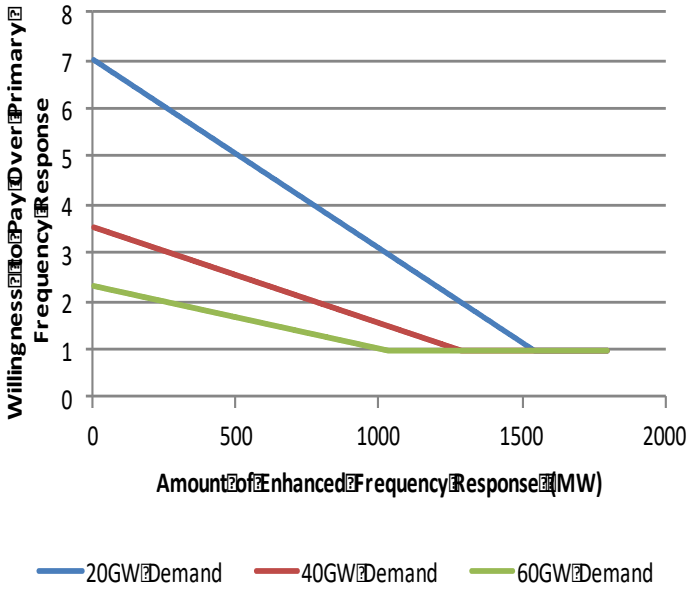




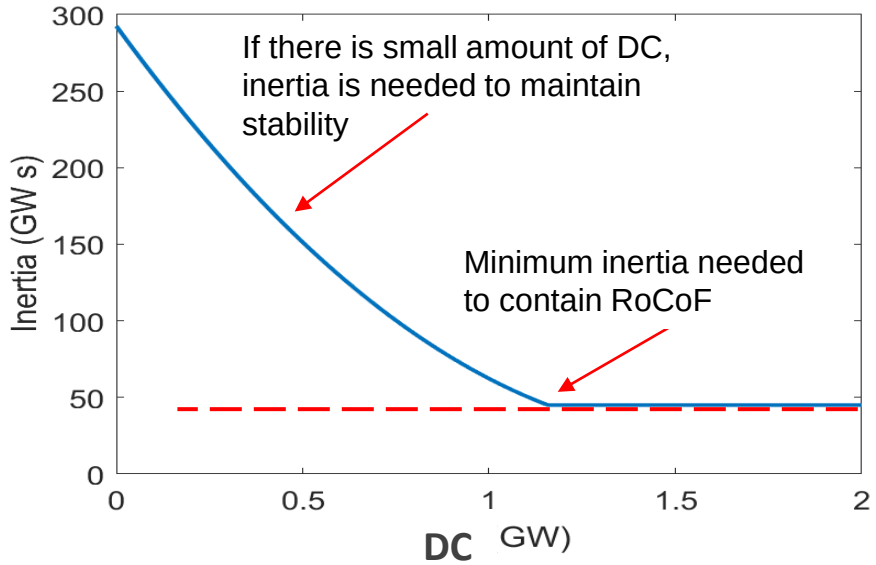
This case would violate the RoCoF limit in Scotland

Market Evolution - Time-Specific Value of Flexibility Services, Real-Time Auctions for Energy and Ancillary Services





Dynamic containment (DC) can be **very effective in reducing the need for inertia**



Real-Time Predictor

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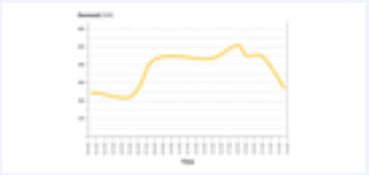
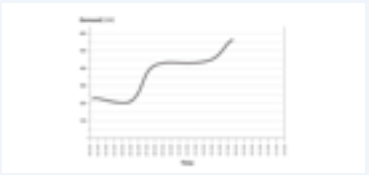
This tool provide a national-level, minute-by-minute demand prediction on a rolling basis

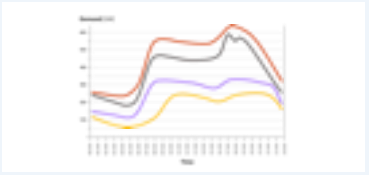
Day-Ahead Forecast



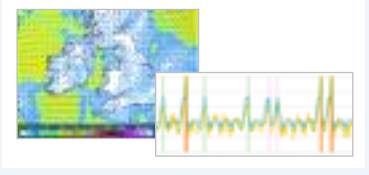
Real-time Measurements

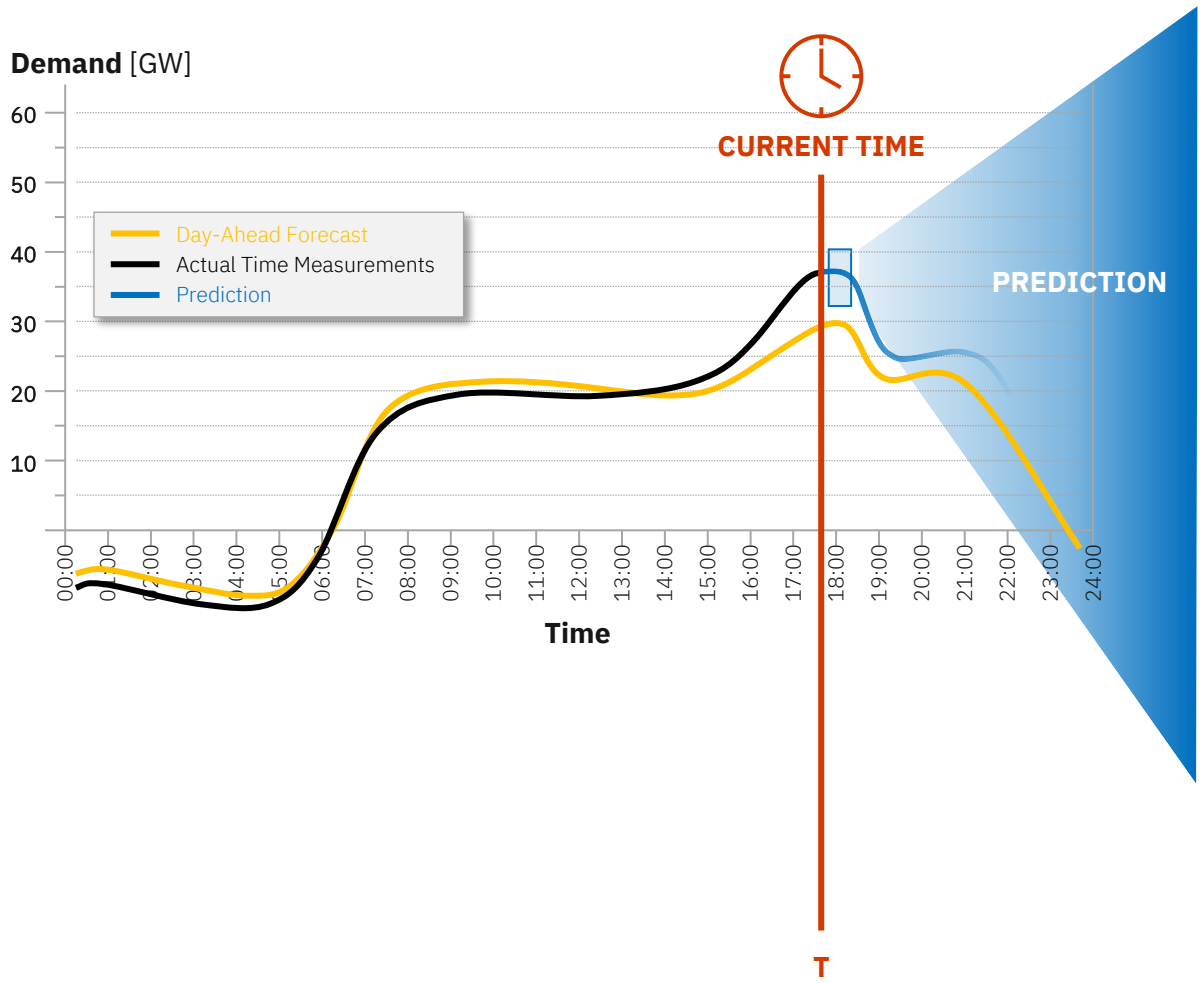


Historic Demand Curves



Other Inputs
(weather/events/contextual data/...)





Current Demand Predictor Tool

Using various input sources, predict on a rolling basis, national-level

- 1- Minute resolution national demand outturn
- 1-minute-ahead national demand
- demand over the next 30+ minutes

Prediction will either complement or supersede the manual adjustments made by control room staff

New Real-Time Predictions (RTP)

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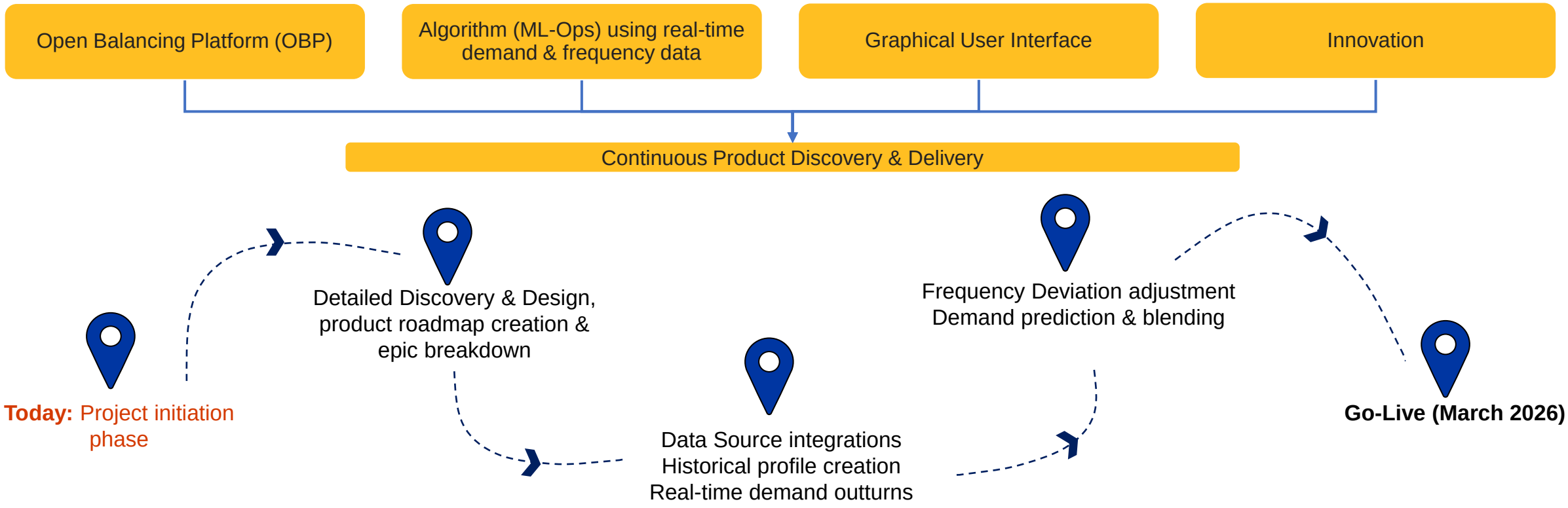
To provide improved minute by minute frequency corrected national demand forecasts and outturns



RTP Innovation project & Roadmap creation for future RTP Products (Wind, Solar & Grid Supply point)

Benefits

Estimated Balancing Cost Reduction or Avoidance **(£43-£86m p.a.)** by Improved Accuracy, Process and User Efficiency

Streamlined processes, Reduction in manual data input and calculation efforts leading to **increased operational efficiency**

Real-Time Predictor, Innovation Project

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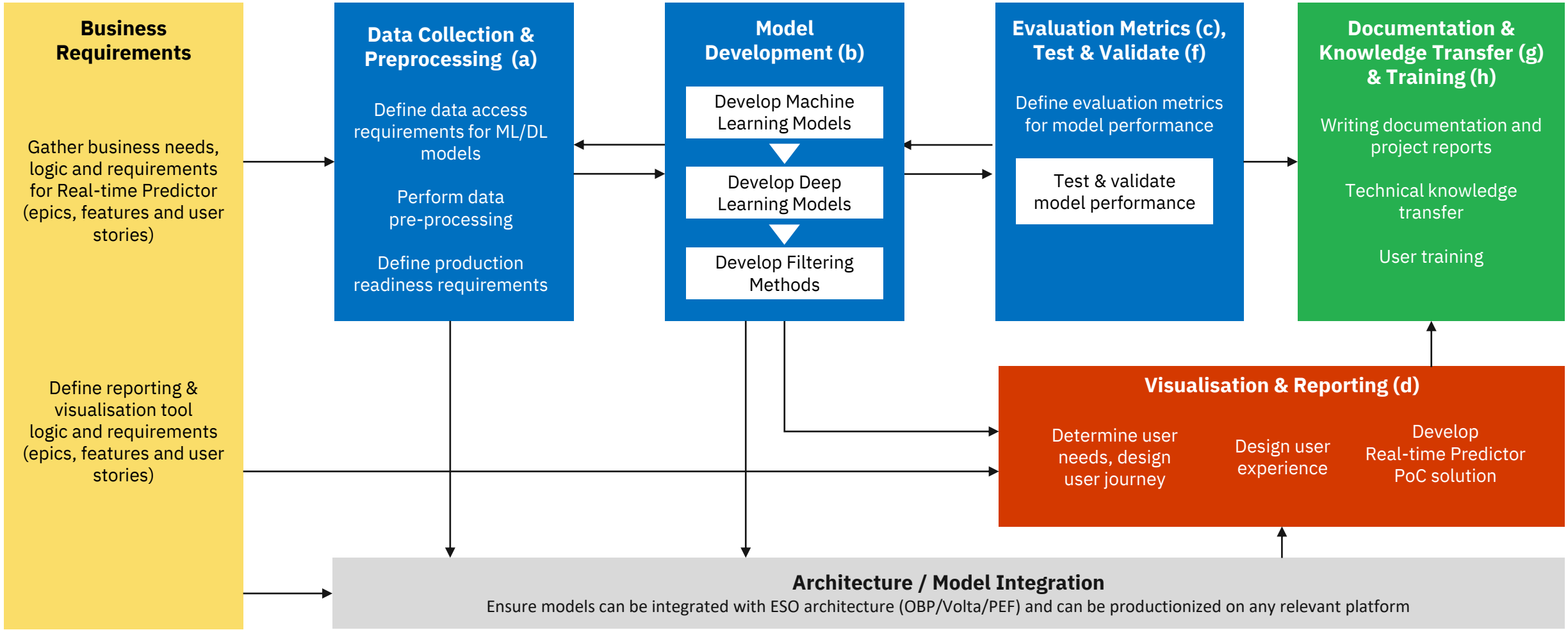

Beyond 2025

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

ESO

Future Product Development 2025 – 2035

#BPJune2024

Title	Presenter	Duration
Welcome & Purpose	Bernie/Neil	5 mins
Roles & structure	Shaunie	3 mins
Generating ideas	You	20 mins
Prioritisation	You	10 mins
Playback	Table leads	10 mins
Next steps & closing	Bernie/Neil	2 mins

Task: Seek your input into our Product Development prioritisation for 2025 – 2035 considering the opportunities for Forecasting & Balancing (including innovation) .

Outcome: Your prioritisation on topics NGESO should consider, aligned to existing or new themes; we will present a summary of the ideas captured & our plans to take those forward as part of our next engagement event later in the year.

Future Product Development Roadmap

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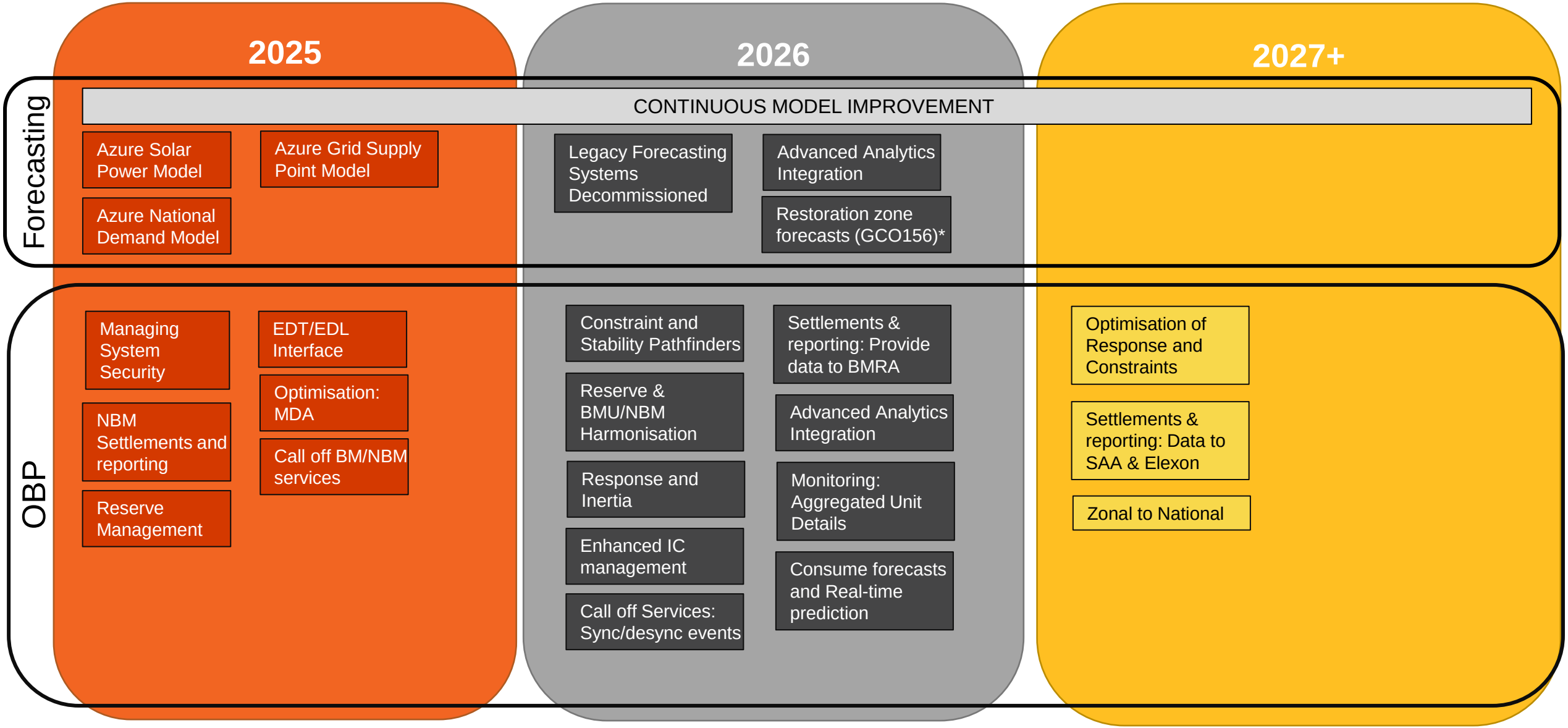

*System development timelines TBC

Major Industry trends (FES 2023 Leading the Way)

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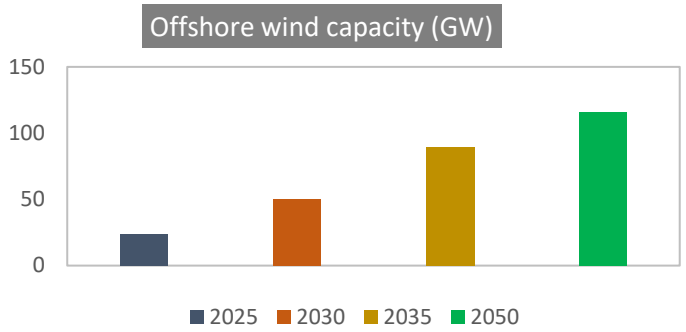
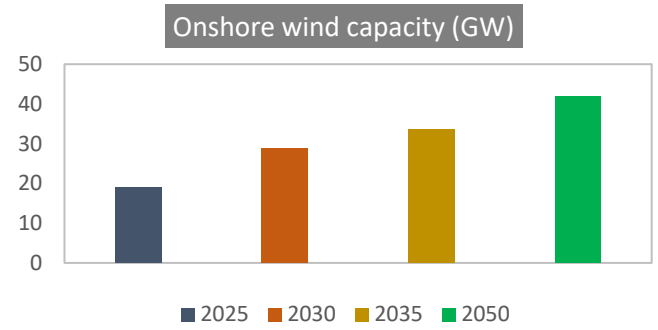
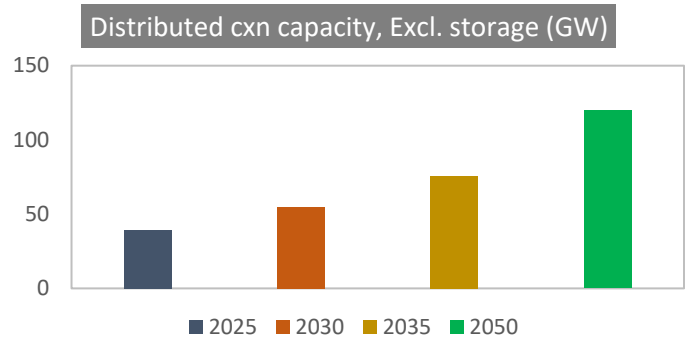
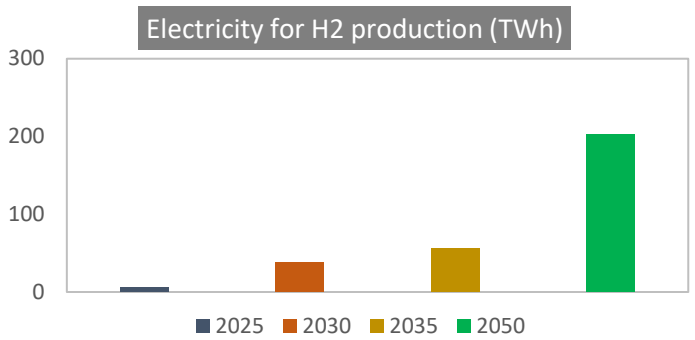
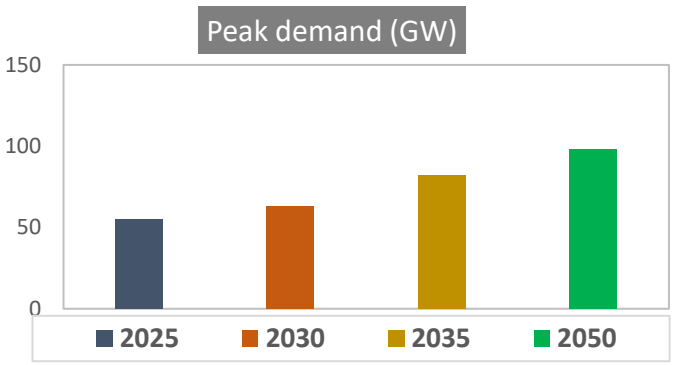
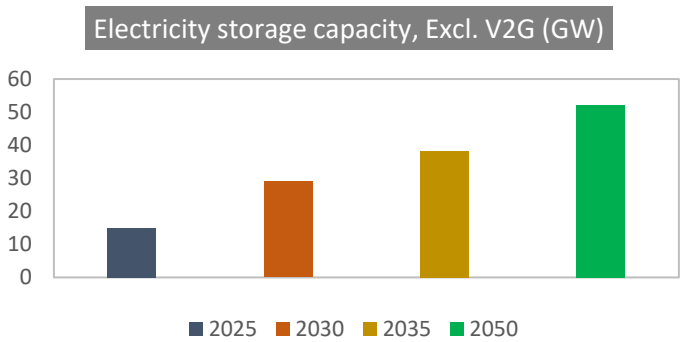


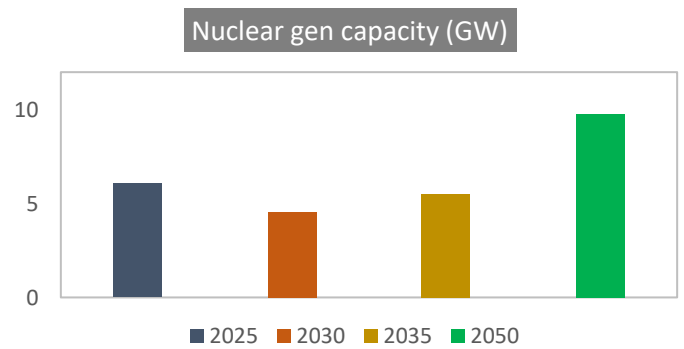


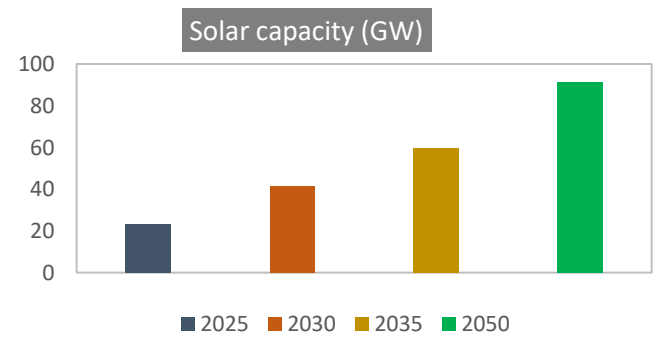


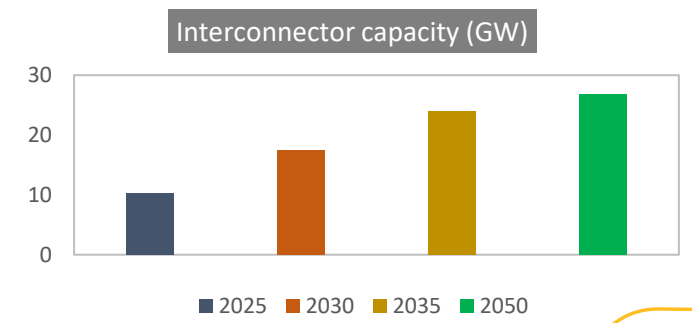












Balancing Enhancement Themes

Whole system management

- Offshore Grids
- Committing to working collaboratively with new and non-traditional system users to find efficiencies
- System performance, stability, and resilience: Enabling integrated management of system frequency, inertia, voltage and fault-ride-through to mitigate new vulnerabilities from increase in non-synchronous generation and volatile operational conditions due to extreme weather and geopolitical factors

Enhanced decision-making tools

- Scenario management
- Adaptive models
- Market Design & Commercial Frameworks - Enabling market arrangements that evolves with technological capabilities to remove inefficiencies and promotes fair competition

Operational data

- New signals to better manage new sources of supply whilst addressing perennial issues of incomplete geographical coverage and variable reliability and quality of operational data
- What data do we need to manage systems?
- What data do you need?
- Transparency: Enabling accessibility and timely visibility of justifications for control room actions as decisions become more numerous, complex and automated

Forecasting Themes

New/Improved Models & Methodologies

Transparency, Insights & Analysis

Data

Other

Balancing Themes

Enhanced Decision Making Tools

Whole System Management

Operational Data

Other

Guidelines for Generating Ideas

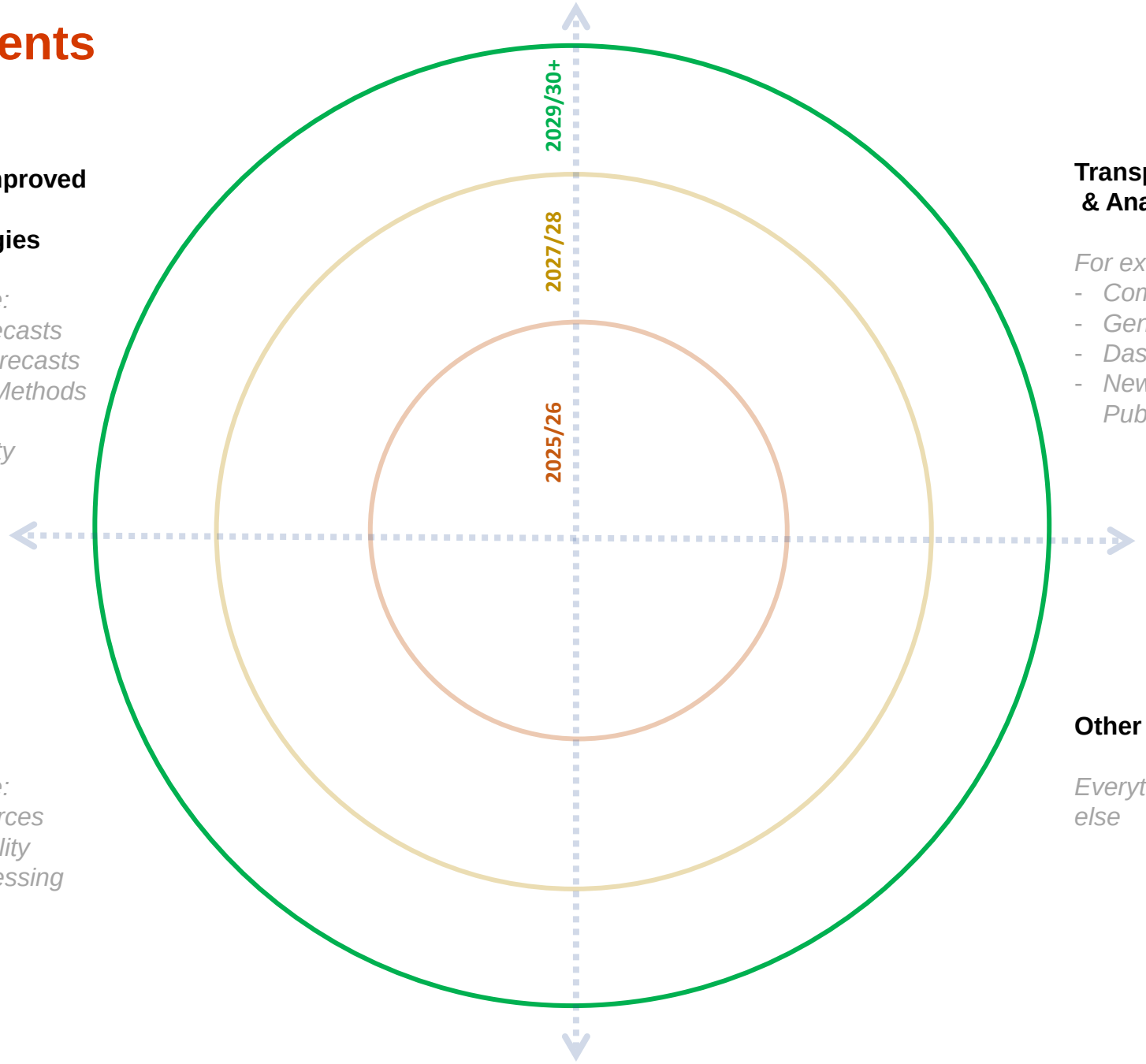
Defer Judgement	**Seek Combinations**
Strive for Quantity	**Freewheel**

Forecasting Enhancements

#BPJune2024

New and Improved Models & Methodologies

For example:
- *DER Forecasts*
- *MVAR Forecasts*
- *New ML Methods*
- *Forecast Granularity*



Transparency, Insights & Analysis

For example:
- *Commercial Impacts*
- *Generative AI*
- *Dashboards*
- *New Dataset Publications*

Data

For example:
- *Data Sources*
- *Data Quality*
- *Pre-Processing*

Other

Everything else

Balancing Enhancements

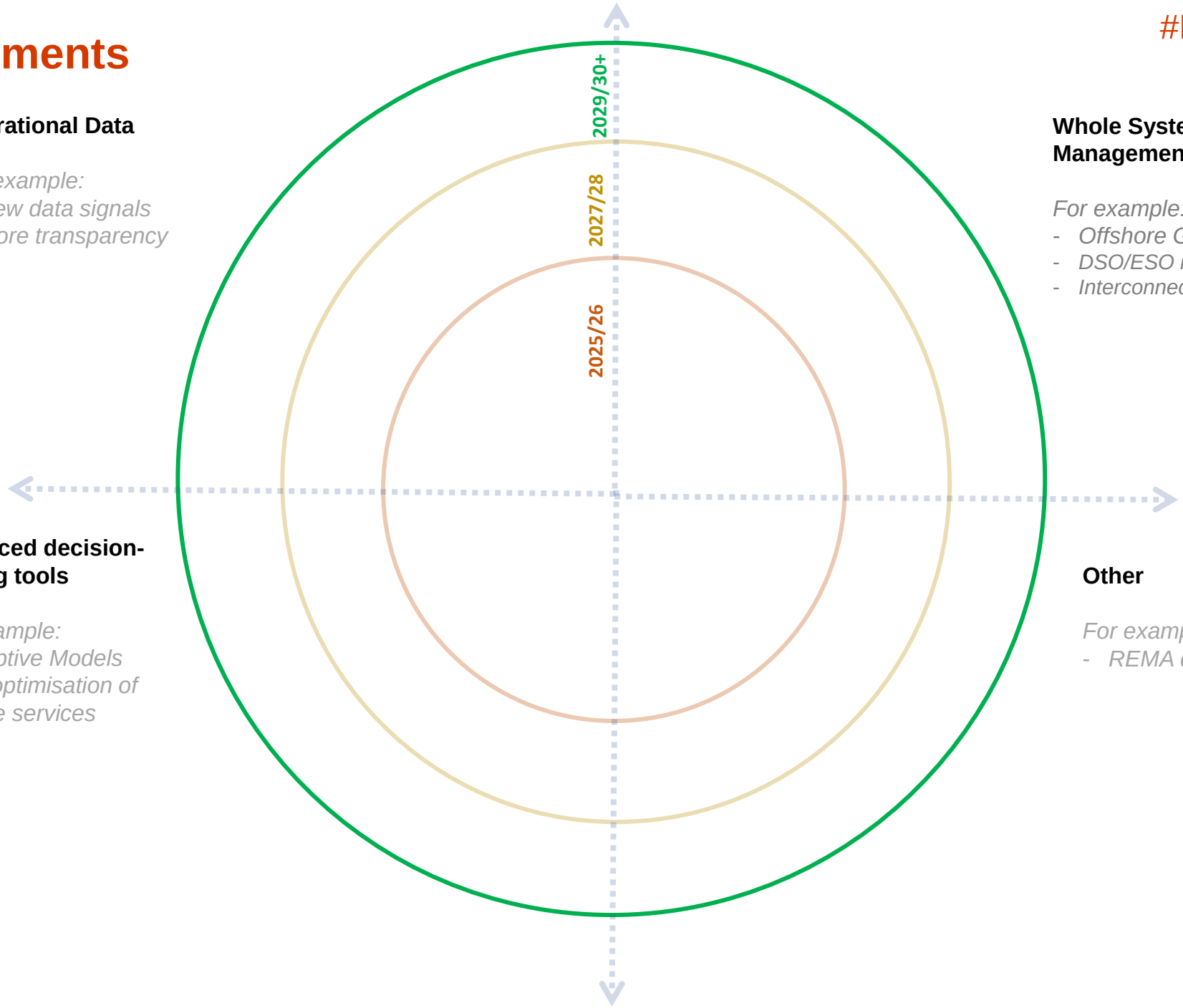
#BPJune2024

Operational Data

For example:
- *New data signals*
- *More transparency*

Whole System Management

For example:
- *Offshore Grid*
- *DSO/ESO interaction*
- *Interconnectors*



Enhanced decision-making tools

For example:
- *Adaptive Models*
- *Co-optimisation of more services*

Other

For example:
- *REMA decision*

Customer Listening Session

Kashia Cullen-Anderson, Strategy & Engagement Manager
Simon Sheridan, Customer Relationship Strategy Manager

ESO

ESO Customer Focus

#BPJune2024

Setting ourselves up for success working with you to *build trust* and deliver on our collective goals

Listen

Customer feedback tells us we need to be:

More responsive

Deliver on time

Improve our collaboration

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Partner

What do these mean in practice?

Respond to emails/calls and be clear in our articulation and set expectations together

Delivering projects when we say we will, engaging earlier when things are delayed and being clear why

Real collaboration – bringing people in earlier, being open to change, transparent in our decision making when we don't agree

Act

What have we started:

Customer Culture – how we listen. how we partner with industry and how we act and deliver on our collective commitments

Customer vision for our teams, a plan to get there and tracking the data and actions

Using insights now - hearing what customers need now, more proactive in responding to these

Balancing Programme Customer Vision and Objectives

What are we going to do?

We will transform our customer experience by engaging effectively with our customers, listening with care and being transparent with our decision making. We take ownership of our commitments and are trusted to deliver system transformation that is flexible to future needs.

Understanding your priorities and challenges, providing opportunities to collaborate on solutions.

Keeping you informed of our future deliverables, reasons why these may change, and where and how our plans impact you.

We will deliver our transformation roadmap with agile releases of new technologies into the control room; your insights will help inform delivery now & beyond 2025.

Why are we doing this?

Engagement & Communications

Specific topic discussions needed and updates between events	Introduced Focus Groups and a regular newsletter
Improved accessibility to attend events	We now alternate between webinars and in-person events

Transparency

A clearer understanding of the impact of our delivery on market participants	We provide OBP utilisation and delivery updates via various channels.
Improved transparency on OBP development & progress	Roadmap updates at our events highlight impacts on Market Participants

Programme Delivery

Battery Dispatch needed to be brought forward in the plan as priority	Delivered the Battery Zone in OBP in December – 3 months early
The 15-minute rule hindered battery dispatch and utilisation	We have now transitioned to the 30-minute rule

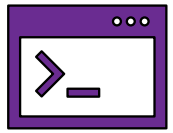
How are we going to do it?

Snapshot of planned improvements to respond to feedback

Dedicated Balancing Programme team leads and more regular 1-2-1 conversations

Inviting customers to talk directly to the teams developing the system changes

Provide better visibility of the development activities of the team and the scope of our work



Improving access to roadmaps and other documentation on our website, making it easier to find

Listening Sessions to find out directly from you what you would like us to do differently or improve.

Table Exercise: Exploring Solutions to Reach our Vision

#BPJune2024

Group Exercise (40 minutes) – On your table you have a template, pens and post-its. This is a facilitated table discussion for you to provide your feedback. You have a member of the team with you on your table who will guide you through this.


Q&A

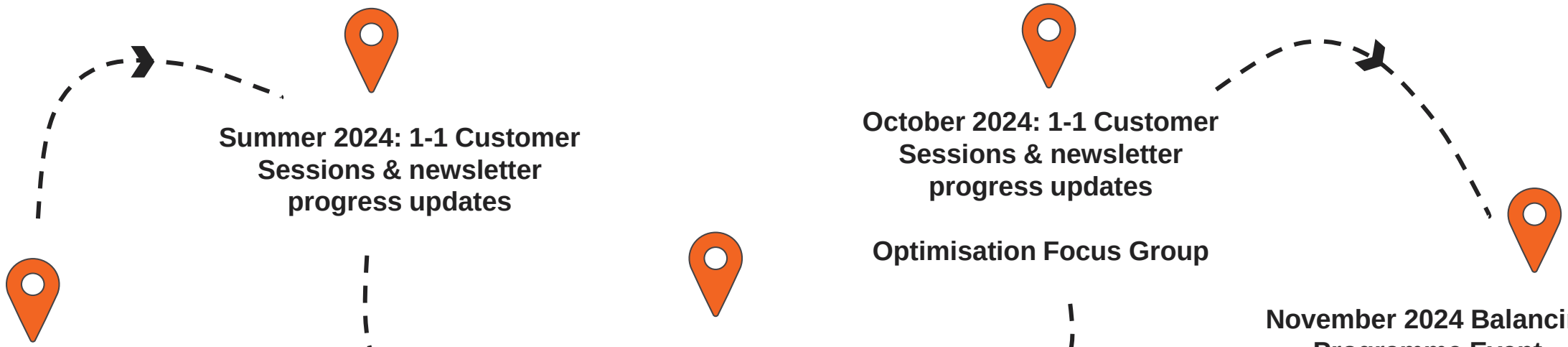
Next Steps & Closing Remarks

Brendan Lyons, Head of Balancing Programme

ESO

2024 Looking Forward: High-Level External Engagement

#BPJune2024



Next Steps . . .

We welcome your feedback – please get in touch via the email address below

Slides from today's session will be published on our website, along with the Q&A

You can reach out to the Balancing Programme team via email – **box.balancingprogramme@nationalgrideso.com**

Sign up to the Balancing Programme Newsletter for more regular updates - **Get the latest from ESO - Balancing Programme (nationalgrid.co.uk)**

Sign-up to our Stakeholder Focus Groups for Optimisation, Technology, & Forecasting - **Balancing Programme Stakeholder Focus Groups**

Balancing Programme Event

27 June 2024

ESO