Balancing Programme
Quarterly engagement session
9 February 2023
Welcome

#BPQuarterlyWorkshop

- Fire Exit Procedures
- Facilities
- Plan for the day
- Engage
Introductions & Aims of the day
Aims of today

• We want to share our progress on what we have delivered to date
• We want to give you insight into how we are transforming the balancing capability of our control room
• We want your input into how our system transformation will impact you
• We want your insight into how we tackle some of the key challenges of transforming our balancing capabilities
## Agenda

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>09:30 – 10:00</td>
<td>Arrival</td>
<td>Tea and coffee</td>
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<tr>
<td>10:00 – 10:05</td>
<td>Welcome</td>
<td>Welcome and housekeeping</td>
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<tr>
<td>10:05 - 10.15</td>
<td>Balancing Programme Vision &amp; Strategy</td>
<td>Objectives and vision of the Balancing Programme</td>
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<tr>
<td></td>
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<td>Collaborating with Stakeholders</td>
</tr>
<tr>
<td>10.15–11.30</td>
<td>Update on our progress to date</td>
<td><strong>Successes</strong>&lt;br&gt;What has been delivered in our existing systems</td>
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<td><strong>Skeleton IT Systems</strong>&lt;br&gt;Laying the foundations for the Open Balancing Platform to enable future delivery</td>
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<td></td>
<td><strong>Skip Rates in Existing systems</strong>&lt;br&gt;Progress made based on feedback from stakeholders, the changes implemented to our current systems and the benefits delivered</td>
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<td><strong>MW Dispatch</strong>&lt;br&gt;System developments we are implementing for MW dispatch, the value to stakeholders and how control room view the change.</td>
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<td><strong>Storage SH Group</strong>&lt;br&gt;Purpose of group and key objectives</td>
</tr>
<tr>
<td>11.30-12.00</td>
<td>Future Deliverables</td>
<td><strong>Open Balancing Platform (OBP) demonstration</strong>&lt;br&gt;Demonstration of OBP Developments</td>
</tr>
<tr>
<td>Lunch (12.00 -12.45)</td>
<td>(4 x 30 minute breakout sessions)</td>
<td><strong>OBP collaboration</strong>&lt;br&gt;Discussion on optimisation &amp; instruction principles</td>
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<tr>
<td>12.45-14.15</td>
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<td><strong>Axe the fax</strong>&lt;br&gt;Overview of the activity that we’re commencing replacing fax machines and legacy comms line and seek feedback on potential solutions</td>
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<td><strong>Forecasting</strong>&lt;br&gt;Roadmap view, current performance, <strong>Forecasting challenges and the need for change</strong></td>
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<tr>
<td>14.30 – 15.15</td>
<td>Q &amp; A Panel</td>
<td>Opportunity for attendees to ask questions</td>
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<tr>
<td>15.15 – 15.30</td>
<td>Close</td>
<td>Recap of the day and opportunity to provide feedback</td>
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</tbody>
</table>
Breakout sessions will occur during the course of the day.

We want these sessions to be mutually beneficial for both the ESO and our stakeholders.

We would like to set some meeting norms ahead of these sessions, so that they can be productive as possible.

We will take discussions and feedback from these sessions into consideration moving forwards.

#BPQuarterlyWorkshop
Event environment – what can you do to get the most from the session

- Be prepared to contribute
- Be present during the session
- Maintain energy levels
- All ideas welcome

Breakouts

- Reserve judgement when generating ideas
- Be prepared to give feedback
- Enter into open and honest discussions
- Reflect after the sessions – What went well? What could go better
- Feedback options
Balancing Programme Strategy and Vision
Balancing Transformation

- Improving existing systems
- Develop the future systems
- Enhancing the balancing capabilities of our control room
- Deliver significant benefits
Balancing Transformation vision

The programme strategic objectives and the new enabling business capabilities were set to address the scalability challenges and modernise the core platforms to provide increased reliability and flexibility in line with RIIO-2 business plan.

**Strategic goals**

<table>
<thead>
<tr>
<th>ESO ambitions</th>
<th>Business plan benefits areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security of Supply</td>
<td>Reduced emission</td>
</tr>
<tr>
<td>Competition everywhere</td>
<td>Flexible technologies</td>
</tr>
<tr>
<td>Zero carbon</td>
<td>Greater interconnection</td>
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<tr>
<td>Whole system</td>
<td>Better inertia management</td>
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<td></td>
<td>Balancing mechanism outage</td>
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**BTP Strategic Objectives**

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

**Focus**

- Controlled automation and scalable efficiency
- Flexibility and maintainability
- Equality and data availability
- Optimisation and effectiveness

**New Balancing Capabilities**

- Controlled Automation with process and user interface integration
- Flexible platform with continuous solution improvement
- Data harmonisation and openness by design
- Advanced optimisation and continuous improvement

Modern, open, reliable, resilient and secure technology platform
Roadmap: A roadmap which stated when functionality would be delivered by the balancing programme.

This was first time we have ever created a plan that pulls together control room requirements, market initiatives and industry’s requirements.
Confidence Levels

Confidence Questions: On a scale of 1 to 5 (1 = Low – 5 = High)

Q1: How confident are you in the approach we are proposing to take to deliver the initial roadmap?
Q2: How confident are you that we have captured the benefits accurately?
Q3: How satisfied are you with the timeframe of the initial roadmap? (does it deliver when you need it to)
Q4: How confident are you that the proposed initial balancing capability roadmap will deliver the quality and what you need?
Q5: How confident are you in the ESO to deliver to the proposed roadmap?
Q6: How confident are you that you understand the cost associated with the initial roadmap?
Q7: How satisfied are you with the costs compared to expected benefit delivery?
Industry Co-created Roadmap

Key:
- Grey Box – Market Initiative, RDP or Pathfinder
- Green Box – Capabilities required by the control room
- Blue Box – Capabilities generated from 5 May in-person meeting

- **2022**
  - Core
  - Add 01
  - Add 02

- **2023**
  - Add 03
  - Add 04

- **2024**
  - Add 05
  - Add 06
  - Add 07

- **2025**
  - Add 08

- **2026**

- Enhanced DM/DC/DR
- MW Dispatch
- NBM Optional Reserve
- SMP Enduring Auction
- Bulk Dispatch
- GEMS Tx
- Constraint Management
- Response & Inertia
- Enhanced Instructions
- Enhanced Interconnector Management
- GEMS Dx
- Reserve (Up/Down Margins)
- Sub MW Dispatch
- Time Varying Dynamic Data
- Stability 2
- All assets can be part of all services
- Stability 3
- Enhanced Forecasting Demand Prediction
- Skeleton for new IT
- Skiprate in existing systems
- Enhanced Visualisation
- Enhanced Optimisation
- BM/NBM combined dispatch
- Increased number of units/aggregation
Update on progress made
Completed: BM R2 – 17 November & 6 December

User experience
- Modifications for Demand Flexibility Service (DFS) – DFS instructed ~10 times including tests
- Improvements to Auto Instruction Repeater (AIR) functionality – reduced need for additional resource
- Enhancements to Constraints page - clearer visibility of constraint actions
- Fixes to Stable Export Limit button on price stack - improves dispatch accuracy when workload is high

Business plan & regulatory
- Fast keys for Voltage Pathfinder & Frequency Response services to reduce manual actions
- Data fixes for CMP326 compliance to ensure accurate settlements for frequency response
- Improved Frequency Response awareness

Asset Health
- Performance improvements to key computational processes
- Performance improvements to how EDL handles re-declarations
- Increasing number of Short-Term Operating Reserve contracts that can be loaded
- Increase interconnector limit in BM
<table>
<thead>
<tr>
<th>BMU</th>
<th>BOA</th>
<th>Target End</th>
<th>Return</th>
<th>Cost</th>
<th>Highest Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MW  Time</td>
<td>MW  Time</td>
<td>(£)</td>
<td>(£/MWh)</td>
</tr>
<tr>
<td>32919</td>
<td>35</td>
<td>6-SEP 16:59</td>
<td>36  6-SEP 17:00</td>
<td>23.00</td>
<td>69.00</td>
</tr>
<tr>
<td>32836</td>
<td>62</td>
<td>6-SEP 17:02</td>
<td>63  6-SEP 17:03</td>
<td>35.50</td>
<td>71.00</td>
</tr>
<tr>
<td>7426</td>
<td>80</td>
<td>6-SEP 17:03</td>
<td>81  6-SEP 17:04</td>
<td>24.38</td>
<td>48.76</td>
</tr>
</tbody>
</table>
Completed: ASDP R13 – 8 December 22

**User experience**
- Situational awareness enhancements to enable control room to nominate most economical units to dispatch for Fast Reserve
- Active health status from service providers through heartbeat signal, including alerts in case of failures
- Physical notifications for units providing response for visibility to the control room at unit, Grid Supply Point (GSP) and service type level

**Business plan & regulatory**
- Enhancement of ASR Response availability service to receive redeclarations between 0 MW to contracted MW
- ARM/DISARM Frequency Response services, units under Dynamic Regulation (DR), Dynamic Moderation (DM) and Dynamic Containment (DC)
- Availability and arming status for response services sent to settlements daily

**Asset Health**
- Security enhancements
- Technical optimisation for performance improvement and better user experience
Completed: ASDP R13 – 8 December 22

New Situation awareness pop-up
Upon clicking on Confirm button
Completed: ASDP R13 – 8 December 22
Completed: ASDP R13 – 8 December 22
Skeleton IT Systems
The ‘Core’ skeleton of Open Balancing Platform (OB)P was completed at the end of September. This delivered a basic platform for us to then deliver the functional & non-functional features in subsequent Programme Increments, which in turn deliver the value, release-by-release.

- Enable development across all technologies
- Enable the ability to system test requirements
- Enable microservice to microservice integration
- Enable microservice integration to front end screens
- Proving support for basic balancing story board
Objectives of Core

Core enables the basic Balancing Story Board

“Core” has enabled the essential process of balancing

- receiving and harmonising declarations
- placing alongside target programs for requirement creation
- determining the optimum set of instructions to be submitted
- feedback into the residual calculations
What this does in detail
Dispatch Transparency & Skip Rates
Dispatch Transparency & Skip Rates

- A skip is a BOA (Bid Offer Acceptance) instruction sent by the ESO Control Room to increase or decrease the output of a generator but at a price that was higher than an alternative option.
- The ESO has to manage several operational variables such as voltage requirements, system stability and thermal constraints simultaneously. Instructions are sent to generators to manage these with consideration for overall cost.
- Skips are classified and published in the Dispatch Transparency dataset.

Why are they of interest?
- The majority of skips are taken for operational reasons and are not preventable. Genuine skips where alternative instructions could have been sent for a lower cost are rare.
  - Example: 29 January 2023, 3 unclassified skips out of a total of 2,787 actions.
- The ESO strives for zero preventable skips.
- The ESO has a licence condition to operate efficiently and economically and a target to reduce balancing cost as much as possible.

Work ongoing in this space
- Dispatch Transparency dataset published weekly showing volume of actions and number of unassigned skips.
- In person dispatch transparency session event on December 5th discussed:
  - ESO’s current dispatch methods and the future of dispatch.
  - Current ESO Dispatch Transparency methodology.
- OTF update in December on content covered.
## Skips – Root Cause

<table>
<thead>
<tr>
<th>Reason Group</th>
<th>Caused by:</th>
<th>Improve:</th>
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<tbody>
<tr>
<td>Frequency</td>
<td>Time to make decisions</td>
<td>User Experience / Manual workarounds</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Complexity of decisions</td>
<td>Situational awareness</td>
</tr>
<tr>
<td>Incomplete</td>
<td>Efficiency of dispatch process</td>
<td>Better dispatch advice</td>
</tr>
<tr>
<td>Zonal Management</td>
<td>Legacy processes</td>
<td>Dispatch mechanism</td>
</tr>
<tr>
<td>Reason not auto assigned</td>
<td>Accuracy of participant’s data</td>
<td>Capture required data</td>
</tr>
<tr>
<td></td>
<td>Unavailability of contextual information</td>
<td>Processes and policies</td>
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</table>
Incremental changes to reduce skip rates

Improve:

- User Experience / Manual workarounds
- Situational awareness
- Better dispatch advice
- Dispatch mechanism
- Capture required data
- Processes and policies

SORT/SPICE/VERGIL

Balancing Platform (OBP)
Current system improvements to address skip rates

Release 0 - Winter 21
• Flex Flag: Enabling dispatch advice to make better use of small BMUs
  • Power Available: Changes to dispatch advice to prevent unnecessary Wind pullbacks

R1 - Spring 22
• Automatic Instruction Repeater (AIR)
• Reducing manual work for dispatch engineer

R2 - Winter 22
• Situational Awareness: Visibility of BOAS per constraint
  • New screens to enable quick dispatch of bi-directional units

R3 – Spring 23
• Visibility of overrides made to metering
  • Find cheapest bi directional units & instruct to the edge of each price band
  • Forecast profile separate from dispatch advice

R4 – Winter 23
• Quick navigation from price stack to BOA instruction
  • Improvements to alarms system

OBP Release 1 – Winter 23
• Bulk dispatch
  • Enhanced user experience
  • Better economic decisions, reduced workload in control room

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- Delivered
- To be delivered
- New system
12,000 hours per year of ENCC time is being saved as a result of removed workarounds.

80% reduction in ZBE workload during busy times due to implementation of Automatic Instruction Repeater (AIR).

40% estimated performance improvement of EDL and EDT as a result of system improvements.

Improved situational awareness and user experience achieved by various incremental usability changes across systems.

Changes to metering visibility of IEMS overrides resulting in better quality of data and improved situational awareness.
Megawatt Dispatch

What Is It?

- Turn down to zero service for distributed non-BM participants
- Pre-fault service used intra-day to manage transmission thermal constraints
- Providers are paid for the MW volume they have curtailed. No availability payments applicable
- To be trialled with National Grid Electricity Distribution at 8 GSPs initially and then followed by UK Power Networks
- Utilises legacy Distributed Energy Resource Management Service (DERMS)/Active Network Management (ANM) and SCADA (PowerOn) systems
- Minimum size of providers is 1 MW

Why develop it?

Improve Coordination

- Provides whole system approach to manage transmission level thermal constraints
- Improve outage co-ordination between ESO and DNO
- Provides test bed for Primacy work

Market providers benefits

- Provides a way for Distributed Energy Resource (DER) to fulfil their Visibility and Control Connection Agreement terms
- Allow faster, more cost-effective participation in services

ENCC benefits

- Offers ESO additional resource to manage constraints
- ENCC can Dispatch non-BM DERs near to real-time
- Additional ICCP links will provide situational awareness to ENCC

So how does the MWD process work?

Registration in Single Market Platform (SMP)

- Providers enter into tripartite agreement between ESO, DNO.
- Providers give visibility and control to ESO
- Providers update their prices at day-ahead via SMP

MW Dispatch Scheduling Tool

- Takes wind and solar forecast
- Provides forecast of available capacity to feed into SOP

Dispatch – Through ASDP including operational metering

- Dispatch instructions sent to DNO via MPLS link
- Operational metering received via MPLS link

Settlements

- Standard Settlements process Through Salesforce using pricing data from SMP and dispatch and metering data from ASDP
Megawatt Dispatch (MWD) system development

- **Registration – December ‘22**
  New ESO business process for registration in Single Markets Platform
  First test provider gone through the process

- **Dispatch capability – July ‘23**
  Control room dispatch capability delivered in ASDP release 15

- **Development – April – July ‘23**
  MWD scheduling and settlement capability being developed

- **GO-LIVE with first DSO - NG ED.**

- **Iterative improvements – Ongoing**
  Incremental improvements and amendments in future ASDP releases, following feedback from control room and industry regarding the new product

- **Wider Registration – April ‘23**
  Registration open to wider participation

#BPQuarterlyWorkshop
Key objectives

- Align internal balancing enhancements with industry expectations
- Active involvement in sessions to identify and work through problems and opportunities
- Work together on potential grid code changes to allow for smooth transitions
- Provide an empathic voice for storage market participants within the balancing programme
- Work together to understand the current pain points of market participants
- Work with the group to put forward changes to current processes such as the “15 min battery workaround”
- Align our internally generated personas with market participants
- Agree future ways of working and operational parameters for limited storage units
Meet the Storage Stakeholder Group

Rhys Oliver  
Department for Business, Energy & Industrial Strategy

Olly Frankland  
origami

Dan Brimelow  
Currently building a snowman

Charlotte Horne  
ESO
I like new technologies, spending time with the kids and user centric design practices

Richard Sykes  
storelectric

Mark Howitt  
New technologies, long walks in the hills, church

Gary Preece  
Highview Power®

Beth Warnock  
catapult

Matthew Margot  
elpower

Giorgio Balestrieri  
tesla
Making the UK system 100% carbon-free

Mike Ryan  
Constantine Energy Storage
Herding kids

Davide Miriello  
enelx

Steve Sinclair  
I make beer in my utility room when not optimising batteries

Giulio Beseghi  
tesla

Nick Huntbatch  
Head of Product at Electron

Paul Rowe-Jones  
zenobé
Skiing and drawing graphs.

Deepak Lala  
ESO
Enabling zero carbon transition

Semih Oztreves  
zenobé
Progress and outcomes so far

Shorter term

• Clarified assumptions that have unblocked work for OBP release 1
  • Programmatically calculating MWh based on MEL/MIL. Currently a manual workaround in current systems
  • Clarified unwritten rules and practices
  • The shorter term clarification has also help us build for the future in OBP
• Started to work together on some iterative changes for market data specifically to give new systems better visibility
  • Technical codes teams have been engaged with us since the group started
  • We want to work together, both the technical codes team and the storage stakeholder group to get the right solution for everyone
Progress and outcomes so far

**Longer term**

- First session had an open floor for conversations about challenges and pain points directly from stakeholders
- Grouped these into themes
- Deeper discussions around each themes challenges and pain points
- Next session in March to involve other parts of the ESO on some of these challenges
- Continue these meetings to continually work towards improvements for everyone

There is enough conversation to keep us going for a while!
Find out more and join

Scan to join our Storage Stakeholder group

Check out the Mural board

More about the balancing programme

#BPQuarterlyWorkshop
Break out stalls
Open Balancing Platform (OBP) Demonstration
The problem of scale – National Balancing

• The Control Room has a manual based process for the interpretation of optimisation and subsequent dispatch

• With increasing number of smaller units, the Control Room has an urgent need to scale and automate its processes for optimisation, dispatch and monitoring
Existing – What have we just seen?

- Heavily dependent on manual activity
- Control Room have to search and find units to dispatch individually
- Unit data is not always valid
- Users have to manually enforce rules such as the "15 minute rule for batteries"
- Dispatch in cost order may not be cost optimised overall

- Time taken (40s) for individual instruction leads to drive to send fewer but larger and longer instructions
- Pressure and stress impacts during impacted periods
- Time spent “doing” rather than “managing”
Restrictions

- OBP and our existing BM system will be operating in parallel.
- Required to manage co-existence where units may be managed in existing systems.
- Applies a directional clamp for dispatch action.
- Enables OBP processes such as battery logic (until new processes).
- Manages communication down.
- Ensure no “unpicking” of earlier actions in the existing BM system.

### Category Description

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Battery Management</td>
<td>Restriction applied when a battery has been instructed. Removed when a new MEL/MIL redeclaration received</td>
</tr>
<tr>
<td>Constraint</td>
<td>Unit restricted (directional) due to a constraint</td>
</tr>
<tr>
<td>Comms Failure</td>
<td>Unit restricted due to a failure in their comms link (e.g. EDL is down)</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Unit is restricted due to limited flexibility (e.g. nuclear plants)</td>
</tr>
<tr>
<td>Response</td>
<td>Unit is restricted as instructed for response</td>
</tr>
<tr>
<td>Reserve</td>
<td>Unit is restricted to adhere to a reserve contract</td>
</tr>
<tr>
<td>Data Reliability</td>
<td>Unit is restricted because of data reliability issues such as bad data</td>
</tr>
<tr>
<td>Managed in BM</td>
<td>Interim reason while transitioning from BM to OBP. Specific types of units can be excluded from the OBP system until the system can manage them</td>
</tr>
<tr>
<td>Other</td>
<td>Unit required to be restricted but none of the above reasons apply</td>
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</tbody>
</table>

Note: new categories can be added should a specific scenario reoccur.
The new end to end process
Optimisation, Instruction Creation & Sending

What are your thoughts on how we plan to Optimise and create/send "linked" instructions? How quickly would you respond and be ready for a second instruction?

How many instructions (for multiple units) can you process at a time?

Can you think of anything we need to consider before implementing this?
Approach

Are there benefits you can foresee for you by our new approach?

Are there changes you would like to see to help support you in this approach?

How would you like us to engage with you to prove integration and the new approach?
Open Balancing Platform (OBP)
Collaboration
BSC Issue Group 98

Introduction

BSC Issue Group 98 covered the topic of “Review of the current practice of setting Dynamic Parameters within the Balancing Mechanism”. The review was conducted between November 2021 and June 2022.

As part of this review we presented a number of rules that can be implemented by our new algorithms when generating instructions.

The purpose of these rules is ensure we do not over-instruct plant (e.g. multiple small instructions instead of one large instruction).

A detailed report from the Working Group is available on the Elexon website.
Scenario 1 – Flat top

Description

A BM unit is issued a BOA (Bid-Offer Acceptance) that has a flat top and the length of the flat top is relatively short. BM units cannot be issued BOAs whose flat tops are less than the acceptable minimum flat tops associated with the unit (or class of units) in question.

The aim of this rule is to allow units to stay at a given output level before being requested to change direction. For example, large thermal generators may need a minimum time before changing direction whereas batteries may not.

Proposed behaviour

Each BM unit would be associated a number which is used as a minimally acceptable length of flat tops of all BOAs before a change of directions is issued to the unit. This value is known as the minimum flat top.

Industry participants to set the value as part of pre-qualification process from 0 to 5 minutes, with a proposed default to 5 minutes.
Scenario 2 – Minimum delta MW

Description

BM unit is issued a BOA that moves the unit from flat top at level W1 to a flat top at level W2. A minimum delta MW (=ABS(W2-W1)) would be applied.

This is to prevent scenarios where a unit will be given a series of very small instructions.

Proposed behaviour

Each BM unit would be associated a number which is used as a minimum delta MW.

Industry participants to set the value as part of pre-qualification process. A default would be set, e.g. 5 MW or a percentage of the max capability of the unit.
Scenario 3 – Near MEL/MIL/SEL/SIL action

Description

Dispatch advice might suggest an instruction that is close to one of these limits (e.g. within 5 MW). When close to such a limit we might issue an instruction to that limit as the expectation is that further dispatch advice will take us there.

Proposed behaviour

Each BM unit would be associated with a number which is used as the “closeness” value.

Industry participants to set the value as part of pre-qualification process. A default would be set, e.g. 5 MW.

If MEL was 100 MW and dispatch advice gave an instruction to 95 MW this would be converted to 100 MW.

NOTE – MEL (Maximum Export Limit), MIL (Maximum Import Limit), SEL (Stable Export Limit), SIL (Stable Import Limit)
Scenario 4 – Splitting large MW instructions

Description

Dispatch advice might suggest a very large instruction to one BM Unit (typically after a loss on the system). Sending one instruction to one BM Unit is seen as risky in these circumstances and so the instruction would be split between more than one BM Unit using the next BM Units in merit.

This would be an exception in urgent circumstances where the failure of a single BM Units to follow the issued BOA may leave the system at risk.

Proposed behaviour

ESO would set this value dynamically, depending on system conditions such as inertia, but inform the market of the splitting methodology and the values used to implement this.
Scenario 5 – State of Energy

Description

Some technologies, such as batteries and pumped storage hydro, may be depleted if we instruct them for too long and may not be available at later, more critical or economic, times.

Currently we use MEL and discussions with providers to decide how to issue instructions to these BM Units.

Proposed behaviour

At this time our algorithm teams need to investigate this. However, we also want to check if industry feel this is a valid parameter and mode of behaviour.

We are pursuing this via our Storage Stakeholder Group.
Scenario 6 – Max number of instructions in a 30-minute settlement period

Description

Potentially an algorithm can issue a large number of instructions to one BM Unit or control point

Can all units/control points handle an increase in the number of instructions? Are there some BM Units that still have manual processes making it hard to accept and act on such instructions? Will IT at sites fall-over if we increase the number of instructions?

Can downstream systems also cater (e.g. settlement at Elexon)

Proposed behaviour

How can we set a limit if one exists?
Axe the fax
ESO uses faxes to send and receive data of varying importance with market participants. Some of them are used repeatedly, some are rarely used.

**Using paper faxes delivers the following benefits**

- Proof that the message has been received by the destination fax machine
- Easy to modify (create new templates) if needed
- Relatively easy for new market participants to acquire the hardware required to participate in the market
- Easy to identify when new information is received

*BUT*...there are a number of disadvantages which are increasing challenging...
Axe the fax – the challenge

The clock is ticking - The telephone network which the faxes run on is due to be decommissioned at the end of 2025. (FYI: this date also applies to ISDN lines which we are already working on)

Additional challenges:

- Significant Manual Work involved in the process
- Increasing Cyber Security Risk
- Legacy technology
- Increasing costs and efforts to procure Fax Machines, parts and ink cartridges etc.
- Growth in number of Market Participants requires a future proof solution
Axe the fax - The requirements

We're moving from a paper-based system to a digital system. The core functionality needed is…

Resilient: Whilst the Faxes are not used for System Restoration, they are used to send information used for System Restoration, so the solution needs to be highly resilient

Non-repudiation: Evidence that messages have been sent / received by the market participants

Data-based: Creation of records in an electronic format to facilitate reporting, auditing and search

Secure: Data must be encrypted, users only able to see only their own data

Standards-based: Use industry standards where possible, facilitates ease of integration / adoption by new market users
Grid Code & STCPs

The Grid Code has several points in it where it mentions that certain transfers of data have to happen via the fax machine, the places that this is mentioned are below.

<table>
<thead>
<tr>
<th>Grid Code</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC7- Appendix 1</td>
<td>Permits the use of “fax or other electronic means” for relevant system warnings</td>
</tr>
<tr>
<td>BC1 – 1.4.1 a</td>
<td>Ambiguous: EX/IM Limits and Dynamic Parameters “may be submitted by telephone or fax”</td>
</tr>
<tr>
<td>BC2 – Appendix 2-4</td>
<td>Revised MVar capabilities must be by fax Frequency Sensitive Mode by fax</td>
</tr>
</tbody>
</table>

The Grid Code team are currently looking into changing the grid code so that the method of data transfer does not have to be reliant on the fax machine.

*Transmission - There is also investigation into the STCPs that relate to the Transmission faxes*
## Categorisation of faxes

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Number in Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Operationally important. These faxes are targets for harmonisation with existing or future interfaces with Market Participants, for example EDL/EDT</td>
<td>15</td>
</tr>
</tbody>
</table>
| 2        | Operationally informative: These faxes are targets for an ‘online portal’ solution, this is due to:  
  - An interface not being found for harmonisation  
  - Requiring a manual acceptance and actioning of the data incoming to the control room                                                                 | 11                |
| 3        | These faxes are ad-hoc, rarely received, received through emails, or unique scenarios                                                                                                                                 | 10                |
| 4        | These faxes are currently in progress for automation by other National Grid ESO projects                                                                                                                        | 10                |
## Axe the fax – Options analysis

<table>
<thead>
<tr>
<th>Option</th>
<th>Data driven (enables integration and reduces manual effort)</th>
<th>Resilient (can be relied upon for critical messages)</th>
<th>Market-wide access (easy for new market users to adopt)</th>
<th>Future-proofed</th>
<th>Supports non-repudiation</th>
<th>Cost effective / easily extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fit existing fax machines with digital receivers</td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>2. Adapt existing comms abilities (EDL/EDT)</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3. Extend EDL/EDT and build an online portal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>?</td>
</tr>
<tr>
<td>4. Extend EDL/EDT and buy an online solution</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

1. Building entire platforms from scratch should not be underestimated in terms of cost and complexity
2. What would constitute ‘Non-repudiation’ needs to be agreed by all users and be part of the product selection criteria
Online portal high level solution – Inbound/Outbound

- **Online Portal**
  - Market Participant securely logs into Online Portal

- **ESO**
  - Control Room Engineer manually accepts/rejects the submitted data
  - Control Room Engineer manually creates outbound message

- **Flow 1**
  - Creates an electronic form
  - Data automatically flows into relevant system
  - Data entities
  - Balancing Harmonisation
  - Settlements, other

- **Flow 1.1**
  - Print/send via email

- **Flow 1.2**
  - Stored for Audit

- **Flow 1.3**
  - Knowledge for control room engineers

- **Other Downstream teams**

*This is a high-level concept and not committed to delivery by any programme as of yet*
But why are we here today?

...we want to hear about your experience with the fax machines and learn about your ideas
Has this challenge been solved already? Views?
Ideation

High

Low

Feasibility

Priority

High

Low

#BPQuarterlyWorkshop
Forecasting
We have delivered improvements
How we forecast

- Day ahead forecast at 9am
- As agreed with Ofgem and industry the ESO forecasts Initial National Demand Outturn (INDO)
- To do this, we forecast 'virtual' demand and subtract embedded wind/solar estimates
- Where virtual demand is the total underlying customer demand
- Permitted inputs: weather data, historical demand and time variables
Why do we forecast virtual demand?

• Virtual demand is relatively “predictable”
• Forecasting virtual demand and subtracting embedded generation forecasts has provided the most accurate forecasts for national demand
• Interpretable results
• Unified approach for all time-horizons
Viscosity of embedded generation

- To improve our virtual and national demand forecasts, we need more data on embedded generation.
- For day-ahead forecasting, we need historic data on embedded generators (especially non-wind/solar).
- For real-time forecasting, we need near real-time metering of embedded generators.
- We also need to keep track of assets as they partake in ancillary services (e.g. response, reserve, and Local Constraint Market (LCM)).
  - Minimise “double counting” of embedded assets in ancillary service markets.
  - E.g. a solar farm selling reserve in the quick reserve market.

Growth of embedded gen vs virtual demand:

- National demand (INDO)
- Wind
- Solar
- Other

% emb of total
%emb forecast of VD

0% 20% 40% 60% 80% 100%


TWh

Visibility of embedded generation

#BPQuarterlyWorkshop
Questions

What data on embedded generation and demand can you share with us?

Could you share historical generation and demand data aggregated by Grid Supply Point and by asset type?
Forecasting time of use tariffs and demand flexibility

- Virtual demand profile is becoming less predictable
- We must develop a forecasting system which helps us manage demand flex
- We think we need to migrate to probabilistic forecasting

Saving Sessions Event - 23 January, 17:00-18:00

Source: from Twitter @DrSimEvans @OctopusEnergy
Questions

How do you think we should we forecast national demand in future?

How do we ensure that Time of Use forecasts are coherent across different suppliers and aggregators?

Can you share data that will help us forecast demand flexibility?
## Forecasting Products & Roadmap

### Releases
- **FY23**
  - R1 National Demand (ML) New PEF GUI
  - R2 GSP Net Demand (14D)
  - R3 LCM
- **FY24**
  - R4 GSP
  - R5
- **FY25**
  - R6
  - R7
  - R8
- **FY26**
  - R9
  - R10

### Milestones
- **FY23**
  - Data Analytics Platform (DAP) Integration
- **FY24**
  - Grid Supply Point (GSP) Integration
- **FY25**
  - Open balancing Platform
  - Wind Power
  - National Demand
- **FY26**
  - Oper PEF Decommissioned
  - EFS Decommissioned

### Platform for Energy Forecasting (PEF)
- **Foundation Platform**
- **Grid Supply Point (GSP)**
- **Solar Power**

### Design, development & Implementation of platform
- Forecast model improvements & enhancements of forecasting products
  - Wind Power (BMU)
  - Small Embedded Non Renewable Generation
  - Probabilistic Forecast
  - Advance Data Analytics & New Data

### Future modelling & data science enhancements – Under Review

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We have collaborated with industry
Panel discussion/Q&A
Aims of today

• We want to share our progress on what we have delivered to date
• We want to give you insight into how we are transforming the balancing capability of our control room
• We want your input into how our system transformation will impact you
• We want your insight into how we tackle some of the key challenges of transforming our balancing capabilities
Thank you

Next Steps

We welcome your feedback

Website updates

You will be added to our mailing list for future updates
  • Reach out via email – box.balancingprogramme@nationalgrideso.com

Next event in June (location TBC)