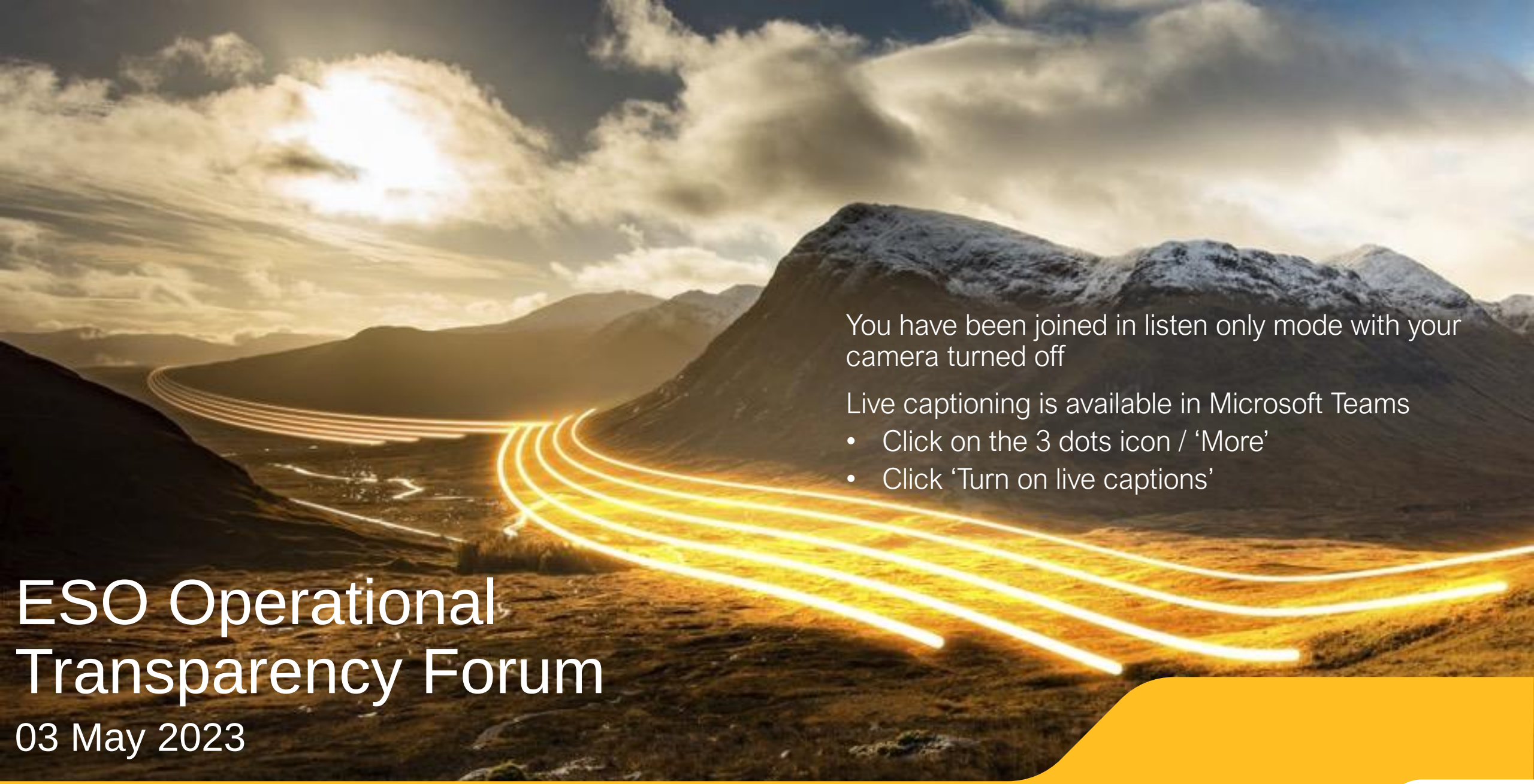


You have been joined in listen only mode with your camera turned off

Live captioning is available in Microsoft Teams

- Click on the 3 dots icon / ‘More’
- Click ‘Turn on live captions’

ESO Operational Transparency Forum

03 May 2023

ESO

Introduction | Sli.do code #OTF

Please visit www.sli.do and enter the code #OTF to ask questions & provide us with post event feedback.

We will answer as many questions as possible at the end of the session. We may have to take away some questions and provide feedback from our expert colleagues in these areas during a future forum. **Ask your questions early in the session to give more opportunity to pull together the right people for responses.**

To tailor our forum and topics further we have asked for names (or organisations, or industry sector) against Sli.do questions. If you do not feel able to ask a question in this way please use the Advanced questions option (see below) or email us at: box.NC.Customer@nationalgrideso.com

These slides, event recordings and further information about the webinars can be found at the following location:

Advanced question can be asked here: https://forms.office.com/r/k0AEfKnai3

Stay up to date on our new webpage: https://www.nationalgrideso.com/OTF

Future deep dive / focus topics

Future

Response markets introduction – 3rd May (Today)

Coronation review – 17th May

If you have suggestions for future deep dives or focus topics please send them to us at: .box.NC.customer@nationalgrideso.com and we will consider including them in a future forum

Dispatch Transparency Event

We will be hosting an online event on **the morning of Friday 2nd June** to for a deep dive about how we dispatch and "Skip Rates".

Exact times and sign up details will be provided at next week's forum

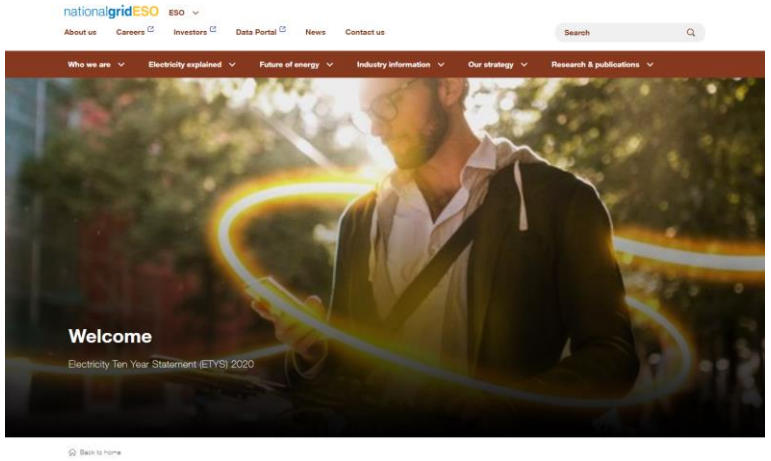
Content will be similar to the event held on 5 December 2022, including:

- How the ESO currently dispatches – illustrating the cumulative challenges faced by our control engineers and explaining our approach to managing this
- The future of dispatch – overview of the Open Balancing Platform roadmap highlighting how progress will improve transparency and support the control room to manage the dispatch challenges
- Current ESO Dispatch Transparency methodology – explaining the reasons for accepting bids or offers which appear to be out of merit; or not accepting those which appear to be in merit. Including risk management actions

There will also be opportunity for a Q & A session and all materials, including the event recording will be shared.

What is the ETYS?

The Electricity Ten Year Statement is the ESO's view of future transmission requirements and the capability needed on Great Britain's National Electricity Transmission System (NETS) in the next ten years.

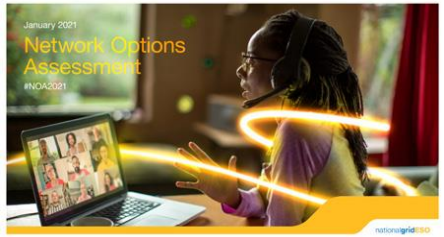


You can access the ETYS by visiting:
https://www.nationalgrideso.com/research-publications/etys

Our Traditional Network Planning Process

Range of credible pathways for the future of energy from today to 2050

Informs the likely future transmission requirements on the electricity system



Shows what options are available to meet reinforcement requirements on the electricity system.

We welcome your feedback to help shape ETYS23

Our network planning process is changing as we are transitioning to a new Centralised Strategic Network Plan (CSNP). We are working in collaboration with Ofgem on the Electricity Transmission Network Planning Review (ETNPR) to review our network planning processes to ensure that the network design and investment processes in Great Britain are fit for the future.

There are key changes proposed for the ETYS include;

- Proposal for an earlier (August) ETYS publication with technical appendices aligned to the transitional Centralised Strategic Network Plan (tCSNP2) publication in December 2023 (subject to Ofgem derogation)
- Integration of our voltage screening analysis
- Year-round system needs for selected boundaries

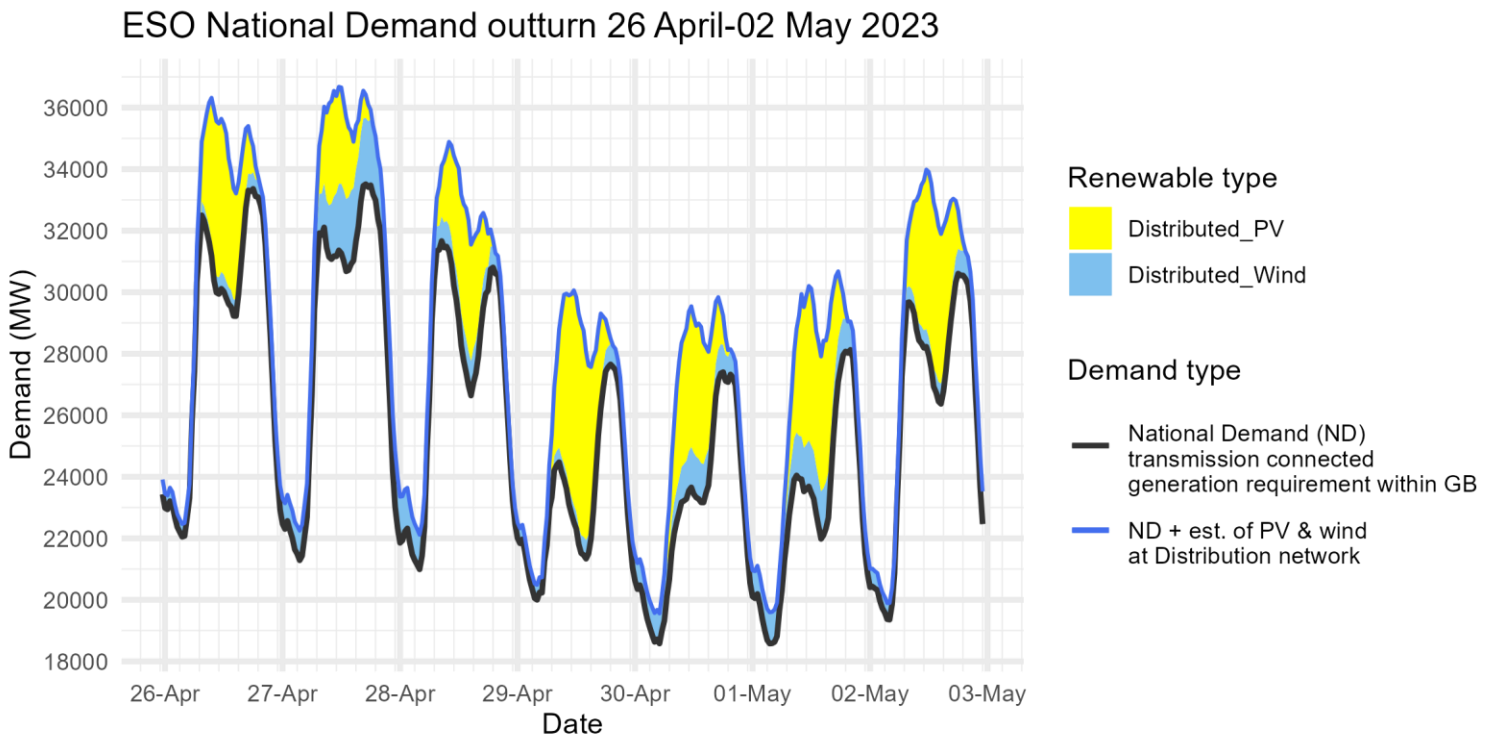
We are looking to hear how this could be useful to our readers, what kind of data/information they would like us to publish, and how we could best communicate these issues.

ETYS Consultation

- Every year we consult on the ETYS to get feedback on our proposal for the next ETYS.
- You can find out about the proposal here and complete the survey here:
- Consultation closes at **5PM** on **Monday 15th May**.
- We would be grateful for your participation and your feedback so we can make the document more useful for the industry.

If you have any questions please get in touch by emailing transmission.etys@nationalgrideso.com

Demand | Last week demand out-turn



		FORECAST (Wed 26 Apr)			OUTTURN		
Date	Forecasting Point	National Demand (GW)	Dist. wind (GW)	Dist. PV (GW)	National Demand (GW)	Dist. wind (GW)	Dist. PV (GW)
26 Apr	Afternoon Min	29.7	0.6	4.0	29.2	0.5	3.4
27 Apr	Overnight Min	21.6	0.9	0.0	21.3	1.0	0.0
27 Apr	Afternoon Min	30.0	2.0	3.0	30.7	2.4	2.7
28 Apr	Overnight Min	20.4	1.4	0.0	21.0	1.1	0.0
28 Apr	Afternoon Min	24.3	1.3	6.3	26.6	1.1	3.8
29 Apr	Overnight Min	19.7	0.5	0.0	20.0	0.5	0.0
29 Apr	Afternoon Min	20.2	0.7	5.8	21.3	0.6	6.1
30 Apr	Overnight Min	17.8	0.6	0.0	18.6	1.0	0.0
30 Apr	Afternoon Min	20.4	0.8	5.3	23.2	1.2	4.0
01 May	Overnight Min	17.8	0.9	0.0	18.6	1.0	0.0
01 May	Afternoon Min	19.6	1.1	7.0	22.0	1.5	4.4
02 May	Overnight Min	18.6	0.7	0.0	19.4	0.5	0.0
02 May	Afternoon Min	25.4	1.0	5.0	26.4	0.7	4.9

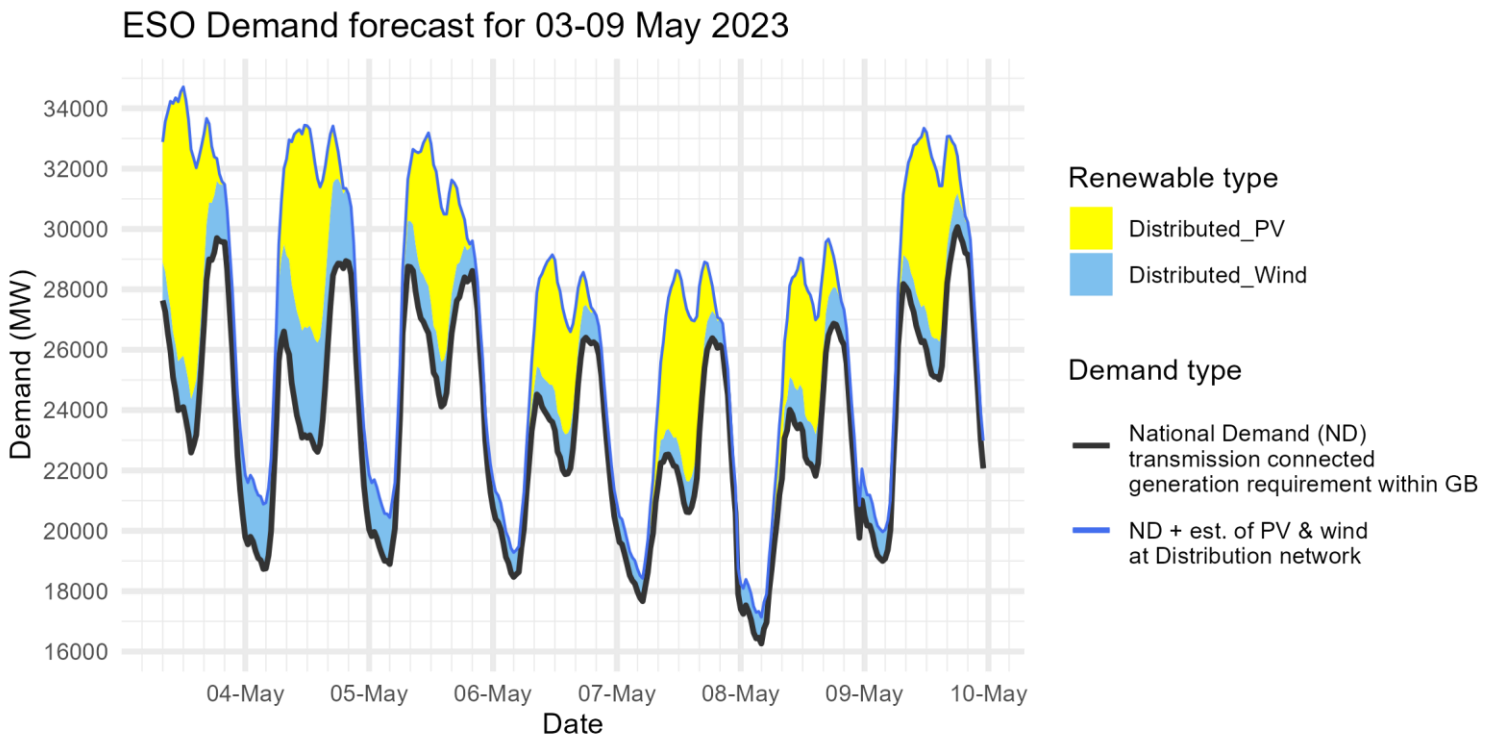
The black line (National Demand ND) is the measure of portion of total GB customer demand that is supplied by the transmission network.

ND values **do not include** export on interconnectors or pumping or station load

Blue line serves as a proxy for total GB customer demand. It includes demand supplied by the distributed wind and solar sources, but it does not include demand supplied by non-weather driven sources at the distributed network for which ESO has no real time data.

Historic out-turn data can be found on the ESO Data Portal in the following data sets: Historic Demand Data & Demand Data Update

Demand | Week Ahead



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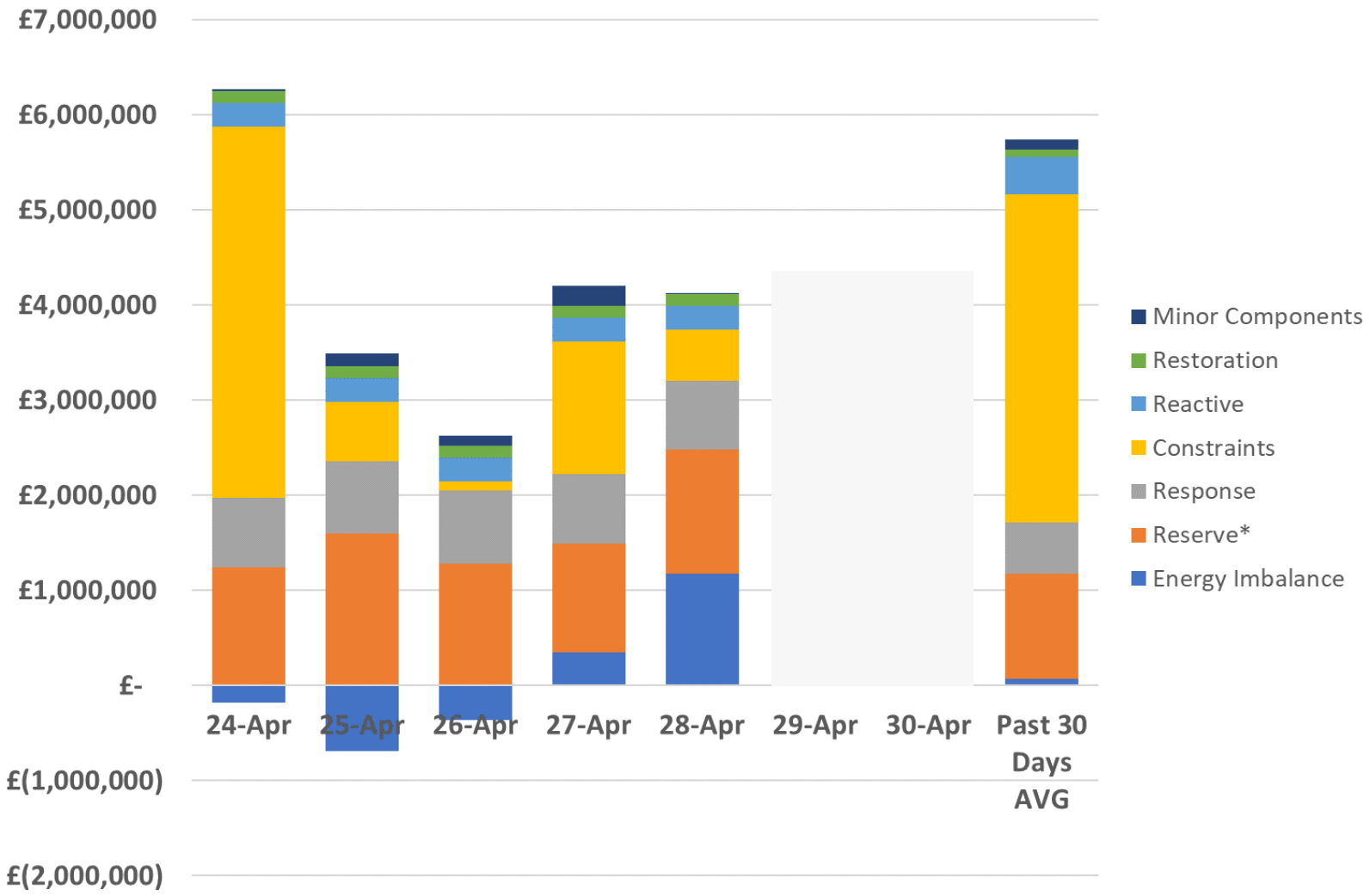
Historic out-turn data can be found on the ESO Data Portal in the following data sets: Historic Demand Data & Demand Data Update

		FORECAST (Wed 03 May)		
Date	Forecasting Point	National Demand (GW)	Dist. wind (GW)	Dist. PV (GW)
03 May 2023	Afternoon Min	22.6	1.8	8.3
04 May 2023	Overnight Min	18.7	2.1	0.0
04 May 2023	Afternoon Min	22.6	3.6	5.4
05 May 2023	Overnight Min	18.9	1.5	0.0
05 May 2023	Afternoon Min	24.1	1.5	5.1
06 May 2023	Overnight Min	18.5	0.8	0.0
06 May 2023	Afternoon Min	21.9	1.3	3.8
07 May 2023	Overnight Min	17.7	0.7	0.0
07 May 2023	Afternoon Min	20.6	1.0	5.5
08 May 2023	Overnight Min	16.3	0.9	0.0
08 May 2023	Afternoon Min	21.8	1.4	3.8
09 May 2023	Overnight Min	19.0	1.0	0.0
09 May 2023	Afternoon Min	25.0	1.3	5.2

ESO Actions | Category costs breakdown for the last week



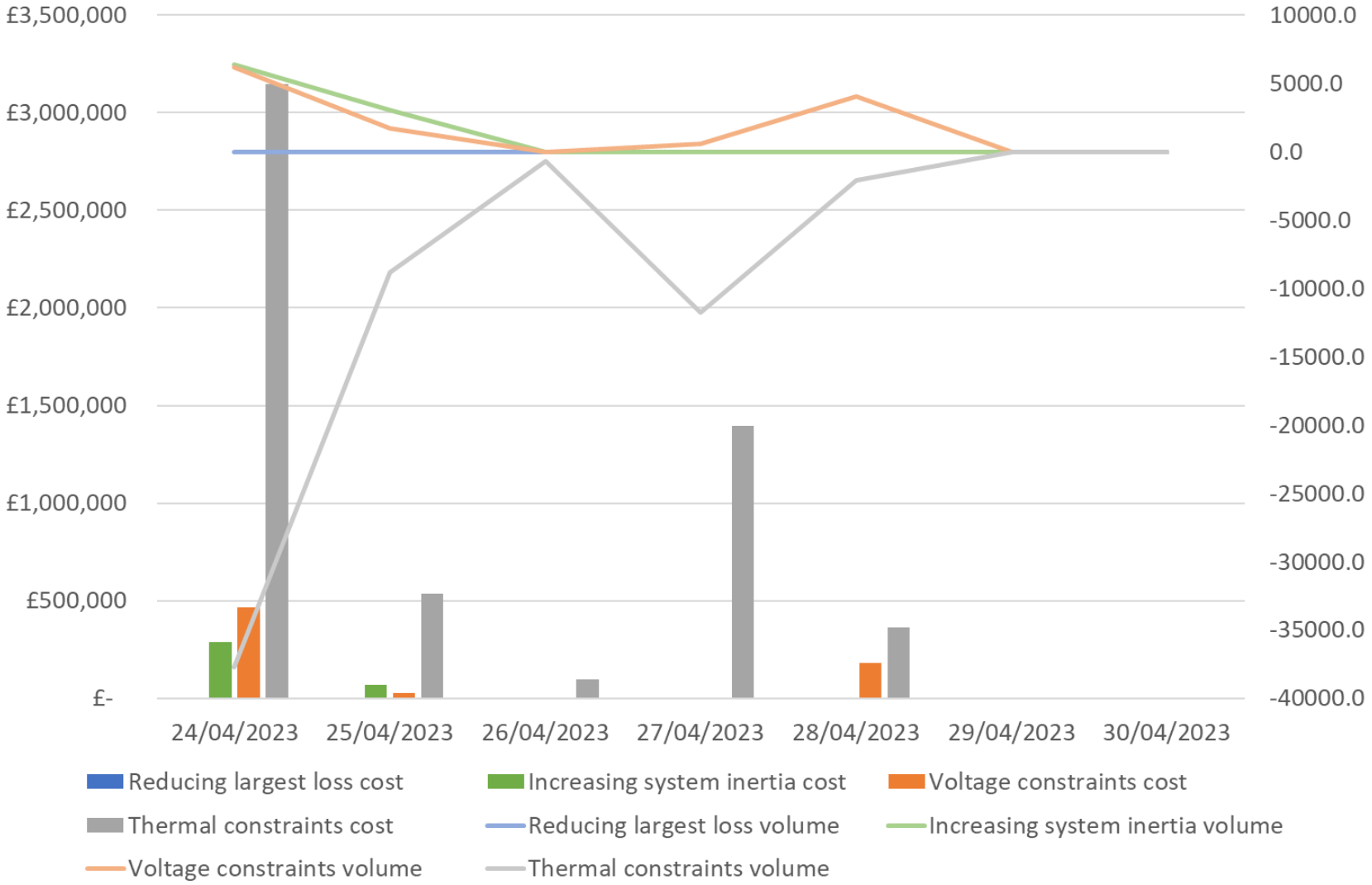
Date	Total (£m)
24/04/2023	6.1
25/04/2023	2.8
26/04/2023	2.3
27/04/2023	4.2
28/04/2023	4.1
29/04/2023	
30/04/2023	
Weekly Total	19.5
Previous Week	70.4

Constraints costs were the key cost component throughout the week.

Please note that all the categories are presented and explained in the MBSS.

Data issue: Please note that due to a data issue on a few days over the last few months, the Minor Components line in Non-Constraint Costs is capturing some costs on those days which should be attributed to different categories. It has been identified that a significant portion of these costs should be allocated to the Operating Reserve Category. Although the categorisation of costs is not correct, we are confident that the total costs are correct in all months. We continue to investigate and will advise when we have a resolution.

ESO Actions | Constraint Cost Breakdown



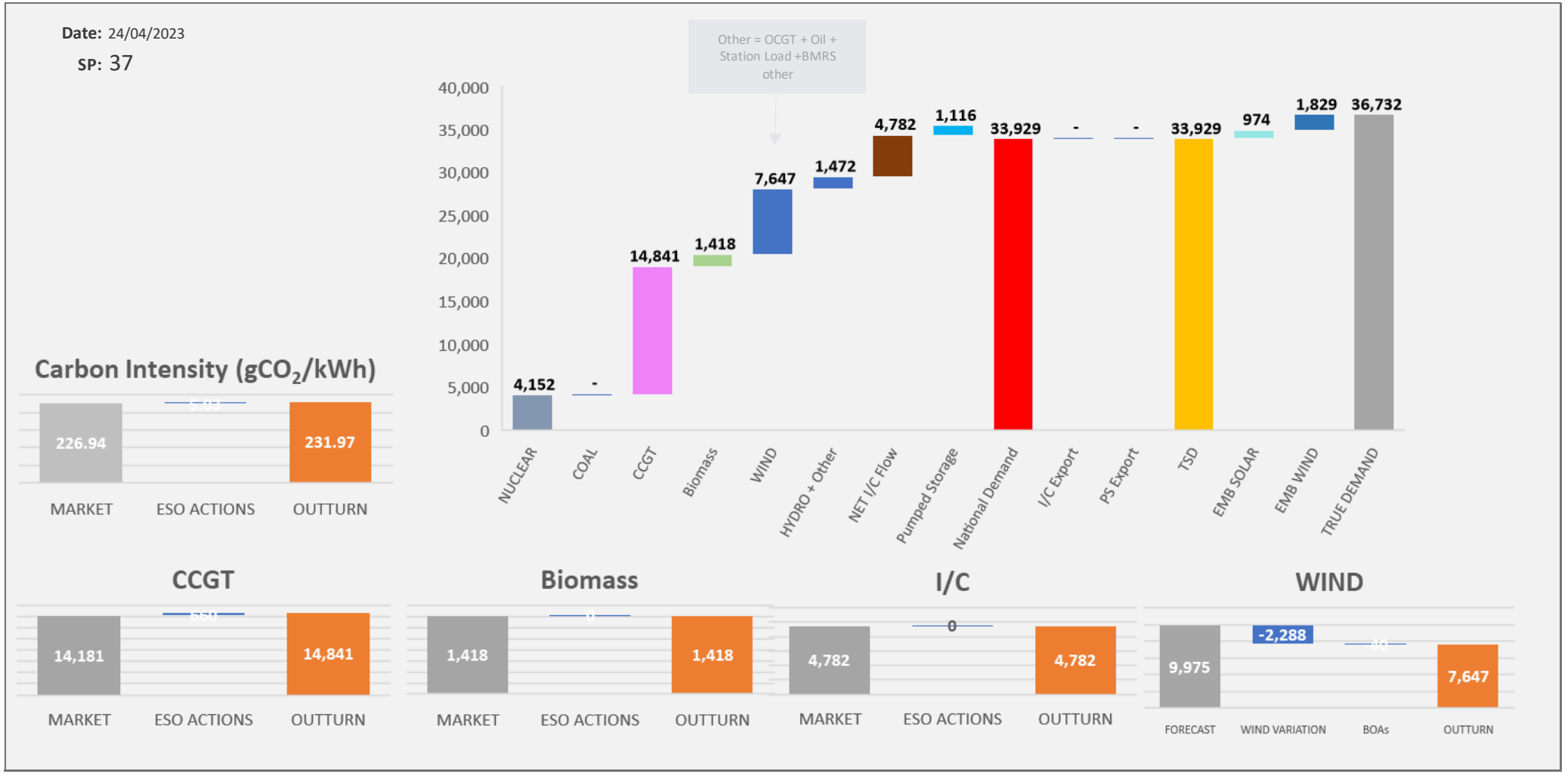
Thermal – network congestion
Actions required to manage Thermal Constraints throughout the week with the highest costs on Mon.

Voltage
Intervention was required to manage voltage levels on Mon, Tue & Thu.

Managing largest loss for RoCoF
No intervention was required to manage largest loss.

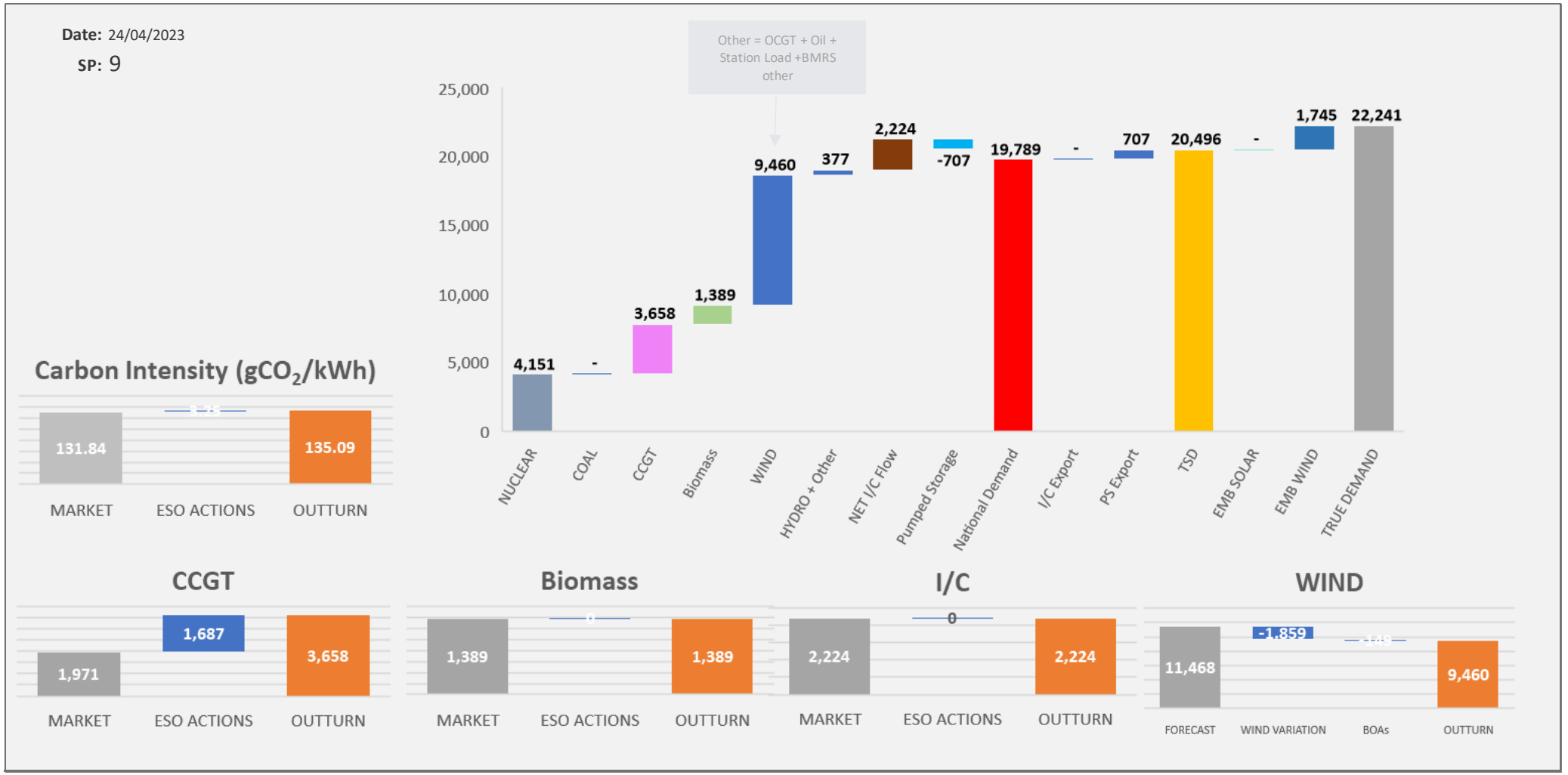
Increasing inertia
Intervention was required to manage system inertia on Mon & Tue.

ESO Actions | Monday 24 April – Peak Demand – SP spend ~£74k



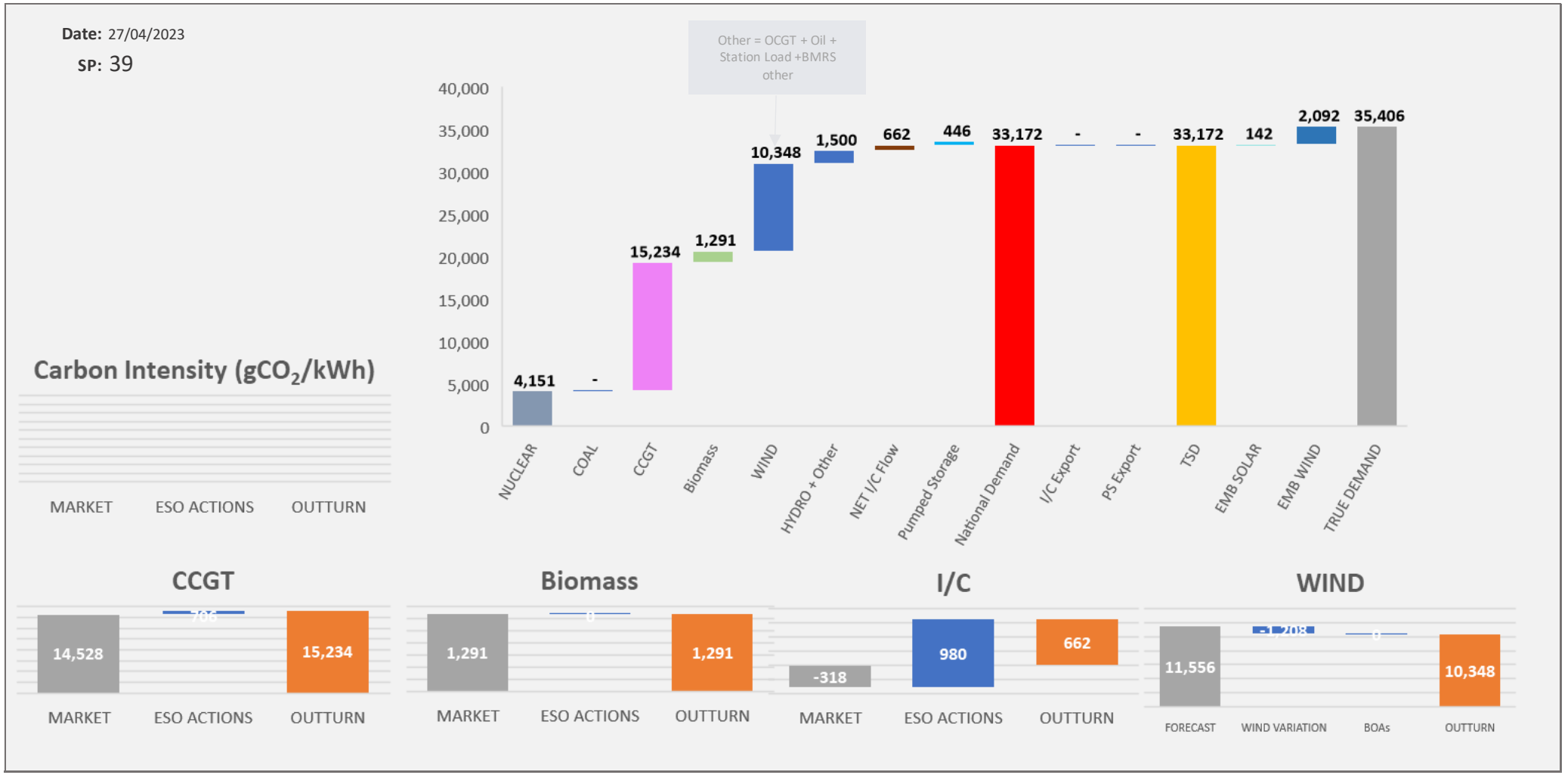
Carbon Intensity data on data portal: https://data.nationalgrideso.com/carbon-intensity1/carbon-intensity-of-balancing-actions

ESO Actions | Monday 24 April – Minimum Demand – SP Spend ~£127k



Carbon Intensity data on data portal: https://data.nationalgrideso.com/carbon-intensity1/carbon-intensity-of-balancing-actions

ESO Actions | Thursday 27 April – Highest SP Spend ~£179k



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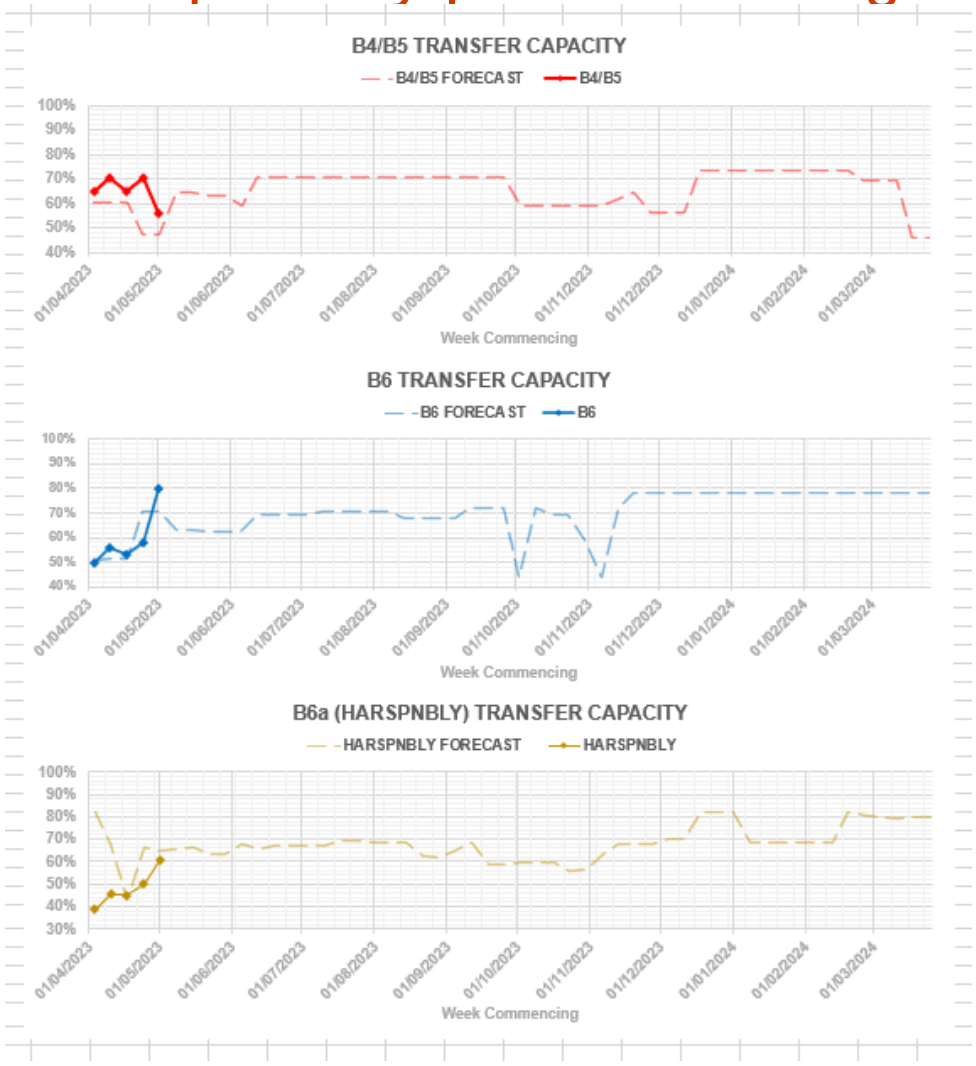
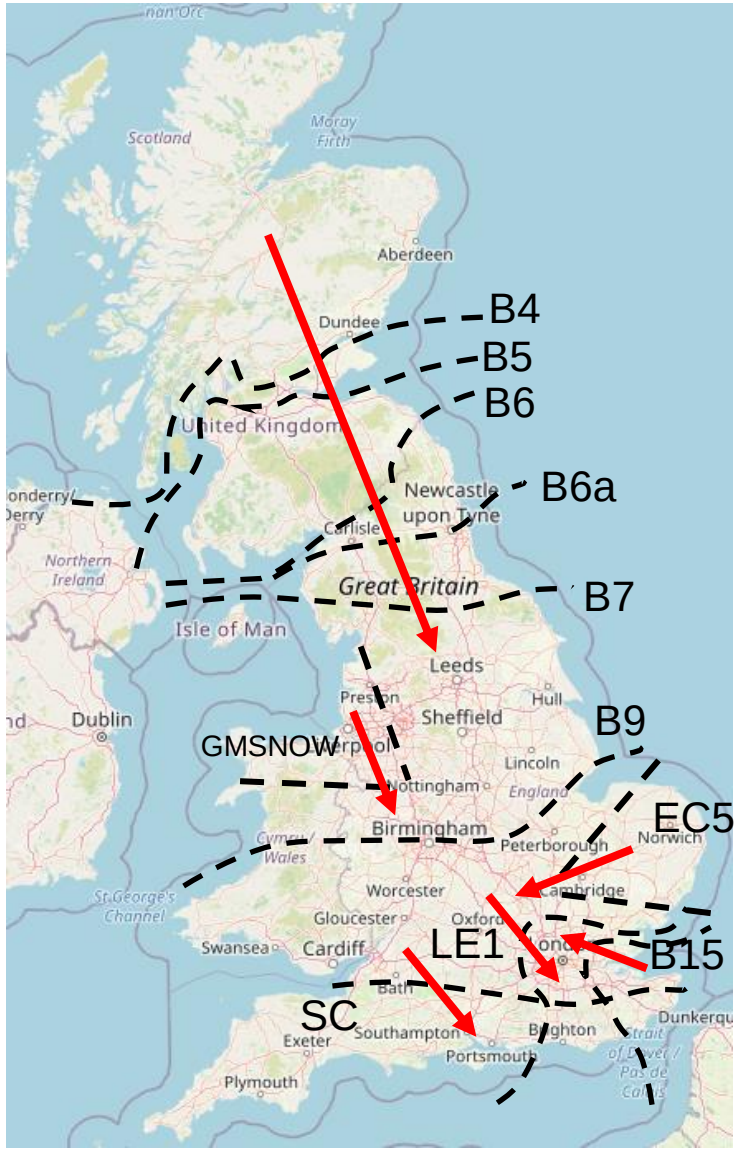
Transparency | Network Congestion

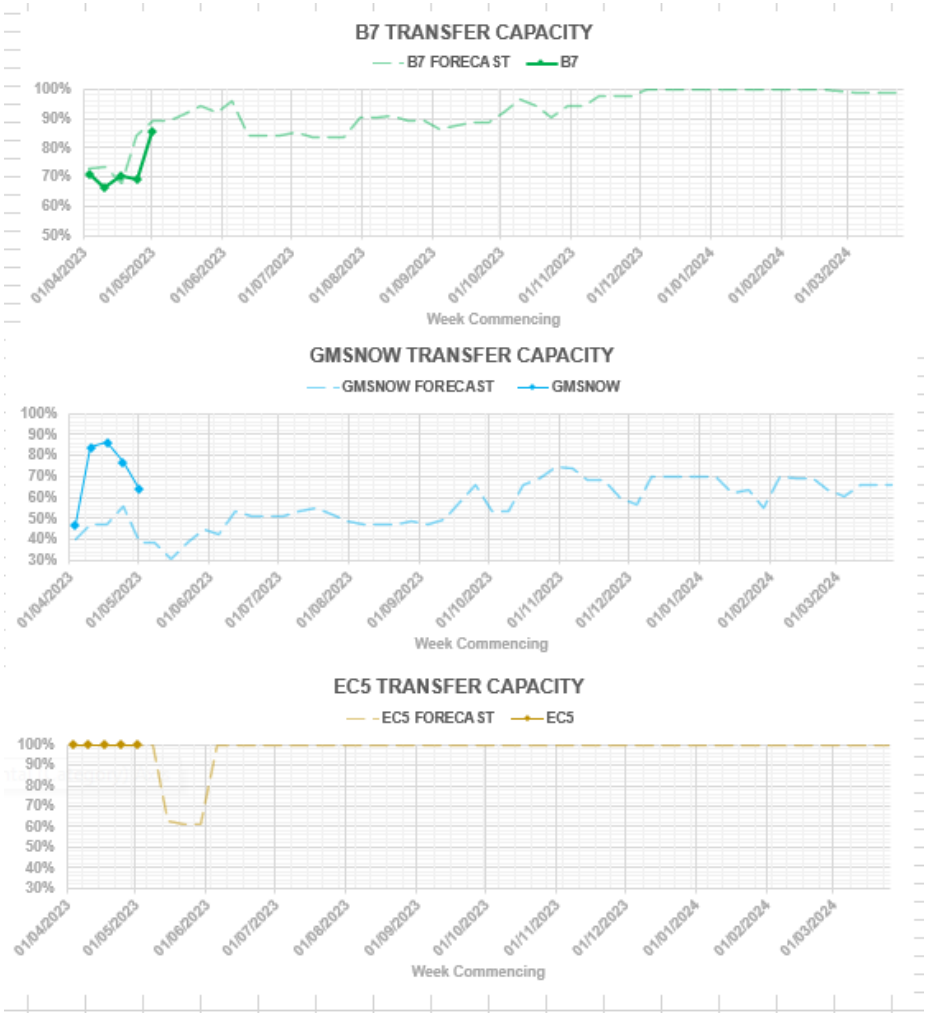


Boundary	Max. Capacity (MW)
B4/B5	1900
B6	5450
B6a	4850
B7	7100
GMSNOW	3000
B9	9800
EC5	5000
LE1	5050
B15	6000
SC	4650



Day ahead flows and limits, and the 24-month constraint limit forecast are published on the ESO Data Portal:
https://data.nationalgrideso.com/data-groups/constraint-management

Transparency | Network Congestion



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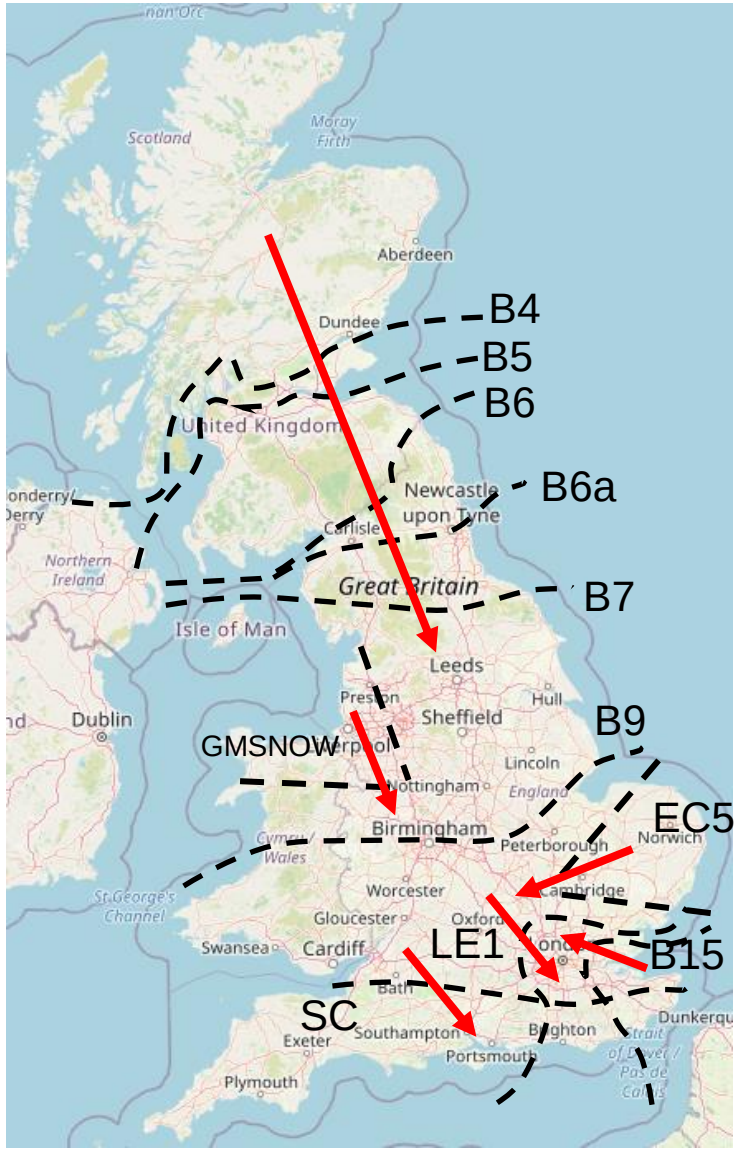

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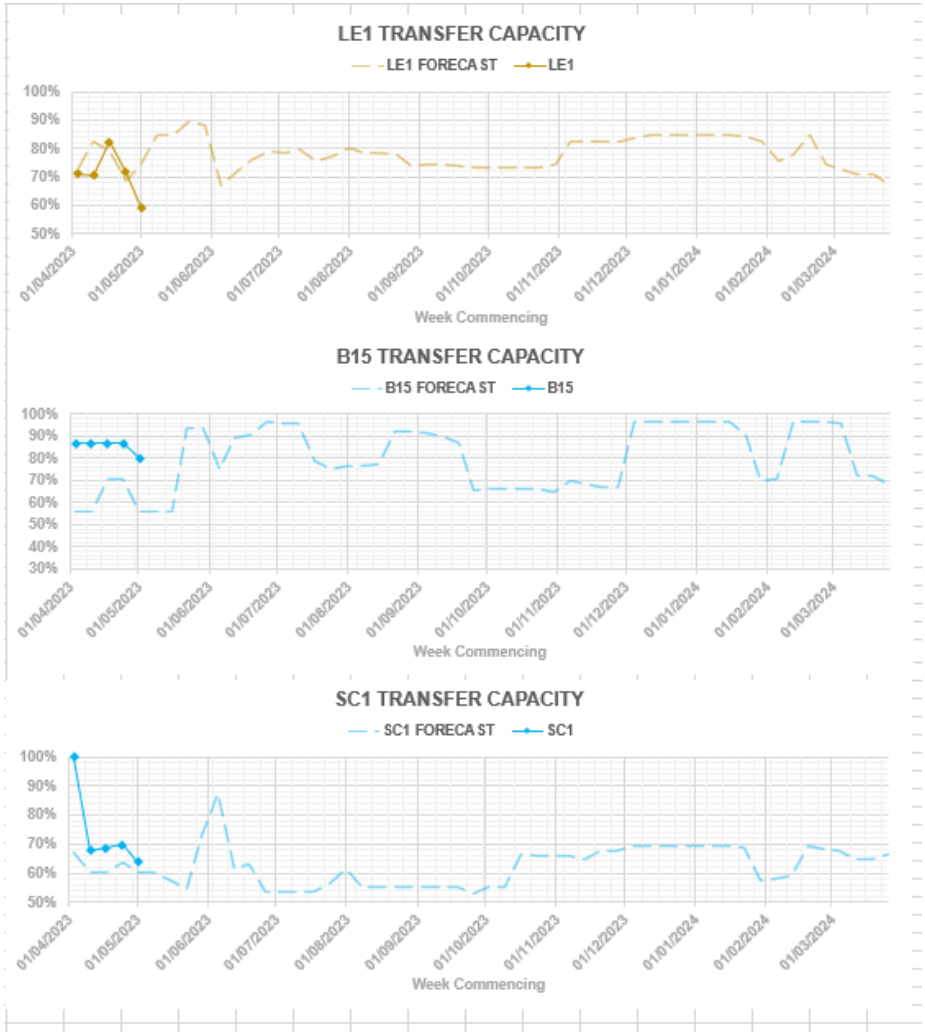

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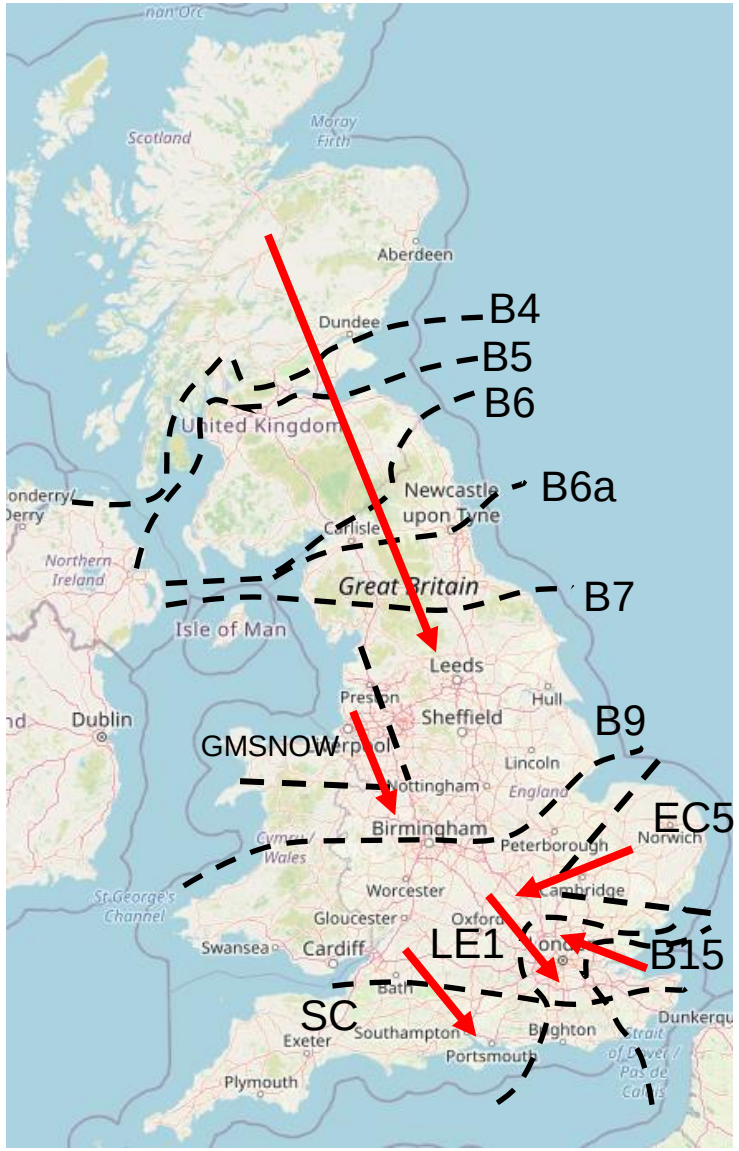


Day ahead flows and limits, and the 24-month constraint limit forecast are published on the ESO Data Portal:
https://data.nationalgrideso.com/data-groups/constraint-management

OTF Response Deep Dive

- Overview of ESO's existing Frequency Response Services
- Calculation Requirements
- Overview of Response service procurement

Please note that there are response events planned for later on in May which will cover the future of our response services, today's presentation focuses on our existing services, requirement setting and procurement methodology.

Overview of Frequency Control

- Our frequency control strategy is achieved through the use of two types of service; frequency response and reserve.

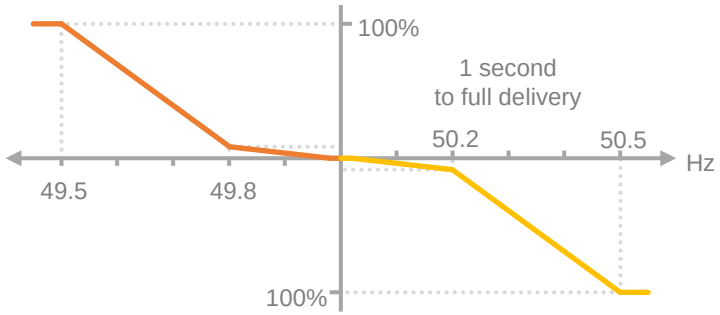
- Frequency response services are activated automatically using a measurement of frequency to determine an appropriate change in active power.

- Reserve is dispatched manually by a control room operator following an observed system event or proactively in anticipation of a system need. Reserve delivers either an increase or decrease in active power and can be provided by either a source of generation or a source of demand.

- The aim of our frequency control strategy, and the services we employ is to maintain system frequency within statutory limits. As well as maintaining frequency we must also balance the costs and impacts of our actions against the residual level of risk and benefits delivered to the end consumer.

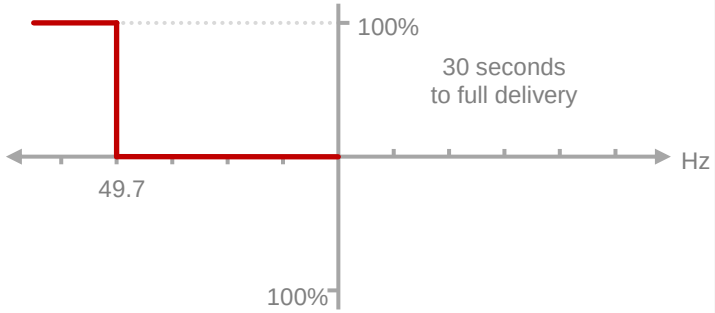
Response Products

Dynamic Containment



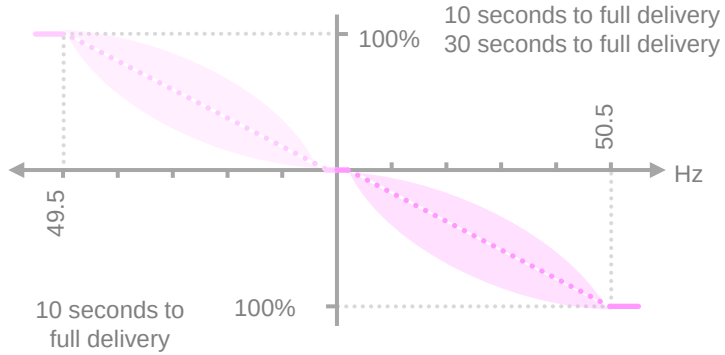
Prevent frequency deviations outside
-0.8Hz / +0.5Hz following large losses

Secondary Static FFR



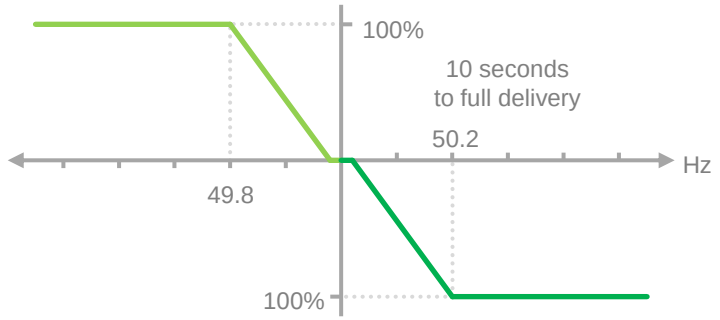
Recover frequency to 0.5Hz within
60 seconds following large losses

Mandatory Frequency Response



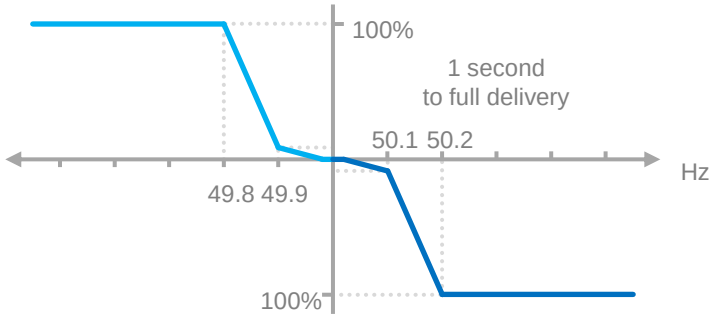
“Frequency Sensitive Mode”
under Grid Code – response of last resort

Dynamic Regulation



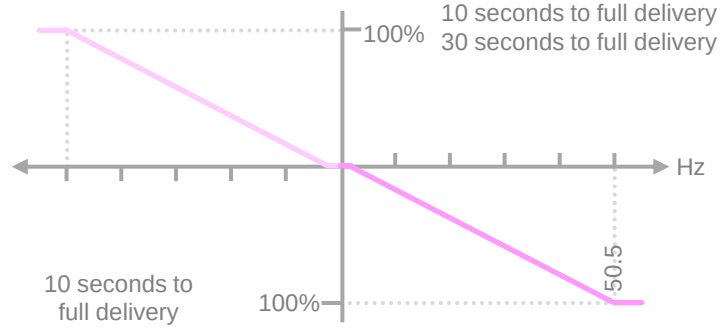
Assist in keeping frequency near
to 50Hz during normal conditions

Dynamic Moderation



Assist in keeping frequency within 0.2Hz,
especially during more volatile conditions

Dynamic Firm Frequency Response



Assist in keeping frequency near
to 50Hz during normal conditions

Calculation Requirements

Security and Quality of Supply Standard (SQSS)
The Security and Quality of Supply Standard sets out the criteria and methodology for planning and operating the National Electricity Transmission System (NETS).

Frequency Risk and Control Report (FRCR)
The Frequency Risk and Control Report includes an assessment of the magnitude, duration and likelihood of transient frequency deviations, forecast impact and the cost of securing the system and confirms which risks will or will not be secured operationally.

Frequency Policy

Calculation Requirements

Pre-fault

To secure the system within Operational limits as close as possible to the target frequency by mitigating small imbalances.

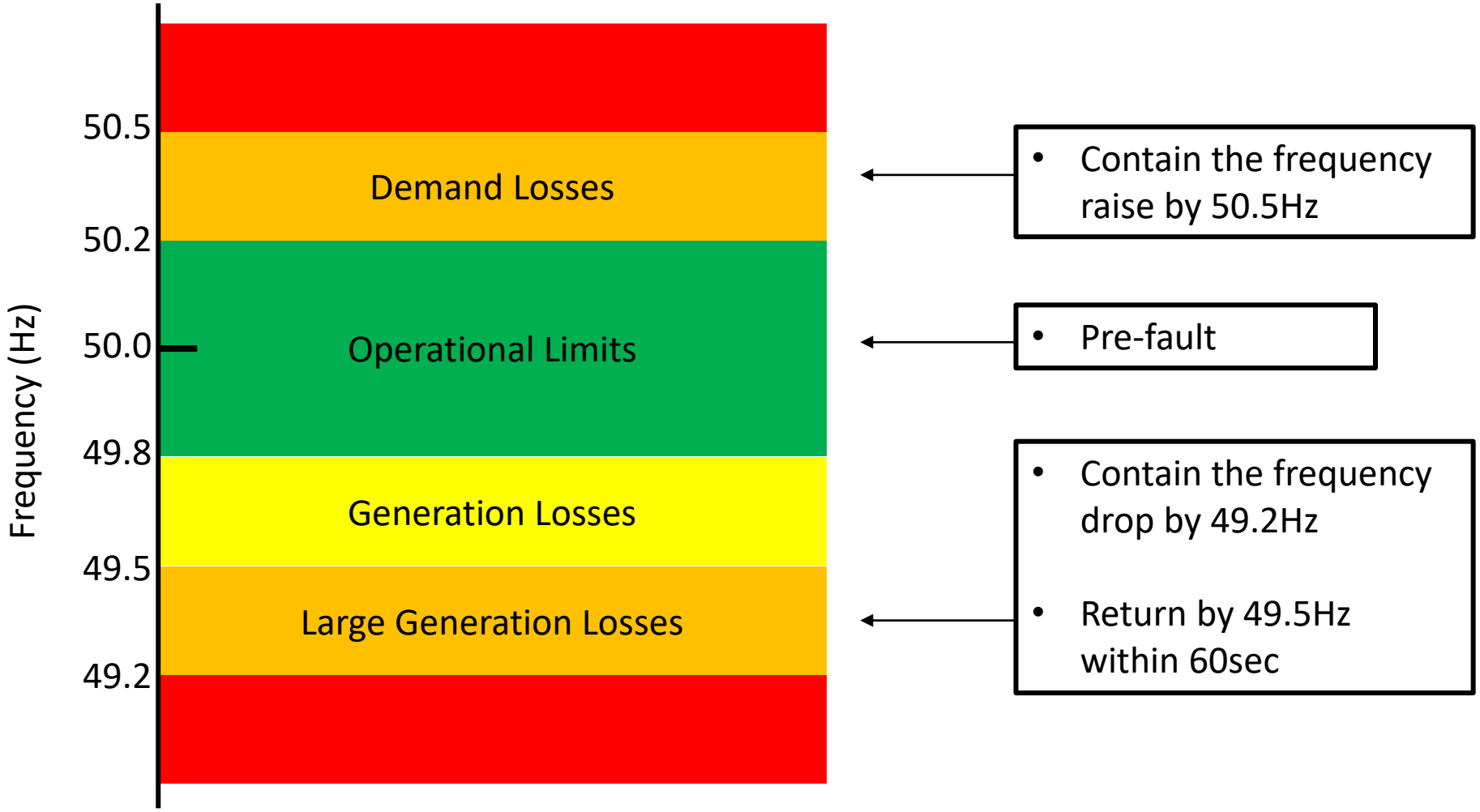
Post-fault

SQSS/FRCR Policy
Response requirements

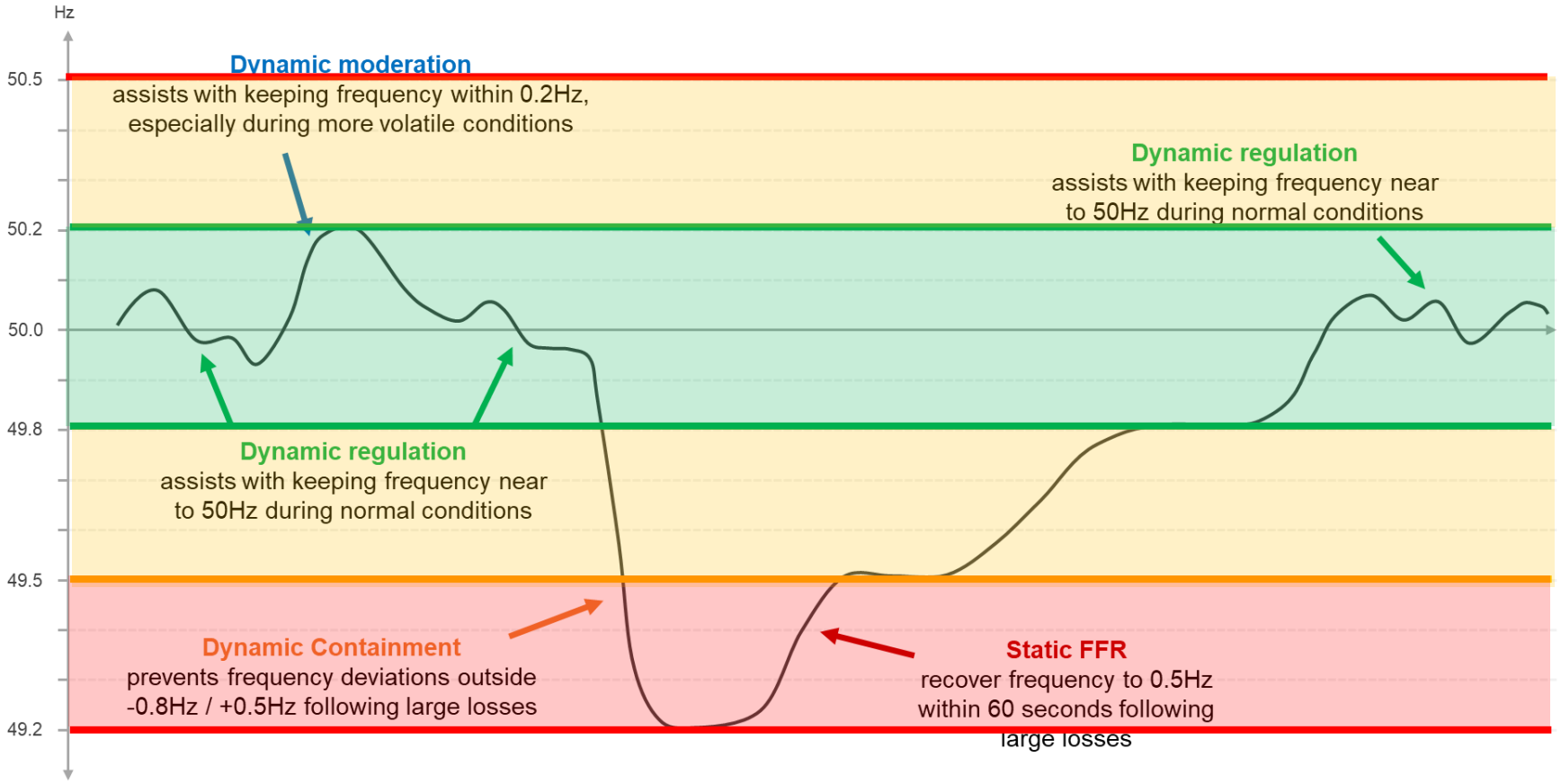
High Frequency
- Contain frequency raise by 50.5Hz

Low Frequency
- Contain the frequency drop by 49.2Hz
- Return by 49.5Hz within 60sec

Calculation Requirements



Calculation Requirements



- Contain the frequency raise by 50.5Hz
- Pre-fault
- Contain the frequency drop by 49.2Hz
- Return by 49.5Hz within 60sec

How response requirements are generated

- System frequency is modelled based on swing equation:

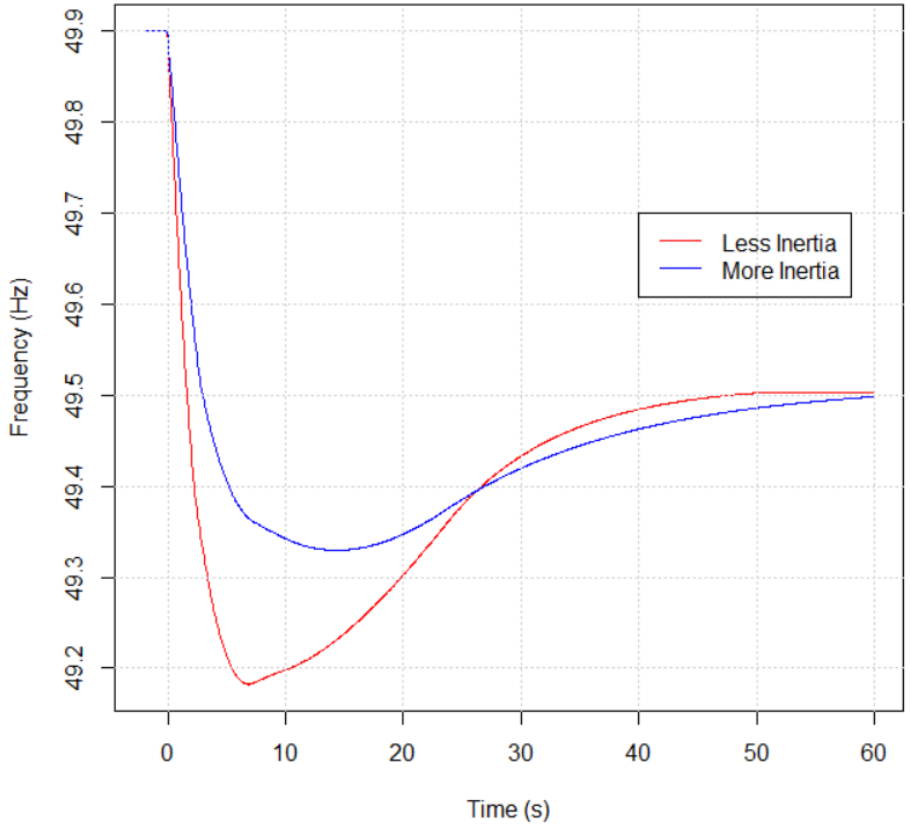
$$\frac{df}{dt} = \frac{f_n}{2} \times \frac{imbalance}{inertia}$$

- Steps to simulate generation/demand loss on the system and ensure enough response is held to maintain frequency to SQSS/FRCR limits:

1. Calculate low response so that the nadir is at or above 49.2 Hz
2. Calculate low response holding required to stabilise the frequency at 49.5 Hz
3. Calculate high response holding required to keep frequency below 50.5 Hz

Calculation Requirements

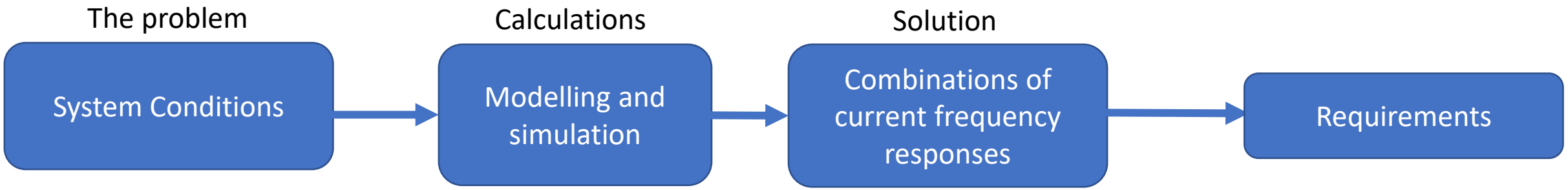
At different system conditions, ESO needs to make sure we are secured within the terms of the policy.



Demand = 20000 MW
Imbalance = -1300 MW
Starting freq. = 49.9 Hz

Less inertia = 120 GVAs
More inertia = 200 GVAs

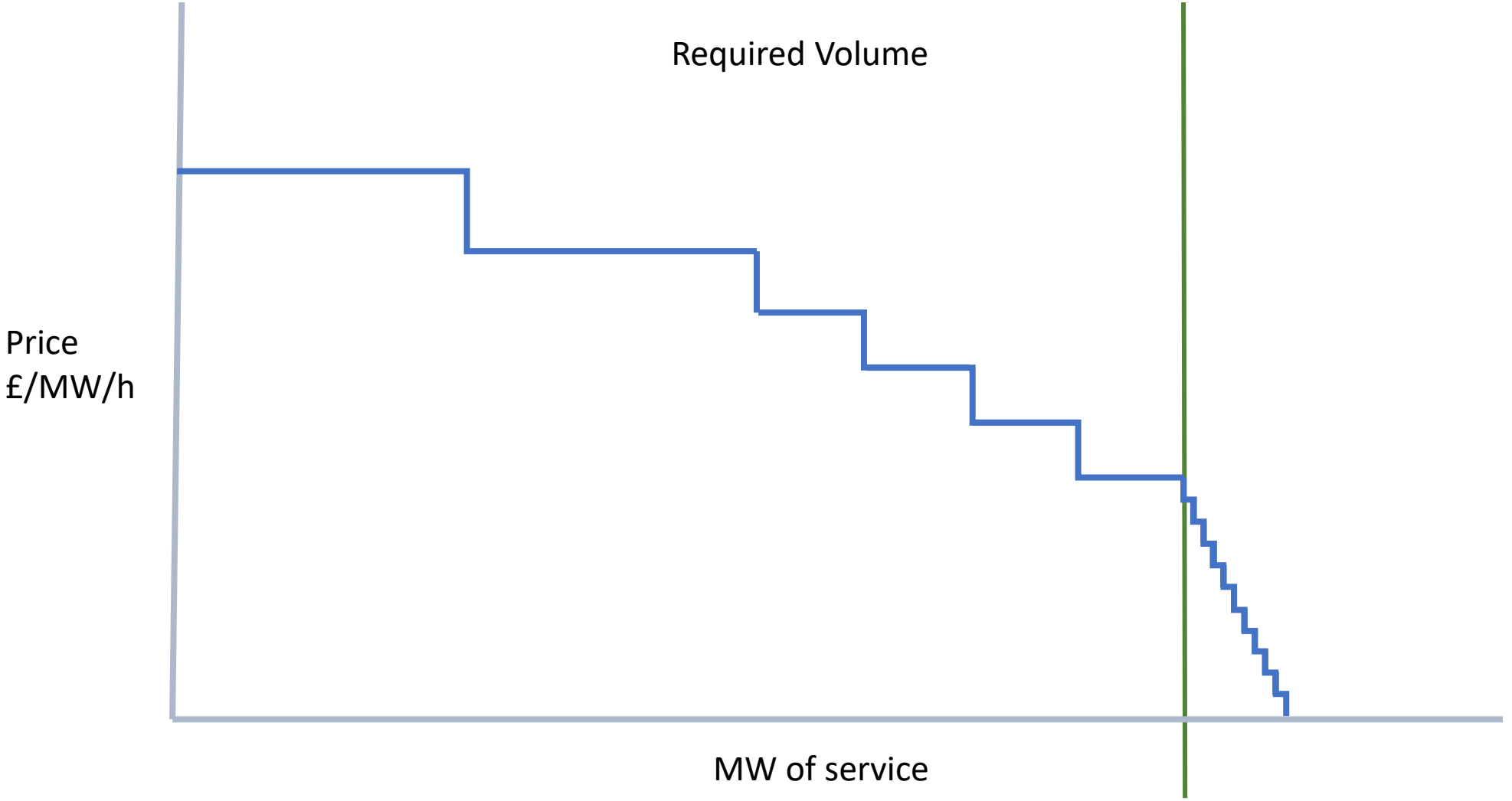
Calculation Requirements



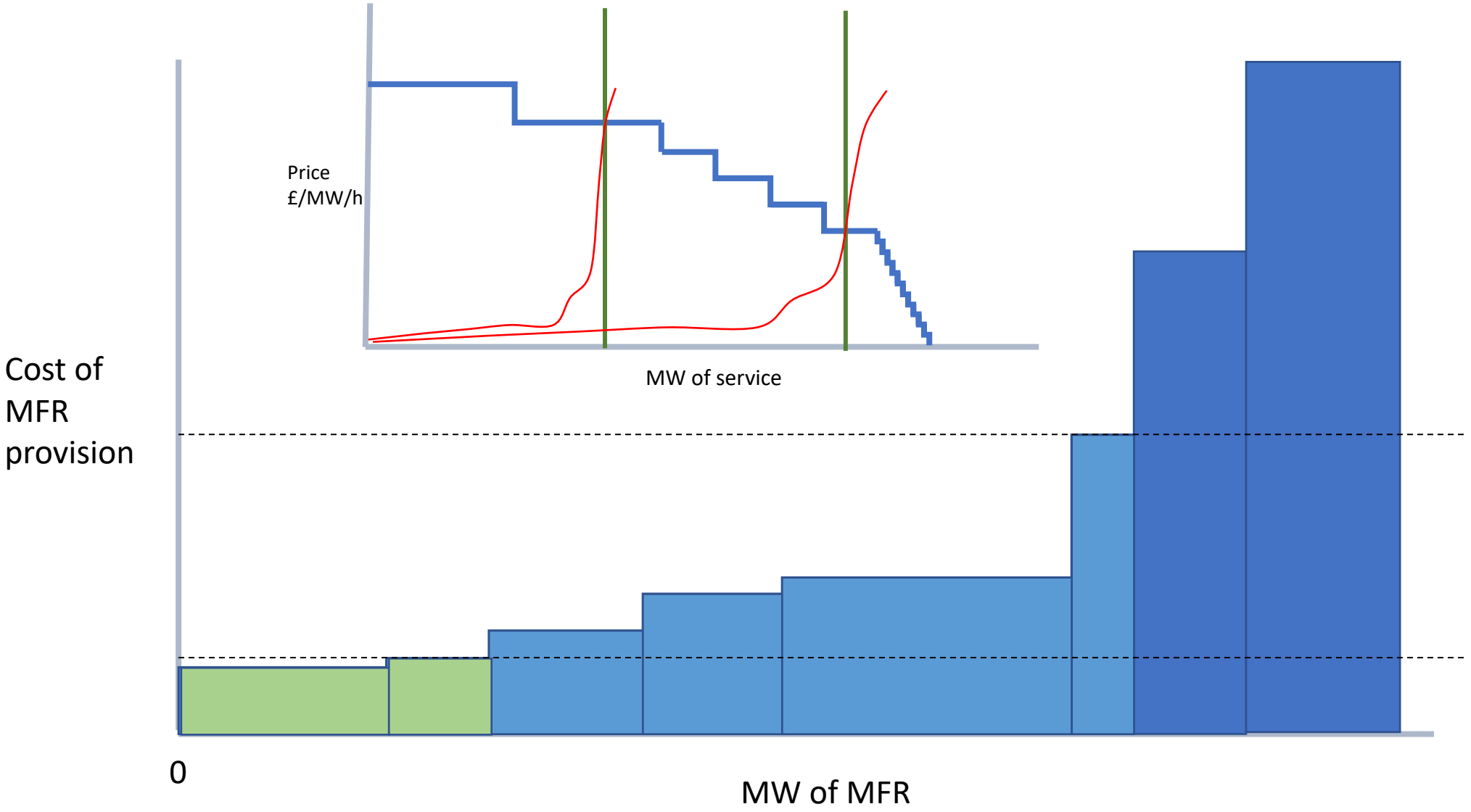
- Largest loss
- Inertia
- Generation
- Demand

- DC/DM/DR
- PSH
- Static

Response buy orders



Price stacks



Service price caps and alternative costs

- For day ahead optimisation the alternative costs focus on procuring the shortfall in requirements from alternative response providers. This is predominantly MFR.
- The cost of procuring MFR contains four components:
  - Response Holding costs.
    - dependent on size of requirement, units available and their holding prices
  - Positioning costs.
    - dependent on size of requirement, market dispatch and BM prices
  - Reserve for response costs
    - dependent on size of requirement, market dispatch and BM prices
  - Response energy costs
    - dependent on units armed, energy price and frequency
- For the daily buy orders, we forecast each of these components on a per EFA block basis, using short term historic trends and forward price data. These forecasts are used to calculate the price caps for each service.

Service Exchange rates

- Each of the 3 services offset MFR differently in different situations,
- As part of calculating the price cap per service we calculate an exchange rate between the service and MFR.
- For DR and DM these exchange rates are fixed whilst we learn and grow the service.
- For DC these exchange rates are dynamically calculated as part of the daily requirements process.

How do we procure response?

Dynamic Containment	Dynamic Moderation	Dynamic Regulation	Mandatory Frequency Response	Dynamic Firm Frequency Response	Static Firm Frequency Response
Procured day ahead	Procured day ahead	Procured day ahead	Procured real time	Procured through monthly tenders	Procured day ahead
Pay as Clear	Pay as Clear	Pay as Clear	Pay as Bid	Pay as Bid	Pay as Clear
Auction Time: 14:30	Auction time: 14:30	Auction time: 14:30	N/A	N/A	Auction Time: 11:00
DCL Cost: £98M	DML Cost: £293K	DRL Cost: £5M	Cost: £59M	Cost: £53M	Cost: £10M*
DCH Cost: £20M	DMH Cost: £993K	DRH Cost:£4M			

All the cost figures are shown for FY 22/23.

* Day ahead procurement and Pay as Clear started from 01-Apr-2023

Future response engagement

We have a number of engagement activities planned for the next month:

- 15 May 11:00 – 12:00 - Frequency response webinar
- 18 May - Balancing services reform roadshow – Edinburgh
- 24 May - Balancing services reform roadshow – London
- Mid June - Response release 2 consultation launch

Sign up for Edinburgh

Sign up for London

Sign up for Response webinar

Advance Questions

Q: At the last OTF, the ESO mentioned that it receives probabilistic weather forecasts from its weather data vendor. Is the ESO able to share who its weather data vendor is please?

A: Thanks for this question. Our current vendor is The Met Office and we receive weather data from them.

Questions from last week

Q: Is the ESO expecting a reduction in FFR procurement volume for June delivery?

A: To enable a measured transition between the legacy and new suite of response services, we intend to reduce our DFFR requirements by no more than 50MW for each EFA block per month. The first reduction in FFR volume procured happened in March 2023 with a further reduction in April 2023.

For the FFR tender for delivery in June 2023 we will continue to procure up to 250 MW across each EFA block to allow us to implement further IT and process developments that are required before we can move on to further reductions.

Information on our FFR requirement can be found in the Response Market Information Report on the ESO Data Portal which is updated and published monthly towards the end of the calendar month.

Q: I can see the current BSUOS data on the website is showing the tariff for settlement periods beyond 01/04/23. Is there any data for actual bsuos costs so we can track under/over?

A: We will be adding the actual settlement period costs back into the daily BSUoS data that we publish on the data portal within the next two weeks. Due to system limitations this is requiring some manual work on our part so it's taken a little longer to get this in place than we would have liked but expect to see this soon within this dataset.

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Audience Q&A Session

ⓘ Start presenting to display the audience questions on this slide.

Feedback

Please remember to use the feedback poll in sli.do after the event.

We welcome feedback to understand what we are doing well and how we can improve the event for the future.

If you have any questions after the event, please contact the following email address:
box.NC.Customer@nationalgrideso.com