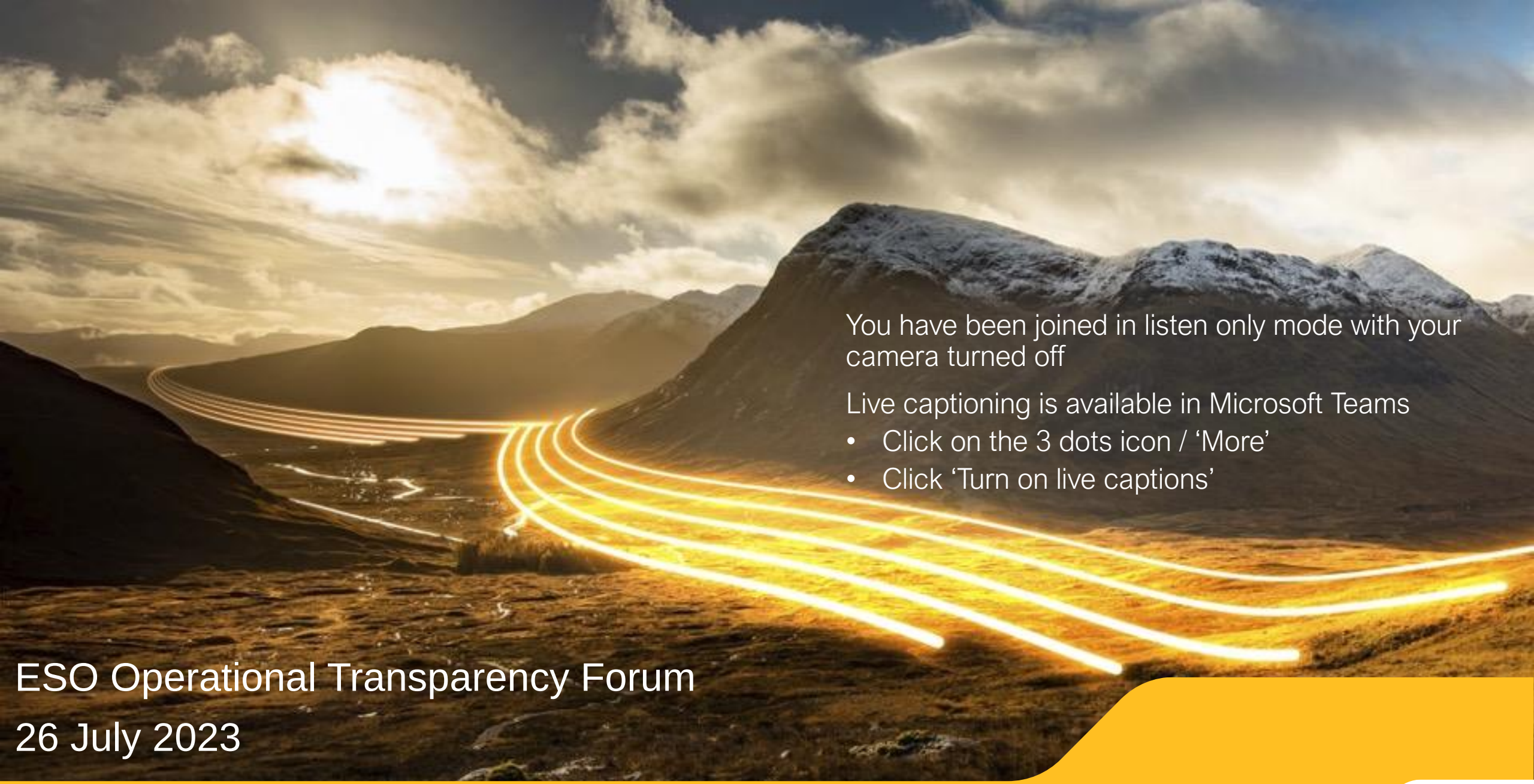

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Live captioning is available in Microsoft Teams

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

ESO Operational Transparency Forum

26 July 2023

ESO

Purpose and scope of the ESO Operational Transparency Forum

Purpose

The Operational Transparency Forum runs once a week to provide updated information on and insight into the operational challenges faced by the control room in the recent past (1-2 weeks) and short term future (1-2 weeks). The OTF will also signpost other ESO events, provide deep dives into focus topics, and allow industry to ask questions.

Scope

Aligns with purpose, see examples below:

In Scope of OTF

Material presented i.e.: regular content, deep dives, focus topics
ESO operational approach & challenges
ESO published data

Out of Scope of OTF

Data owned and/or published by other parties
e.g.: BMRS is published by Elexon
Processes including consultations operated by other parties e.g.: Elexon, Ofgem, DESNZ
Data owned by other parties
Details of ESO Control Room actions & decision making
Activities & operations of particular market participants
ESO policy & strategic decision making
Formal consultations e.g.: Code Changes, Business Planning, Market development

Managing questions at the ESO Operational Transparency Forum

- OTF participants can ask questions in the following ways:
  - Live via Sli.do code #OTF
  - In advance (before 12:00 on Monday) at https://forms.office.com/r/k0AEfKnai3
  - At any time to box.NC.Customer@nationalgrideso.com
- Sli.do questions:
  - Ask your questions as early as possible as our experts may need time to ensure a correct answer can be given live.
  - Please provide your name or organisation. This is an operational forum for industry participants therefore questions from unidentified parties will not be answered live. If you have reasons to remain anonymous to the wider forum please use the advance question or email options above.
  - Questions will be answered in the upvoted order whenever possible. We will take questions from further down the list when: the answer is not ready; we need to take the question away or the topic is outside of the scope of the OTF.
  - Sli.do will remain open until 12:00, even when the call closes earlier, to provide the maximum opportunity for you to ask questions.
  - Questions which are not answered on the day will be included, with answers, in the slide pack for the next OTF.
  - All questions asked through Sli.do will be recorded and published, with answers, in the Operational Transparency Forum Q&A on the webpage: Operational Transparency Forum | ESO (nationalgrideso.com)
- Advance questions will be included, with answers, in the slide pack for the next OTF and published in the OTF Q&A as above.
- Email questions which specifically request inclusion in the OTF will be treated as Advance questions, otherwise we will only reply direct to the sender.
- Takeaway questions – we may ask you to contact us by email in order to clarify or confirm details for the question.
- Out of scope questions will be forwarded to the appropriate ESO expert or team for a direct response. We may ask you to contact us by email to ensure we have the correct contact details for the response. These questions will not be managed through the OTF, and we are unable to forward questions without correct contact details.

Introduction | Sli.do code #OTF

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

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

https://www.nationalgrideso.com/OTF

Future deep dive / focus topics

Future

Scottish Oscillations – following conclusion of current investigative work. Date to be confirmed.

Constraints – September

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

World-first live trial proves battery can help restore network

Redhouse live trial

19–28 June 2022

Distributed ReStart

Energy restoration for tomorrow

In partnership with:

tnei

SP Energy Networks

nationalgridESO

What is the Distributed ReStart project?

- Launched in 2019, this innovation project is a partnership between National Grid Electricity System Operator (ESO), SP Energy Networks and TNEI (a specialist energy consultancy).

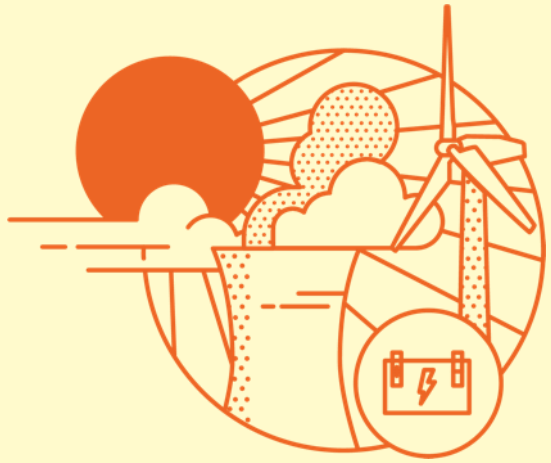
- While a total shutdown of the electricity network is extremely unlikely, it's essential we have the capability for rapid restoration (AKA black start).

- The conventional approach, both here and in many countries, uses large fossil fuel power stations for restoration.

- Distributed ReStart has been exploring how we can use distributed energy resources (DERs), such as wind, solar, hydro, biomass and battery to restore power to the network.

- Making renewables and other DER viable for electricity system restoration is essential for achieving net zero, improving the resilience of our network and reducing costs for consumers.

Distributed ReStart workstreams



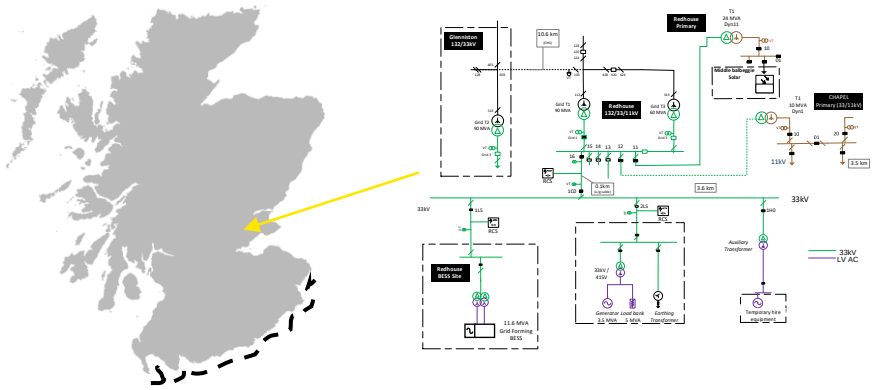
The Power Engineering & Trials workstream is responsible for technical specifications and conducting the live trials.

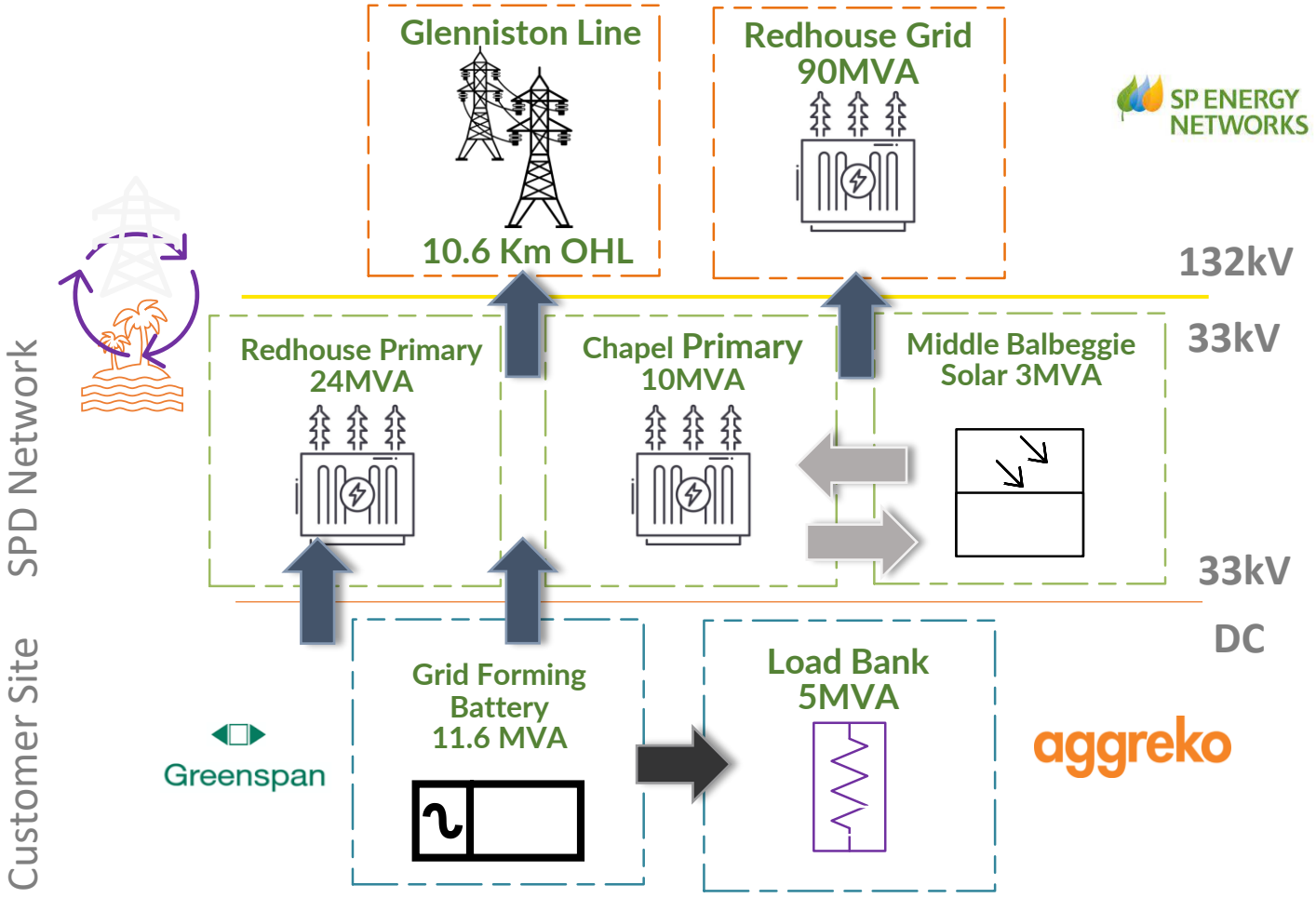
The Organisational, Systems & Telecoms workstream ran desktop exercises to inform designs for new ways of working.

The Procurement & Compliance workstream used mock tenders to tackle commercial and regulatory processes for the transition to BAU .

The goal and scope of the world-first Redhouse live trial

- The project's two previous live trials had proven the concept of using **biomass** and **hydro** to start-up and control a power island or 'distribution restoration zone' (DRZ).
- The goal of this trial was to use **a non-synchronous converter-connected battery energy storage system (BESS** to restart the DRZ.





Redhouse live trial proves battery restoration in practice

The Redhouse live trial successfully:

- energised the primary (33/11kV) transformers (up to 24 MVA) and transmission (132/33kV) transformers (up to 90 MVA) from the BESS operating at normal voltage levels (33 kV), **with and without point** on wave (POW) switching.

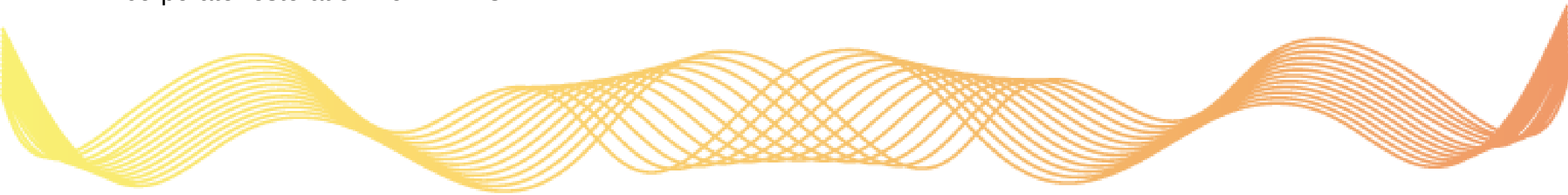
- proved the **block load pick up (BLPU) capability of the anchor generator**; the amount of instantaneous demand which can be applied while maintaining the frequency above 47.5 Hz

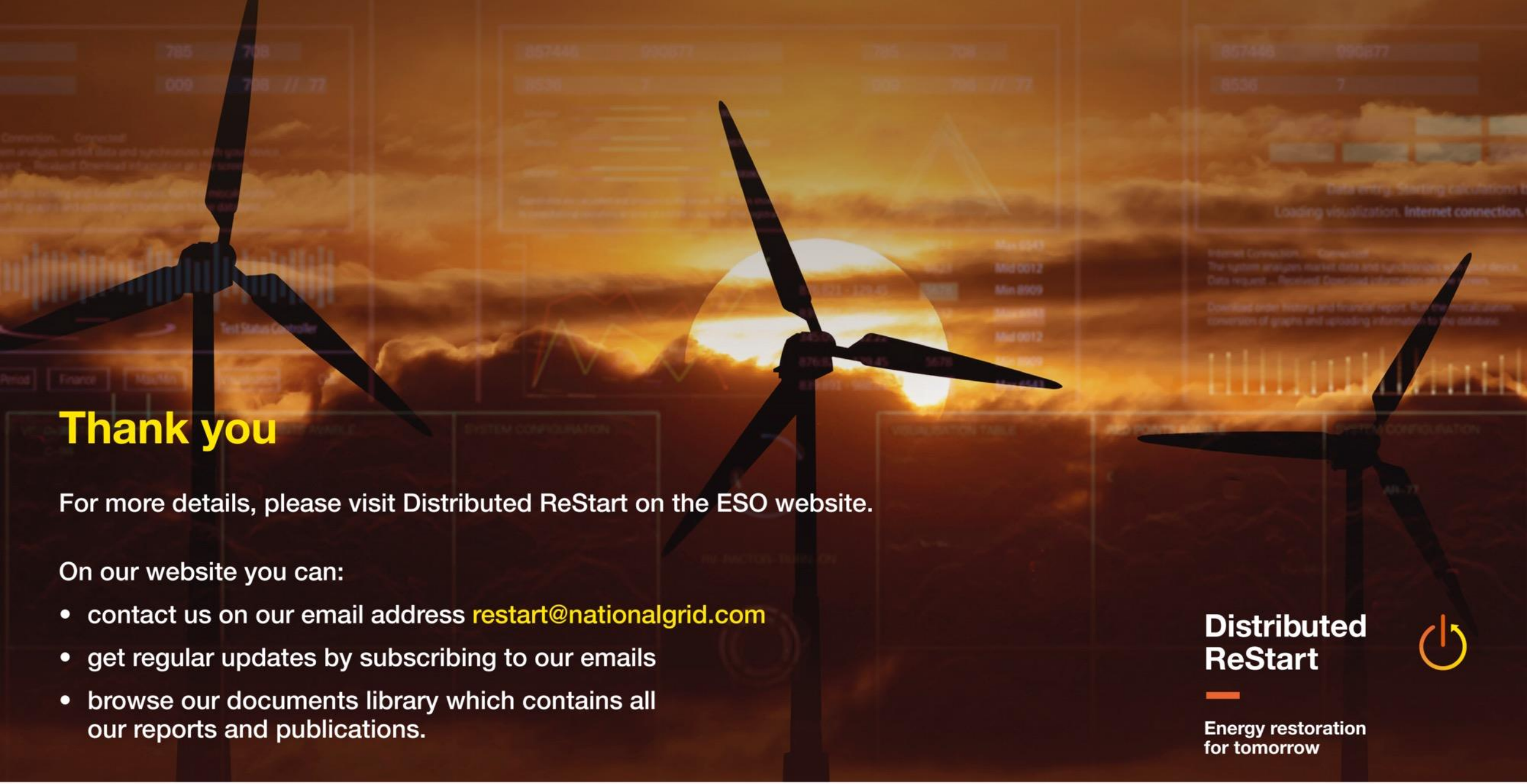
- energised an additional DER's (Middle Balbeggie Solar) 33kV cable arrays, and associated transformers, from the anchor generator & proved stable island operation both in frequency and voltage droop control modes

- incorporated the prototype **Distribution Restoration Zone Controller (DRZC)** that can automate a lot of the island functions, control and monitoring.

The project has now transitioned to BAU

- With the project's transition to business as usual (BAU), the concept of providing restoration services from DERs is now becoming a reality based on the learnings from our live trials.
- New tenders for the South East and Northern regions were launched in 2022 and interest from DERs was high.
- Compared to previous restoration tenders, where around 2-3 technology types bid, there were expressions of interest from at least 7 different technology types including wind/batteries/solar/hydro.
- By successfully transitioning to BAU, the project has created a 'blueprint' of recommendations for the industry to incorporate restoration from DERs.





Thank you

For more details, please visit Distributed ReStart on the ESO website.

On our website you can:

- contact us on our email address restart@nationalgrid.com
- get regular updates by subscribing to our emails
- browse our documents library which contains all our reports and publications.

Distributed ReStart

Energy restoration for tomorrow

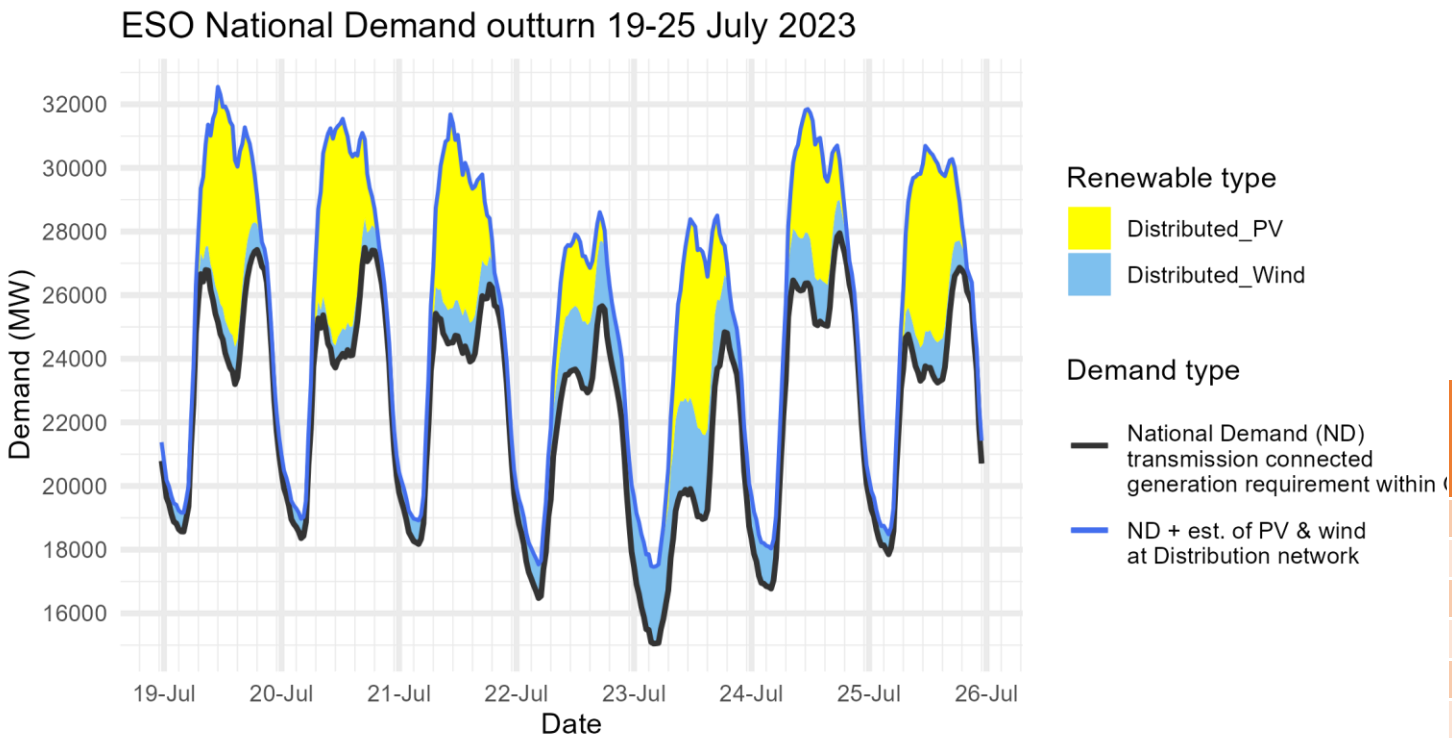
In partnership with:

tnei

SP Energy Networks

nationalgridESO

Demand | Last week demand out-turn



		FORECAST (Wed 19 Jul)			OUTTURN		
Date	Forecasting Point	National Demand (GW)	Dist. wind (GW)	Dist. PV (GW)	National Demand (GW)	Dist. wind (GW)	Dist. PV (GW)
19 Jul	Afternoon Min	23.7	1.2	6.0	23.2	1.2	5.9
20 Jul	Overnight Min	18.4	0.6	0.0	18.4	0.6	0.0
20 Jul	Afternoon Min	23.9	1.1	5.7	24.1	0.8	6.3
21 Jul	Overnight Min	18.3	0.8	0.0	18.2	0.7	0.0
21 Jul	Afternoon Min	22.9	1.3	5.8	23.9	1.2	4.4
22 Jul	Overnight Min	16.7	1.2	0.0	16.5	1.1	0.0
22 Jul	Afternoon Min	20.4	2.2	3.0	22.9	2.1	1.9
23 Jul	Overnight Min	15.2	1.7	0.0	15.0	2.4	0.0
23 Jul	Afternoon Min	19.2	2.1	4.5	19.0	2.7	5.7
24 Jul	Overnight Min	16.7	1.2	0.0	16.8	1.3	0.0
24 Jul	Afternoon Min	22.6	1.8	6.0	25.0	1.3	3.2
25 Jul	Overnight Min	17.5	1.0	0.0	17.9	0.6	0.0
25 Jul	Afternoon Min	22.6	1.5	5.8	23.2	1.3	5.6

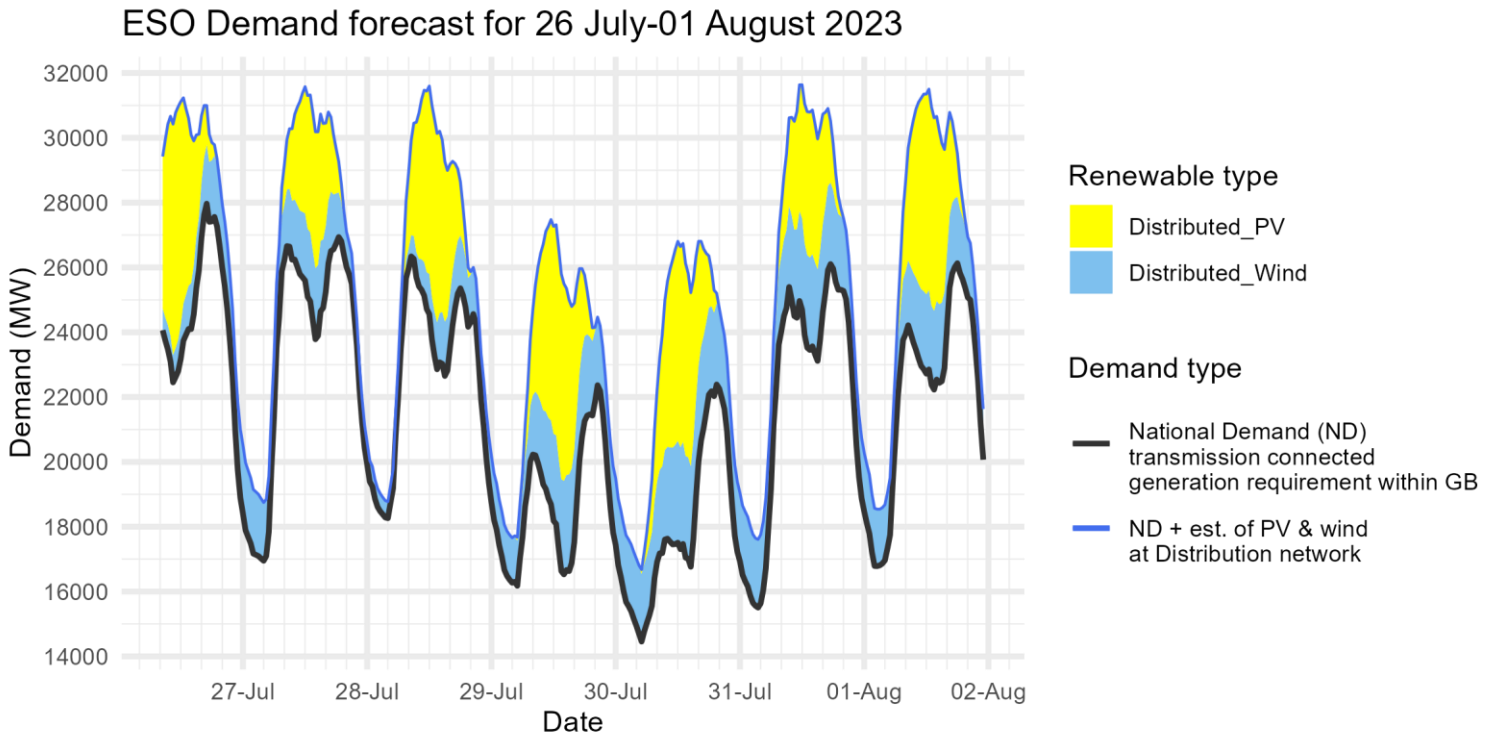
The black line (National Demand ND) is the measure of portion of total GB customer demand that is supplied by the transmission network.

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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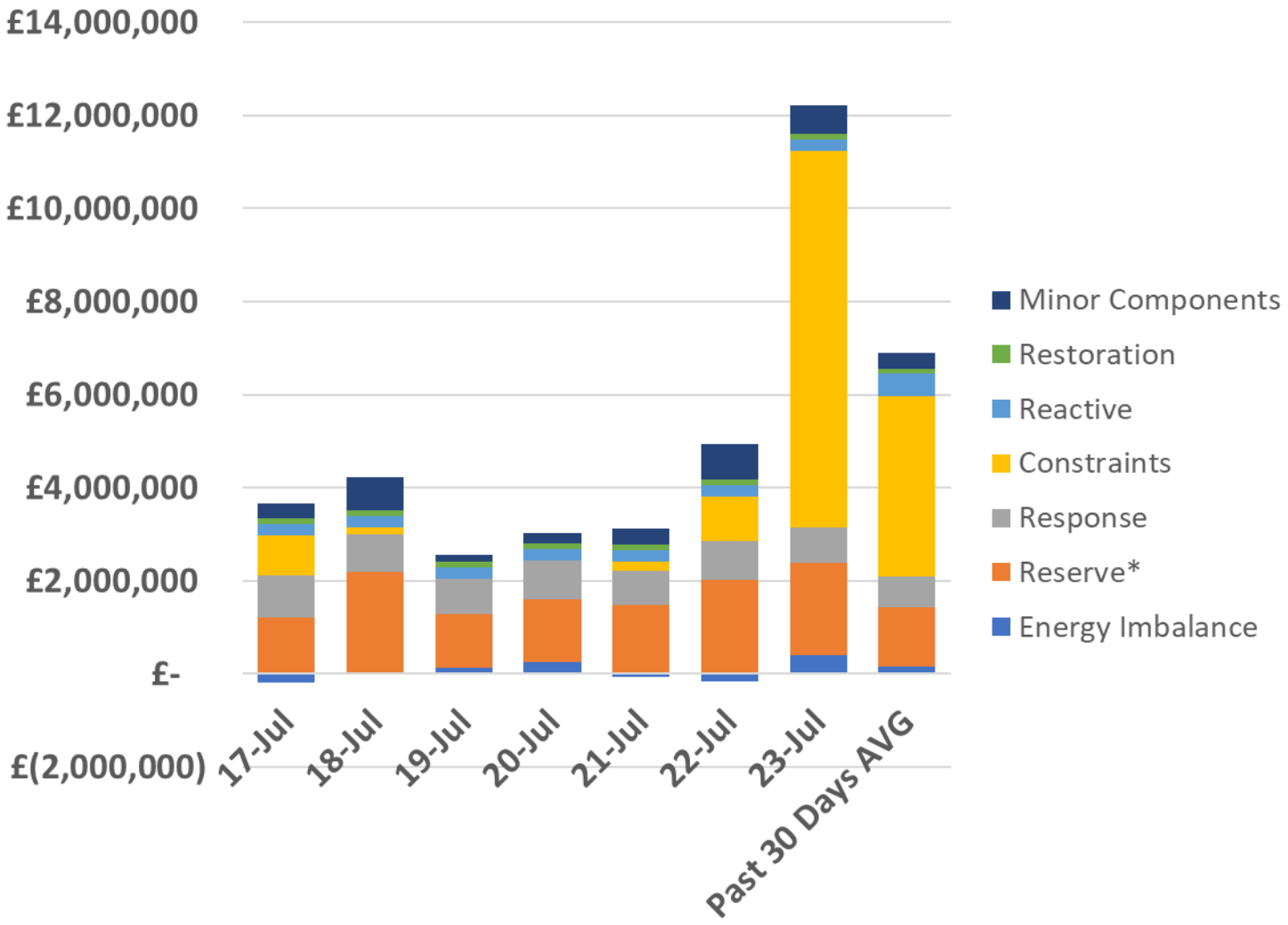
		FORECAST (Wed 26 Jul)		
Date	Forecasting Point	National Demand (GW)	Dist. wind (GW)	Dist. PV (GW)
26 Jul 2023	Afternoon Min	23.7	1.1	6.4
27 Jul 2023	Overnight Min	16.9	1.8	0.0
27 Jul 2023	Afternoon Min	23.8	2.2	4.2
28 Jul 2023	Overnight Min	18.3	0.5	0.0
28 Jul 2023	Afternoon Min	22.7	1.7	4.9
29 Jul 2023	Overnight Min	16.2	1.4	0.1
29 Jul 2023	Afternoon Min	16.5	2.9	6.1
30 Jul 2023	Overnight Min	14.5	2.1	0.1
30 Jul 2023	Afternoon Min	16.8	3.1	5.4
31 Jul 2023	Overnight Min	15.5	2.1	0.0
31 Jul 2023	Afternoon Min	23.1	2.8	4.0
01 Aug 2023	Overnight Min	16.8	1.8	0.0
01 Aug 2023	Afternoon Min	22.2	2.4	6.0

ESO Actions | Category costs breakdown for the last week

Date	Total (£m)
17/07/2023	3.5
18/07/2023	4.2
19/07/2023	2.5
20/07/2023	3.0
21/07/2023	3.1
22/07/2023	4.8
23/07/2023	12.2
Weekly Total	33.3
Previous Week	43.7

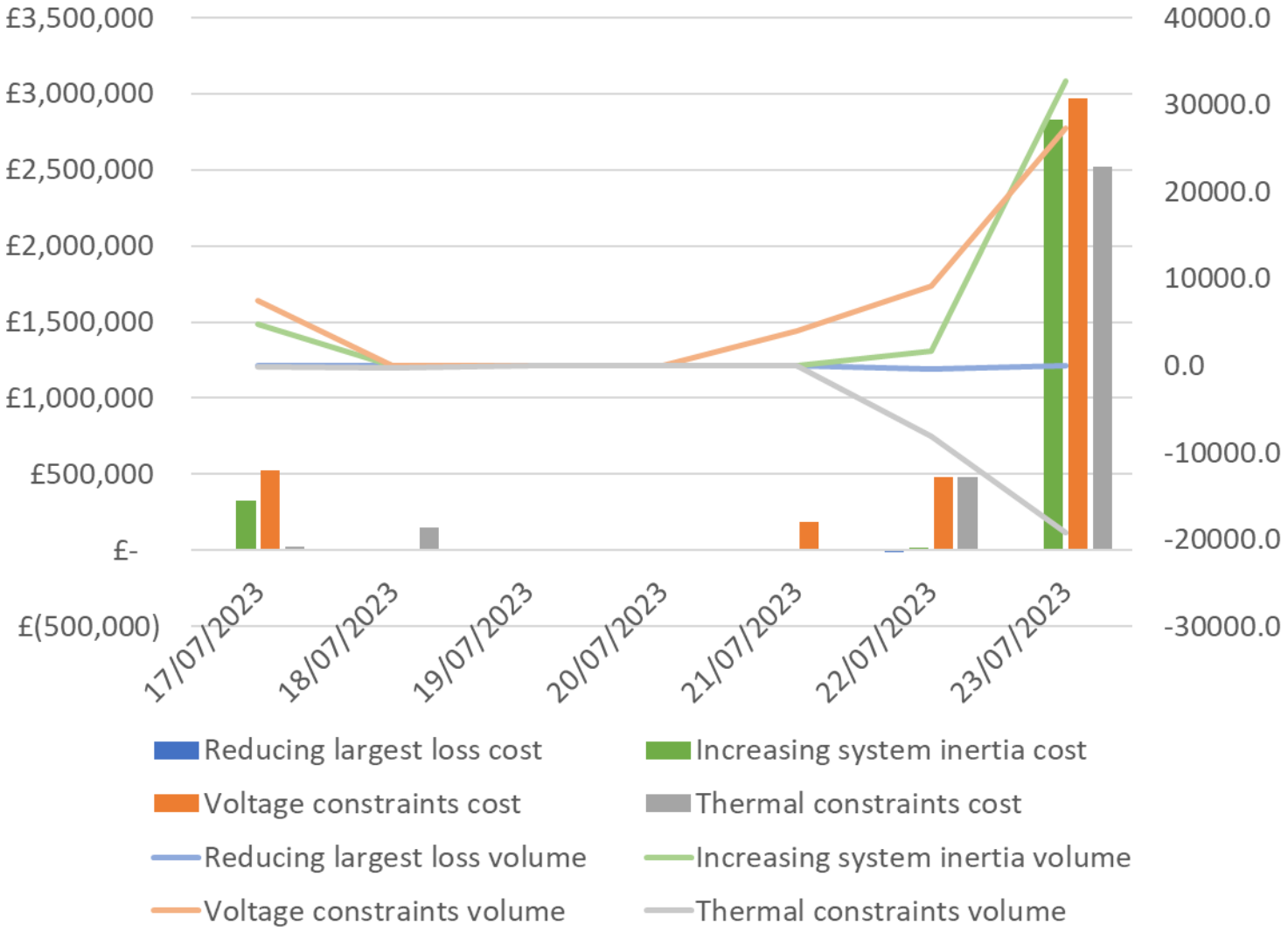


Constraints costs were the key cost component for the week.

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



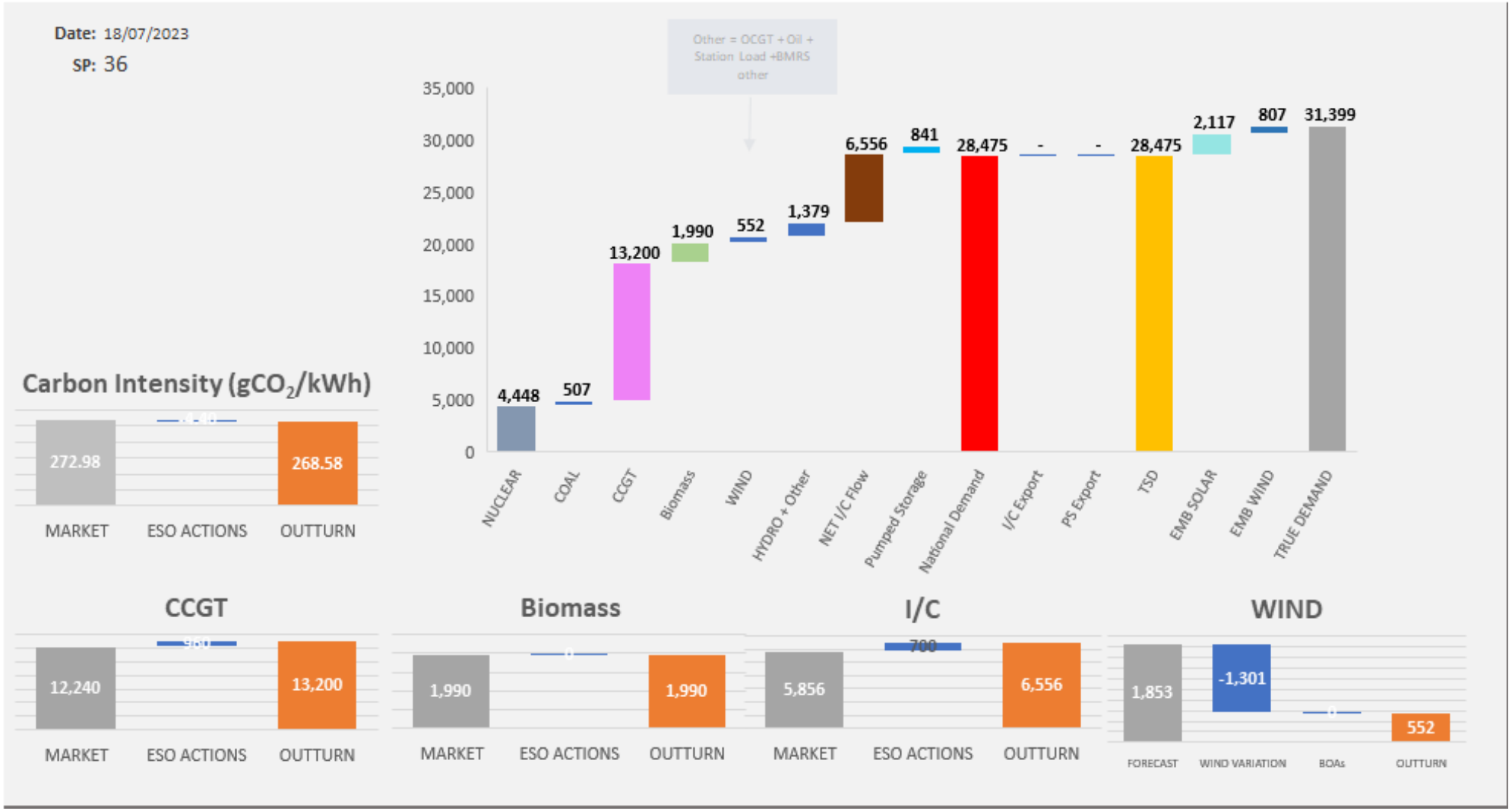
Thermal – network congestion
Actions were required to manage thermal constraints Mon, Tue, Sat and Sun with the most significant costs on Sunday.

Voltage
Intervention was required to manage voltage levels Mon, Fri, Sat and Sun.

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

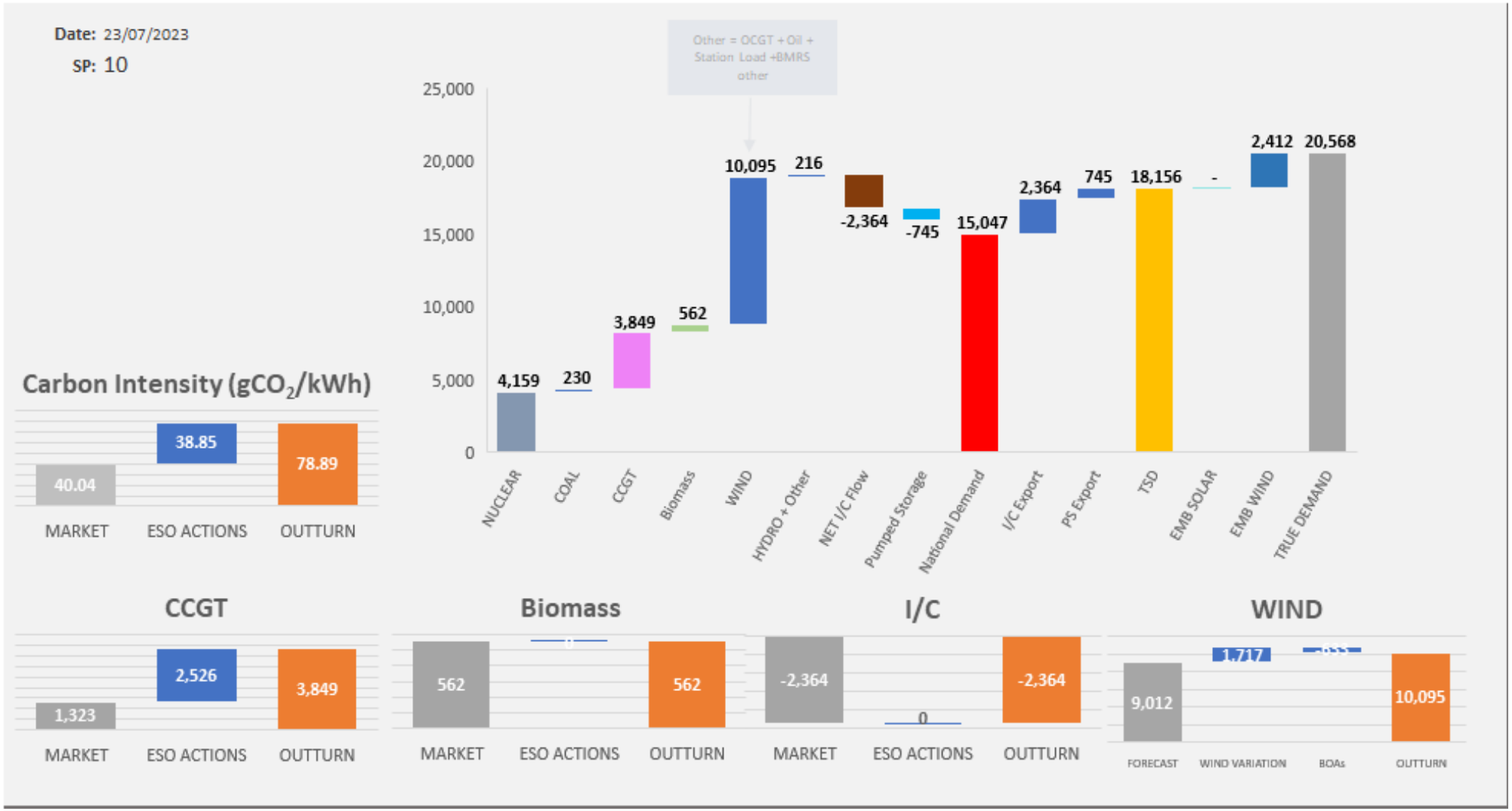
Increasing inertia
Intervention was required to manage system inertia on Mon, Sat and Sun.

ESO Actions | Tuesday 18 July – Peak Demand – SP spend ~£165k



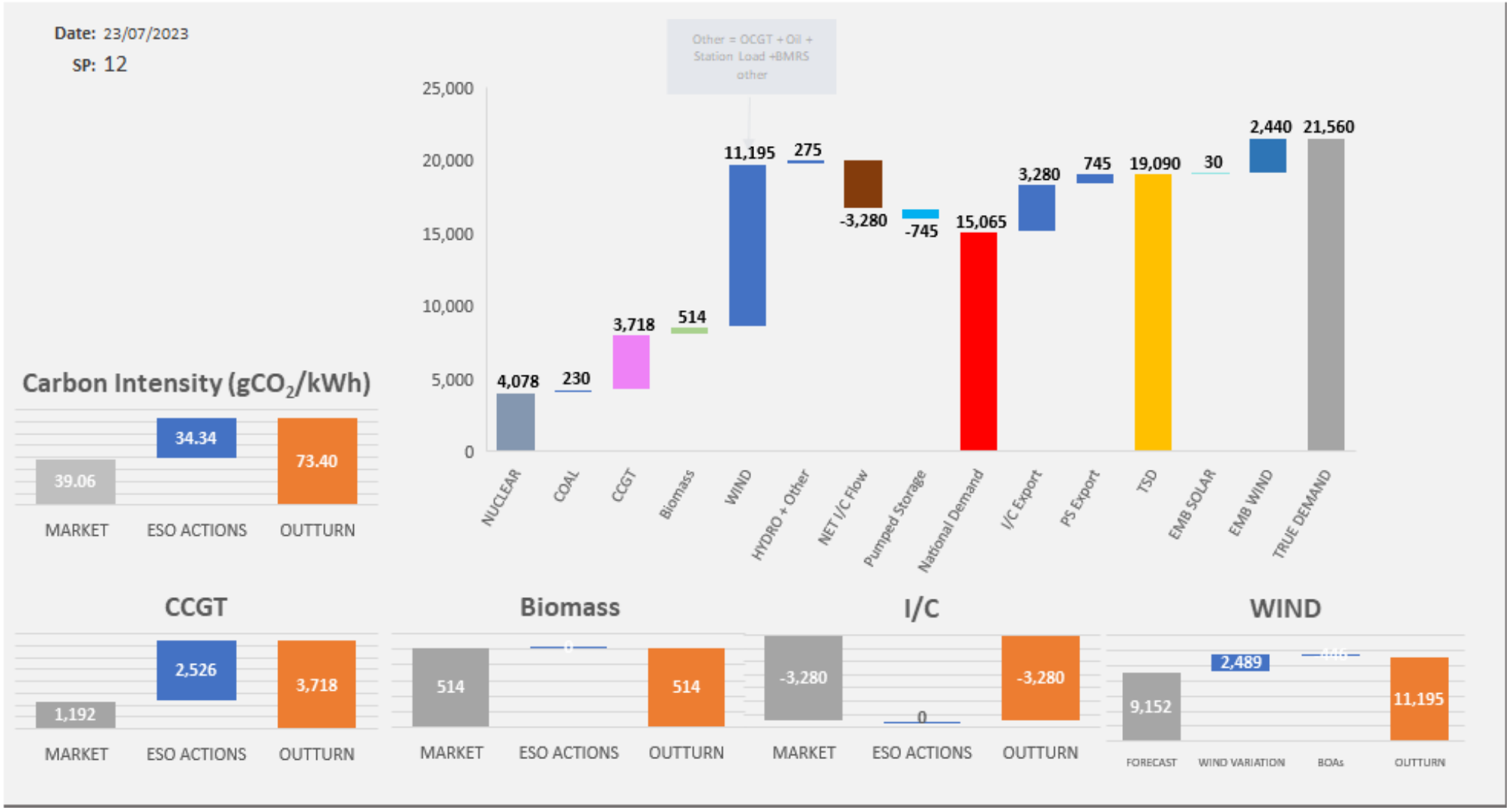
Carbon Intensity data on data portal: https://data.nationalgrideso.com/carbon-intensity1/carbon-intensity-of-balancing-actions

ESO Actions | Sunday 23 July – Minimum Demand – SP Spend ~£373k



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

ESO Actions | Sunday 23 July – Highest SP Spend ~£448k



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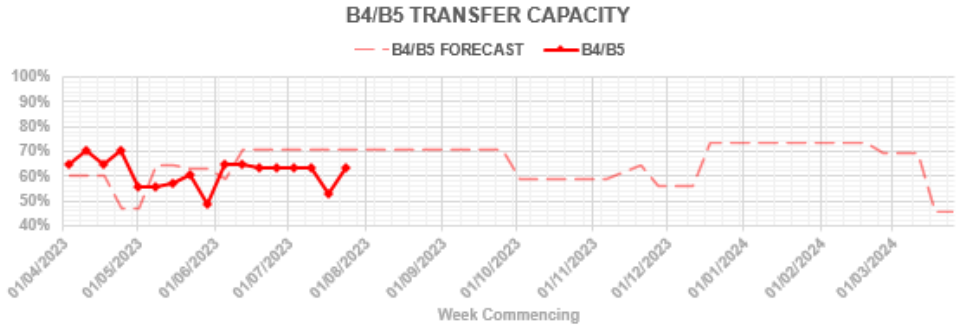
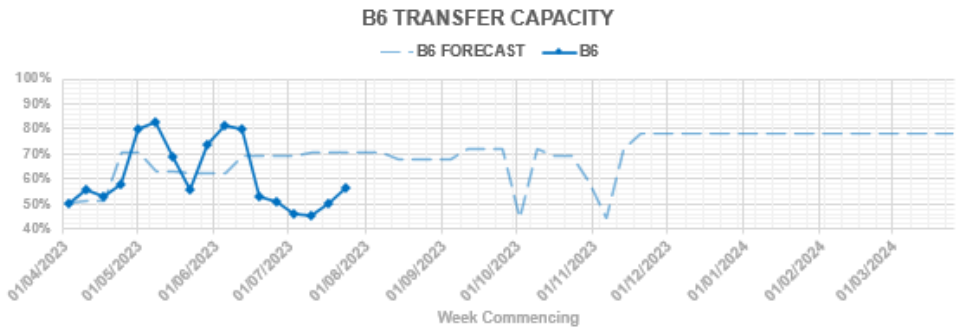
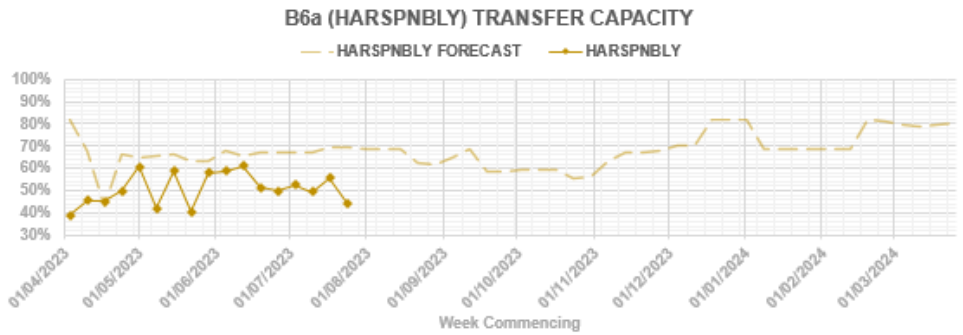
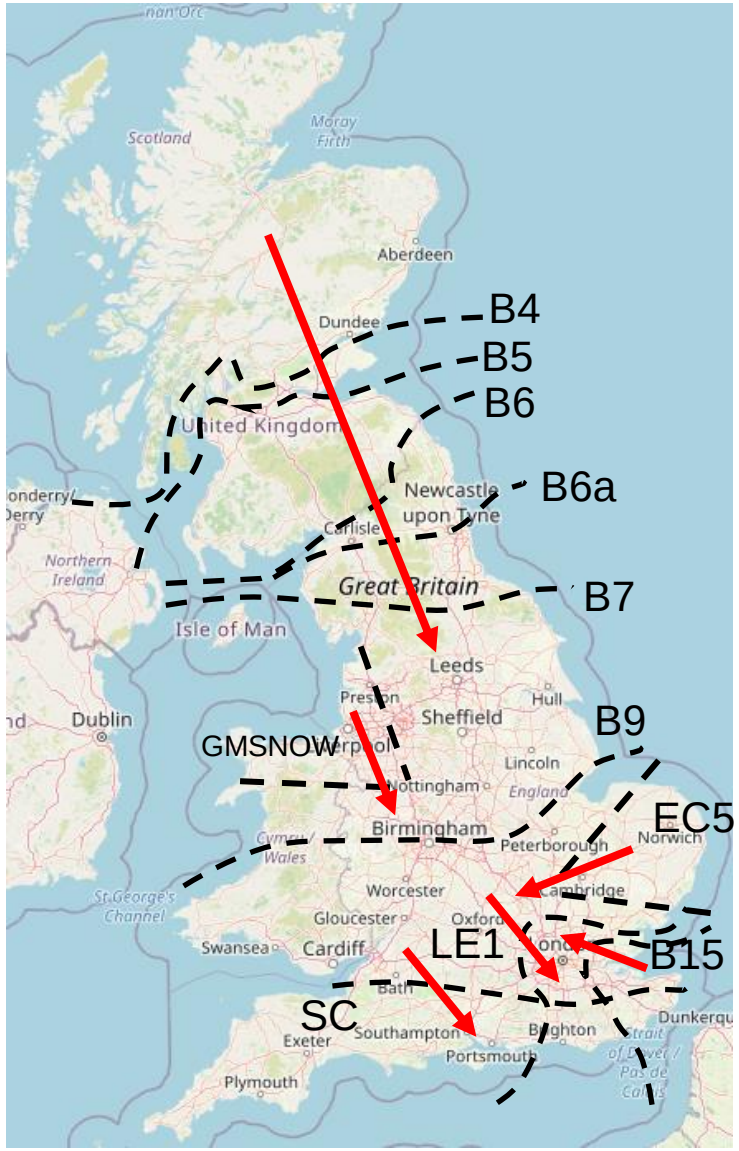
Transparency | Network Congestion





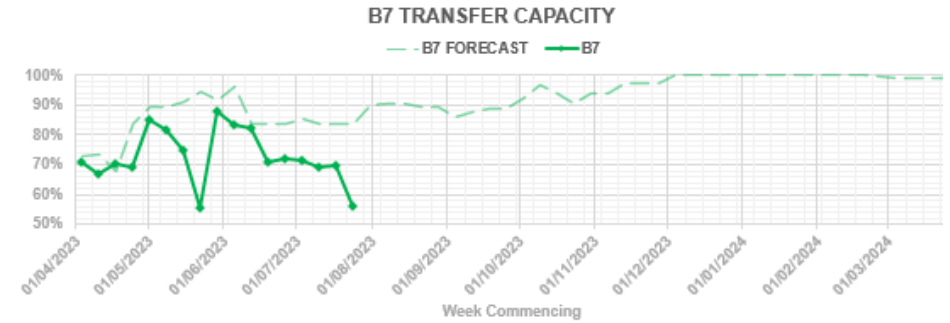


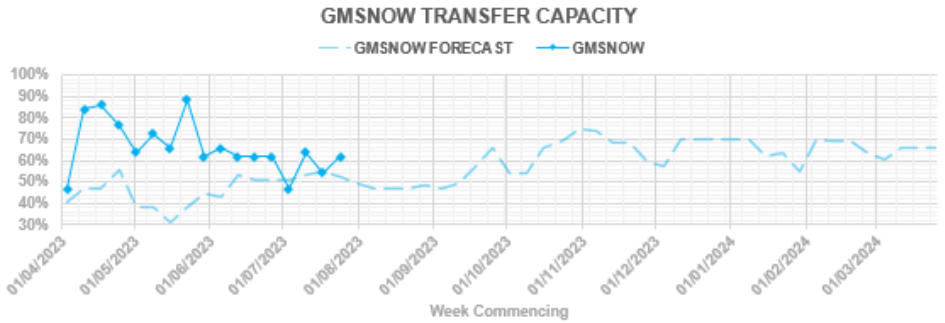
Boundary	Max. Capacity (MW)
B4/B5	3400
B6	6800
B6a	8000
B7	8325
GMSNOW	4700
B9	10600
EC5	5000
LE1	8500
B15	7500
SC	7300

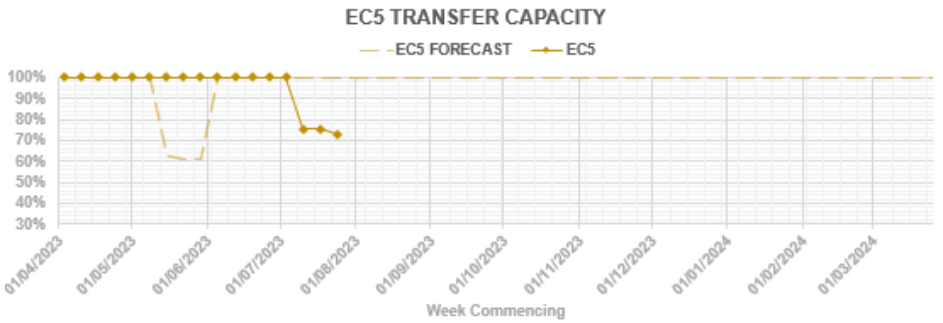


Day ahead flows and limits, and the 24-month constraint limit forecast are published on the ESO Data Portal:
https://data.nationalgrideso.com/data-groups/constraint-management

Transparency | Network Congestion







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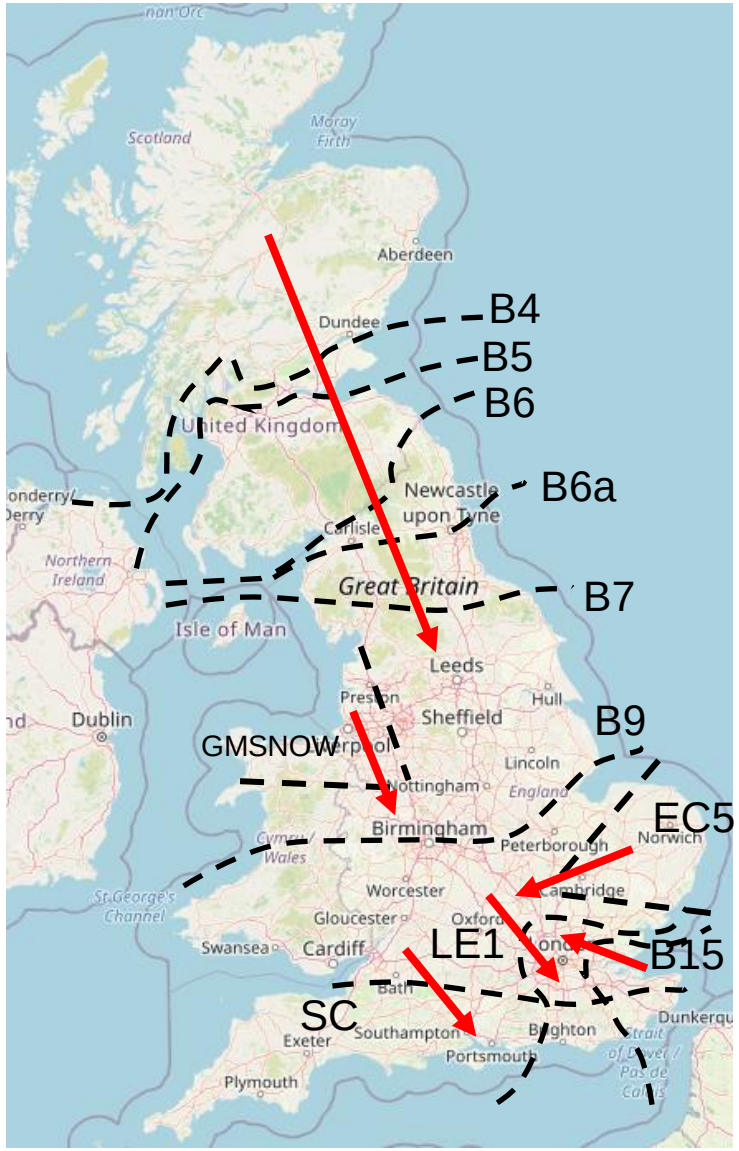

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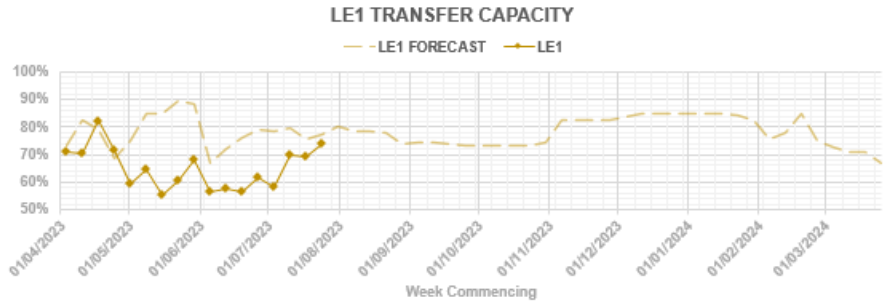
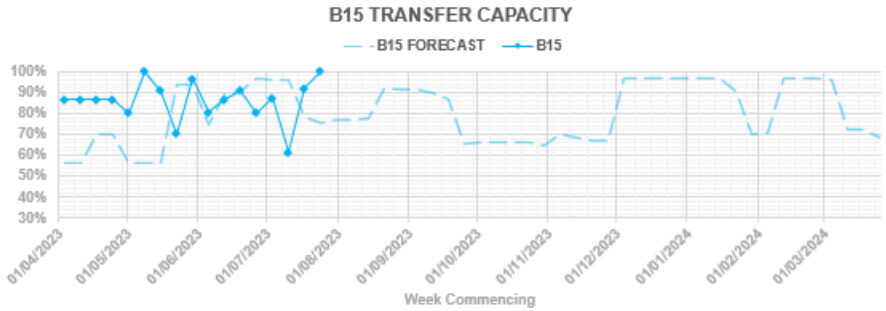
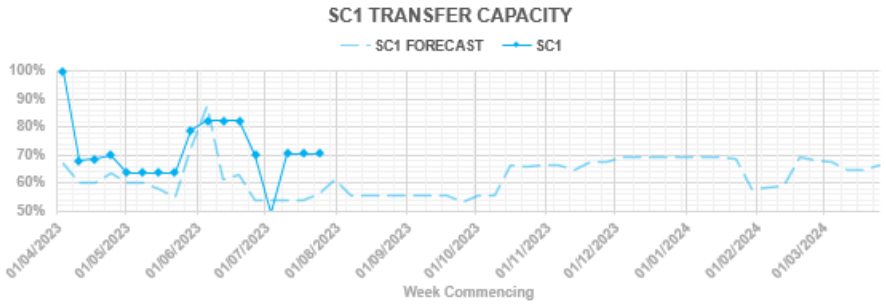
Transparency | Network Congestion







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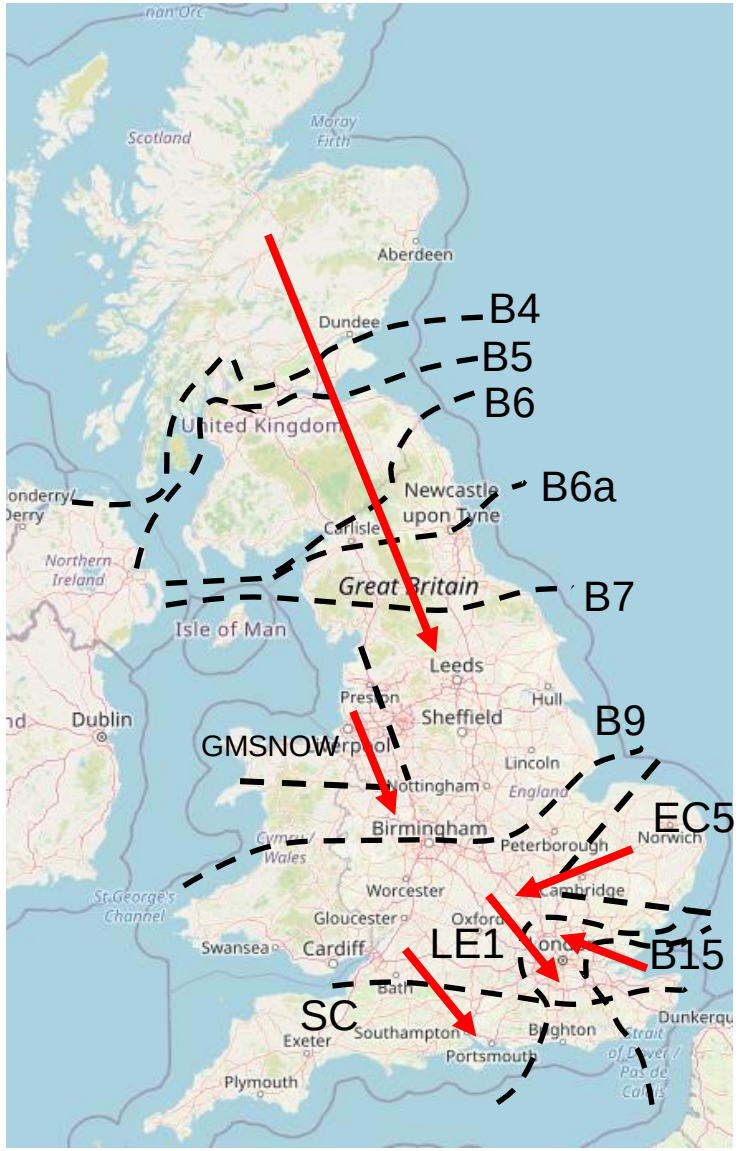

Day ahead flows and limits, and the 24-month constraint limit forecast are published on the ESO Data Portal:
https://data.nationalgrideso.com/data-groups/constraint-management

Questions from last week

Q: My question at OTF re the system outage, there were a few things I had in mind:

• Can NGESO explain what happened and what has been done to increase resilience going forward?

• Can IT people in the industry learn any lessons from what happened to NGESO's system? Sharing any lessons would be sensible?

• While the systems were down NGESO had to balance the system. Did it use any small plants, or did it have to concentrate on large plants as the reliance on faxes (which I know are going by 2025) means using smaller plants is impractical? If faxes were not practical for smaller plants then should we stop them needing to buy them now, not wait for 2025?

A: Thanks for the question. There was one outage to one of the ESO infrastructure systems, which supports data flow to and from the BM. Although this is not a CNI outage, the industry was impacted and market messages via BMRS were sent. We include details here for transparency of our activities, recognising the impact this had on market participants.

During this outage, the BM system remained functional and resilient throughout, but the result was a lack of availability to users, both internal and external. The outage was communicated to the market at the time via BMRS and email notifications, in line with our obligations to report these events.

Whilst working to re-establish full system availability to all users, the ESO implemented a number of established contingency measures to ensure continued data submission and instructions to users.

In summary, the infrastructure outage lasted 150 minutes, and restricted the use of the BM system to both internal and external users for a total period of 245 minutes. We are conducting an internal investigation into this unplanned outage to identify and implement learnings from this into our future activities.

Questions from last week

Q: ESO is buying an increasing amount of inertia in order to ensure security of supply. Why is there such a short-fall and are all the 3 Stability pathfinders running now or just 1 and 2 SPF volumes?

Follow up Q: where did my Inertia Question go - seems to have disappeared off the list? It was about why is the ESO buying so much inertia and if the Stability Pathfinders 1 and 2 are already delivering the volumes the ESO bought to help top up?

A: Apologies that your question did not appear on the Sli.do screen during the live forum. We had a technical glitch. Please be reassured that your question had been captured outside of Sli.do and our answer is below.

In response to the first part of your question about short-fall, it's not clear if this is in reference to recent actions to procure inertia or overall inertia requirements. In relation to overall inertia requirements looking into the future: We regularly assess our future inertia needs based on changing future energy scenarios.

The different phases of stability pathfinders completed to date have bought different levels of inertia in different areas of the network based on the requirements established at the point in time when each tender was launched, accounting for inertia volumes bought in previous rounds. However, we have not procured 100% of our total inertia requirement for all future years through the three stability pathfinders that have been completed due uncertainty in scenarios for later years.

This is where the development of the mid-term and short-term stability markets will come into play in future years, to provide cheaper inertia closer to real time based on the inertia requirements at the time.

In response to the second part of your question about whether all pathfinder units are live, only the Stability Phase 1 units are live and operational. The units procured through Stability Phase 2 and Phase 3 are still in delivery and due to commence service provision from 2024 onwards for Phase 2 and 2025 onwards for Phase 3.

Questions from last week

Q: Wind forecasts seem to have been quite a long way out recently. Has there been some change to the forecasting?

A: The wind forecasting methodology has not changed. But recently, we have experienced increased commercial CfD activity (triggered by forecast or out turning negative prices), resulting in significant volumes of wind production being self-curtailed. Our current forecasts do not take account of predicted commercial behaviour, but ESO are looking at options to address this. These occurrences are usually during periods of low demand, in parallel with high levels of wind production; resulting in higher BOA (renewable) activity on the network which compounds the errors further.

Q: This is the transparency forum - please answer the questions on things like DFS here, not in bilateral chats.

A: The topic of these questions is currently outside the scope of the OTF.

However, we have requested DFS for a future focus topic at the OTF.

Recent information about DFS can be found on the website at: Demand Flexibility Service (DFS) | ESO (nationalgrideso.com) which includes information on how to sign up for the DFS newsletter

Questions from last week

Q. Given the transparency dataset exists, surely discussions of why specific out-of-merit BOA were taken happened is fair game for discussion here?

Q. But surely this a Transparency Forum is the place to discuss those dispatch transparency data items? Appreciate you may not be able to answer off the cuff, but if you refuse to discuss transparency data sets, does transparency mean anything?

Q. Appreciate the ESO can't comment on individual assets but they questions today have been about CCGTs or other generation class (wind etc) as a whole so surely can be discussed as doesn't disclose any individual "company" which is what your licence prohibits i believe but please correct if wrong. Ta

Q. Perhaps you could scope out improving the dispatch transparency data as it seems like a significant number of q's in these forums relate to that so it seems it's potentially not serving it's purpose as well as it could..

A: The topic of these questions is currently outside the scope of the OTF.

However, we are considering how to take forward our engagement on Dispatch Transparency following the feedback from the event on 2 June, the OTF and other occasions. All of your comments have been included for consideration, and we will definitely be feeding back to the OTF in the near future.

We are also reviewing the performance of our Dispatch Transparency tool.

Outstanding Questions

Last week there was a comment about a previous question had disappeared.

We believe this relates to a detailed set of questions that was asked about Project CLASS.

At the OTF on 8th Feb (at approx. 29 mins) we said we would refer the question to the appropriate team for action.

The topic of this question is outside the scope of the OTF. We have forwarded it to the appropriate team within the ESO to respond direct. We will also ensure this question is capture in the ESO query process which includes providing you with a contact email to follow up on this question. We will not be bringing these questions back to OTF, however we have requested the project team provide an update on Project CLASS at a future date.

Advance Questions

Q: Regarding the recent sub-100kW BM trial, could you provide clarity as to why you are trailing this ahead of implementing changes to your systems to allow existing BMUs to operate to 0.1/kW accuracy?

A: The recently proposed trial for sub-100kW assets is to compliment the work being done by a Power Responsive working group, which is looking to quantify the accuracy of an aggregated metering feed based on different metering capability (both in terms of meter read accuracy and read frequency) at the sub-asset level. The trial will allow us to explore how these new asset types will interact with energy balancing markets, review the accuracy and reliability with which these assets can operate within the market framework. Through the trial we will also be able to review any impacts that relaxed operational metering standards could have on balancing the system, setting trial parameters to ensure we are doing this in a controlled manor. Findings from the trial will feed into work being done by the Power Responsive team around the amendment of any operational metering standards longer term.

Advance Questions

Q: Is it possible to publish the sites which have the Power Available installed? Alternatively, could the ESO provide an update on Power Available as the last one I can find is from March 2021 (https://www.nationalgrideso.com/news/power-available-phase-2-further-unlocks-potential-variable-generation-provide-balancing), e.g. what is the current state of PA? how many sites have it? has the signal for solar sites commenced?

A: We are still working on an answer to this and will bring back the answer to a future forum.

Reminder about answering questions at the ESO OTF

- Questions from unidentified parties will not be answered live. If you have reasons to remain anonymous to the wider forum please use the advance question or email options in the slide at the beginning of the pack.
- Questions will be answered in the upvoted order whenever possible. We will take questions from further down the list when: the answer is not ready; we need to take the question away or the topic is outside of the scope of the OTF.
- Sli.do will remain open until 12:00, even when the call closes earlier, to provide the maximum opportunity for you to ask questions.
- Questions which are not answered on the day will be included, with answers, in the slide pack for the next OTF.
- All questions asked through Sli.do will be recorded and published, with answers, in the Operational Transparency Forum Q&A on the webpage
- Takeaway questions – we may ask you to contact us by email in order to clarify or confirm details for the question.
- Out of scope questions will be forwarded to the appropriate ESO expert or team for a direct response. We may ask you to contact us by email to ensure we have the correct contact details for the response. These questions will not be managed or published through the OTF, and we are unable to forward questions without correct contact details.

slido

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