ESO RIIO2 Business Plan 2 (2023-25)

April 2024-25 Incentives Report

24 May 2024

ESO

Contents

Introduction

As part of the RIIO-2 price control, we submitted a second Business Plan to Ofgem in August 2022. It sets out our proposed activities, deliverables, and investments for years three and four of RIIO-2 (2023-2025) as we respond to the rapidly changing external environment.

The ESO's Delivery Schedule sets out in more detail what the ESO will deliver, along with associated milestones and outputs, for the "Business Plan 2" period.

Ofgem, as part of its Final Determinations for the RIIO-2 price control, set out that the ESO would be subject to an evaluative incentive framework, assessing our performance in delivering the Business Plan.

The updated ESO Reporting and Incentives (ESORI) guidance sets out the process and criteria for assessing the performance of the ESO, and the reporting requirements which form part of the incentive scheme for the BP2 period. Every month, we report on a set of monthly performance measures; Performance Metrics (which have benchmarks) and Regularly Reported Evidence items (which do not have benchmarks). This report is published on the 17th working day of each month, covering the preceding month.

Every quarter, we report on a larger set of performance measures, and also provide an update on our progress against our Delivery Schedule in the RIIO-2 deliverables tracker. Our six-month and eighteen-month reports will broadly be similar to our usual quarterly report.

Our mid-scheme and end of scheme reports will be more detailed, covering all of the criteria used to assess our performance.

Following our Business Plan 2 (BP2) submission, Ofgem outlined the requirement for a Cost Monitoring Framework (CMF). The objective of the CMF is to provide visibility of our BP2 Digital, Data and Technology (DD&T) delivery progress and cost management, and the value being delivered across the BP2 DD&T investment portfolio. As per the ESORI guidance, we are required to provide quarterly reports directly to Ofgem as part of the CMF. We feel it is important to share updates with our external stakeholders and industry as part of the framework. So, we'll be including a summary of the CMF update every six months alongside our incentives reporting.

Please see our website for more information.

Summary of Notable Events

In April we successfully delivered the following notable events and publications. We provide further detail on each of these under the role sections:

- On 15 April, we achieved a new low carbon intensity record of 19gCO2/kWh, driven by mild weather, high wind levels, and increased clean energy connections. Wind was the largest source of generation in April, providing 35.1% of electricity, and 59% of electricity came from zero-carbon sources, peaking at 88% on 15 April at 1pm.
- On 15 April, the share of Great Britain's electricity generated by fossil fuels dropped to a record low of 2.4%. This year, there have been 75 half-hour periods with fossil fuels accounting for less than 5% of electricity demand, indicating progress towards a zero-carbon electricity system.
- On 25 April in London and 1 May in Edinburgh, we held in-person Frequency Response and Reserve Roadshows. These events featured presentations on upcoming IT and Policy changes, new Quick and Slow Reserve products, and provided an opportunity for valuable discussions with industry participants and stakeholders to gather feedback for shaping future developments.
- On 11 April, we published our 2024 Summer Outlook, setting out our operational expectations for the national electricity network over the coming summer months. The full Summer Outlook and associated data workbook are published on our website or you can watch a short video here.
- On 16 April, we published our initial proposals to further develop our First Ready, First Connected approach in connections. This was originally announced in December and would now apply to the whole queue and not just new projects. We plan to go live as of January 2025. For more information on this process, please click here.
- On 23 April, we hosted our bi-annual Customer Connections Seminar for over 160 guests in Glasgow. Through a series of panel discussions, breakout sessions and drop-in rooms, customers and stakeholders had the opportunity to engage in conversations around key connections topics. A key topic of conversation at the seminar and our ongoing monthly forums was connections reform, following the recently published Retrospective Application of Upcoming Long-Term Connections Reform.

Summary of Metrics and RREs

The tables below summarise our Metrics and Regularly Reported Evidence (RRE) for April 2024.

Metric/RRE		Performance	Status
Metric 1A	**Balancing Costs**	£209m vs benchmark of £228m	●
Metric 1B	**Demand Forecasting**	Forecasting error of 687MW vs indicative benchmark of 642MW	●
Metric 1C	**Wind Generation Forecasting**	Forecasting error of 5.73% vs indicative benchmark of 4.32%	●
Metric 1D	**Short Notice Changes to Planned Outages**	1.5 delays or cancellations per 1000 outages due to an ESO process failure (vs benchmark of 1 to 2.5).	●
RRE 1E	**Transparency of Operational Decision Making**	90.9% of actions taken in merit order or driven by an electrical parameter	N/A
RRE 1G	**Carbon intensity of ESO actions**	11.9gCO_2/kWh of actions taken by the ESO	N/A
RRE 1I	**Security of Supply**	0 instances where frequency was more than ±0.3Hz away from 50Hz for more than 60 seconds. 0 voltage excursions	N/A
RRE 1J	**CNI Outages**	0 planned and 0 unplanned system outages	N/A
RRE 2E	**Accuracy of Forecasts for Charge Setting**	Month ahead BSUoS forecasting accuracy (absolute percentage error) of 16%	N/A

Below expectations ● **Meeting expectations** ● **Exceeding expectations** ●

We welcome feedback on our performance reporting to box.soincentives.electricity@nationalgrideso.com

Hannah Kruimer

Interim Head of Regulation

Role 1 (Control Centre operations)

ESO

Metric 1A Balancing cost management

This metric measures the ESO's outturn balancing costs (including Electricity System Restoration costs) against a balancing cost benchmark.

A new benchmark was introduced for BP2. Analysis has shown that the two most significant measurable external drivers of balancing costs are wholesale price and outturn wind generation. The new benchmark was derived using the historical relationships between those two drivers and balancing costs:

i. The benchmark was created using monthly data from the preceding 3 years.

ii. A straight-line relationship has been established between historic constraint costs, outturn wind generation and the historic wholesale day ahead price of electricity.

iii. A straight-line relationship has been established between historic non-constraint costs and the historic wholesale day ahead price of electricity.

iv. Ex-post actual data input into the equation created by the historic relationships to create the monthly benchmarks.

The formulas used are as follows (with Day Ahead Baseload being the measure of wholesale price):

Non-constraint costs = 62.25 + (Day Ahead baseload x 0.478)
Constraint costs = -33.49 + (Day Ahead baseload x 0.39) + (Outturn wind x 23.51)

Benchmark (Total) = 28.76 + (Day Ahead baseload x 0.87) + (Outturn wind x 23.51)

**Constants in the formulas above are derived from the benchmark model*

ESO Operational Transparency Forum: The ESO hosts a weekly forum that provides additional transparency on operational actions taken in previous weeks. It also gives industry the opportunity to ask questions to our National Control panel. Details of how to sign up and recordings of previous meetings are available here.

April 2024-25 performance

Figure: 2024-25 Monthly balancing cost outturn versus benchmark

Table: 2024-25 Monthly breakdown of balancing cost benchmark and outturn

All costs in £m	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	YTD
Outturn wind (TWh)	6.3												6.3
Average Day Ahead Baseload (£/MWh)	59												59
Benchmark	228												228
Outturn balancing costs[1]	**209**												**209**
Status	●												●

Previous months' outturn balancing costs are updated every month with reconciled values. Figures are rounded to the nearest whole number, except outturn wind which is rounded to one decimal place.

Performance benchmarks:

- ● **Exceeding expectations:** 10% lower than the annual balancing cost benchmark
- ● **Meeting expectations:** within ±10% of the annual balancing cost benchmark
- ● **Below expectations:** 10% higher than the annual balancing cost benchmark

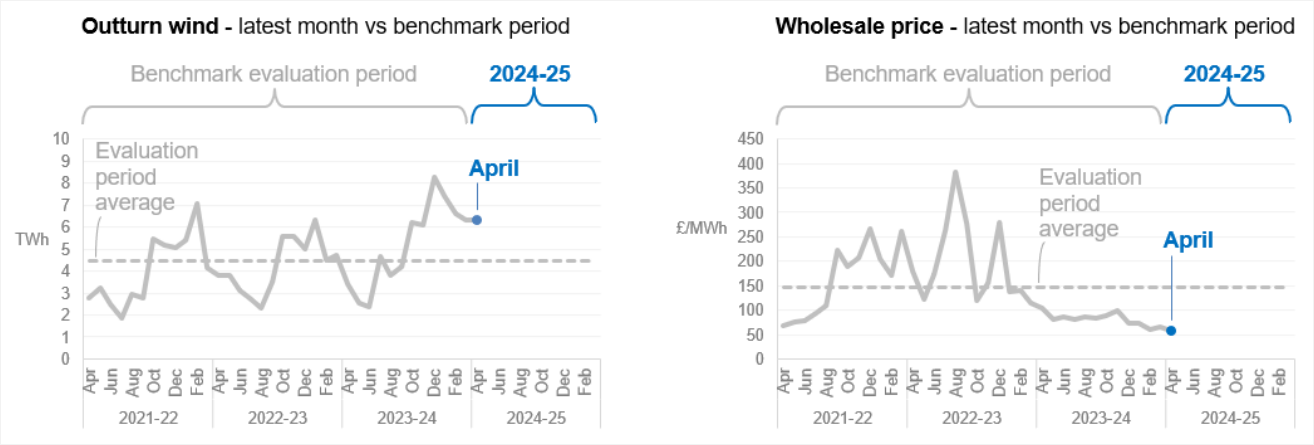
Supporting information

This month's benchmark

As mentioned above, a new benchmark was introduced for BP2. The benchmark is derived using the historical relationships between two drivers (wholesale price and outturn wind generation) and balancing costs. As this is the first month of 2024-25, the benchmark has now been updated using the same methodology but based on data from the last three years (April 2023 to March 2024).

The April benchmark of £228m is slightly lower than March 2024 (£241m) and reflects:

- an **outturn wind** figure of 6.3TWh that remains high compared to the benchmark evaluation period (the last three years) and in line with last month (March 2024).
- A drop of £7/MWh in the average monthly **wholesale price** (Day Ahead Baseload) this month compared to March 2024. This drop in wholesale price is the driver of the slight decrease in the overall benchmark compared to last month. The April 2024 figure is lower than every month in the entire benchmark evaluation period (the last three years).



[1] Outturn balancing costs excludes Winter Contingency costs for comparison to the benchmark as agreed with Ofgem. However, in the rest of this section we continue to include those costs for transparency and analysis purposes.

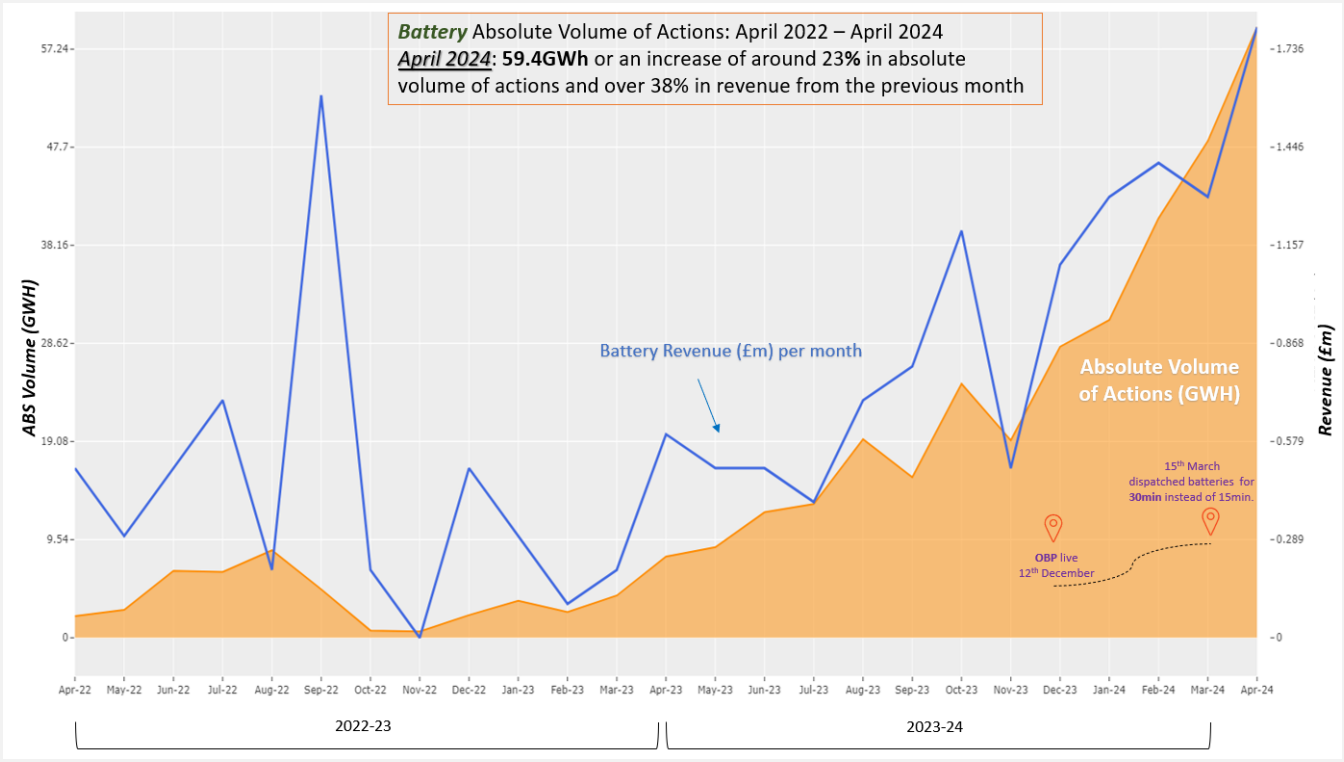
April Performance

April's total balancing costs were £209m which is £19m (~8%) below the benchmark of £228m, and therefore performance is meeting expectations. April's overall outturn wind remains in line with March 2024, although still significantly higher than the rest of the months in 2023-2024. The volume weighted average price for offers has increased by £10/MWh compared to last month and is slightly higher than the previous three months, whilst the volume weighted average bid price remains the same compared to last month and relatively lower than the previous three months.

As discussed in December's incentives report, the first stage of our new platform to support the bulk dispatch of battery storage and small Balancing Mechanism Units, the Open Balancing Platform (OBP), went live on 12 December.

This month marked a significant milestone for batteries, with absolute volumes dispatched more than doubling and revenues nearly doubling (in BM and trades) compared to last December. April had the highest battery dispatch absolute volume (~60GWh) and the highest battery revenue since April 2022 in the Balancing Mechanism (BM), as show on the graph below. This illustrates our commitment to maximising the flexibility of energy offered by battery storage over the last year.

Figure: April 2022 to April 2024 - Monthly Absolute Volume of actions and Revenue for Batteries from the BM



April saw a slightly higher cost than the previous three months – with a steady yet relatively high wind generation and slightly lower wholesale price. The total non-constraint volumes and non-constraint costs have decreased by 570GWh volume and £3.6m in part due to lower energy prices. Although the total constraint volumes and costs have increased by 160GWh and £19m compared to March 2024, the constraint volume in Scotland and sterilized headroom have decreased by 63GWh and 45GWh, and the constraints costs in Cheviot have decreased by £8.8m. Despite the slightly higher total constraint costs, we were still able to make a significant total amount of savings through optimising outages and trading activities.

The total savings from outage optimisation were £31.1m in April 2024. Whilst still a largely significant amount of savings, this is a decrease of £22.3m relative to April 2023. The action that yielded the greatest value was related to Coalburn substation where some internal works were returned three weeks earlier than planned. This delivered potential savings of roughly £9.6m, enabling 128 GWh of additional (mostly renewable) generation.

The Trading team were able to make a total saving of £31.4m in April through trading actions compared to alternative BM actions, representing a 10% increase on the previous month. A high proportion of these savings were due to increased requirements for downwards regulation, which would have been met through trading units

at their Stable Export Limit (SEL) or trading capacity on the interconnectors. April also saw strong wind generation due to the windy weather, which coupled with interconnector imports meant that energy needed to be sold back across the interconnectors. This helped to both reduce imports and effectively balance the system.

Work is still ongoing in quantifying the value of savings from the Operational Balancing Platform, but as can be seen from the figure above, a record volume of batteries (59.4GWh) was dispatched through the Balancing Mechanism in April 2024.

Breakdown of costs vs previous month

Balancing Costs variance (£m): April 2024 vs March 2024

		(a) Mar-24	(b) Apr-24	(b) - (a) Variance	decrease ◄► increase Variance chart
Non-Constraint Costs	Energy Imbalance	7.7	-0.1	(7.8)	
	Operating Reserve	11.1	12.2	1.0	
	STOR	3.0	3.0	0.0	
	Negative Reserve	0.3	0.2	(0.2)	
	Fast Reserve	14.6	15.1	0.5	
	Response	13.7	17.2	3.5	
	Other Reserve	2.1	2.1	(0.0)	
	Reactive	12.0	10.9	(1.1)	
	Restoration	3.4	3.6	0.1	
	Winter Contingency	0.0	0.0	0.0	
	Minor Components	4.4	4.7	0.3	
Constraint Costs	Constraints - E&W	33.2	47.1	13.9	
	Constraints - Cheviot	9.2	0.4	(8.8)	
	Constraints - Scotland	57.8	68.4	10.5	
	Constraints - Ancillary	0.5	0.2	(0.3)	
	ROCOF	0.2	0.8	0.6	
	Constraints Sterilised HR	20.2	23.6	3.4	
Totals	Non-Constraint Costs - TOTAL	72.4	68.8	(3.6)	
	Constraint Costs - TOTAL	121.2	140.4	19.3	
	Total Balancing Costs	**193.5**	**209.2**	**15.6**	

As shown in the total rows from the table above, constraint costs increased by £19.3m and non-constraint costs decreased by £3.6m, resulting in an overall increase of £15.6m compared to March 2024.

Constraint costs: The main drivers of the variances this month are detailed below:

- **Constraint-Scotland & Cheviot***: The constraint costs increased by £10.5m in Scotland \and decreased by £8.8m in Cheviot, resulting a total increase of £1.7m of the two, due to an increase of 25GWh volume of actions.
- **Constraint-England & Wales***: The constraints cost in England & Wales increased by £14m with an increase in volume of 165GWh. This is mainly due to an increase in the import constraint actions by 135GWh for voltage control and to support system inertia.
- **Constraints Sterilised Headroom***: £3.4m increase, despite a decrease of 45GWh total volume of replacement energy.

*80 more planned outages compared to last month and 49 more planned outages than April 2023. This month also saw a slight increase of the volume weighted average price for offers following a significant low electricity price.

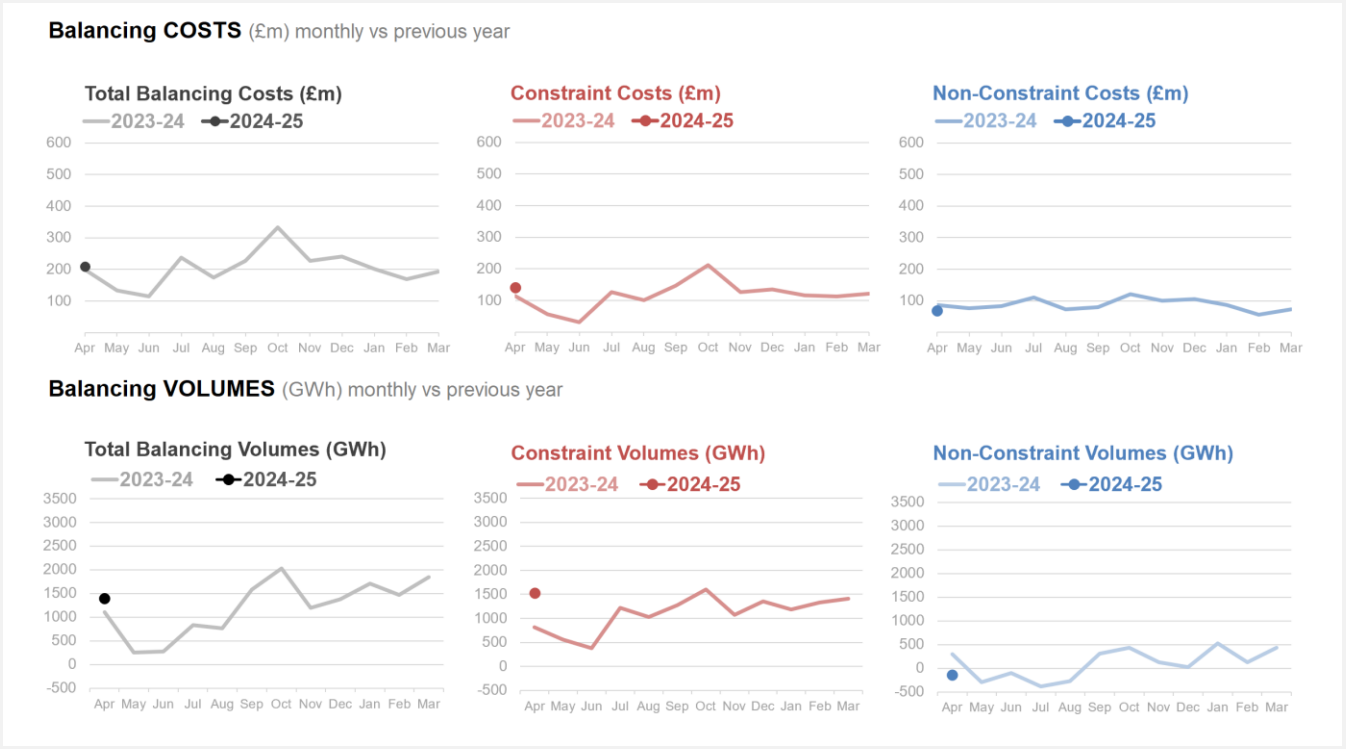
Non-constraint costs*: The main driver of the variance this month is:

- **Energy Imbalance**: £7.8m decrease due to a reduction of 176GWh in the absolute volume of actions.
- **Response**: £3.5m increase despite a decrease of 3.3GWh in the absolute volume of actions, in part due to a slightly higher volume weighted average offer price for response.
- **Reactive**: £1.1m decrease due to a drop in the volume average price from £3.7/MVAr to £3.4/MVAr compared to last month.

- **Operating Reserve**: £1m increase despite a decrease of 244GWh reserve required to secure the system.

*Excluding the volume of actions from ancillary services as not yet quantified at the time of writing this report.

Constraint vs non-constraint costs and volumes



Please note that a portion of the **Minor Components spend** contributing to non-constraint cost and volume is Operating Reserve cost and volume. The broad themes describing this cost are featured below. The figures will be revised once the data issue is resolved.

Constraint costs	
Compared with the same month of the previous year:	We observe an increase of £24m in constraint costs compared to April 2023, due to an increase of 539GWh in volume of constraint actions.
Compared with last month:	Constraint costs were £19m higher than in March 2024, due to 160GWh more volume of constraint actions, driven by high wind generation.

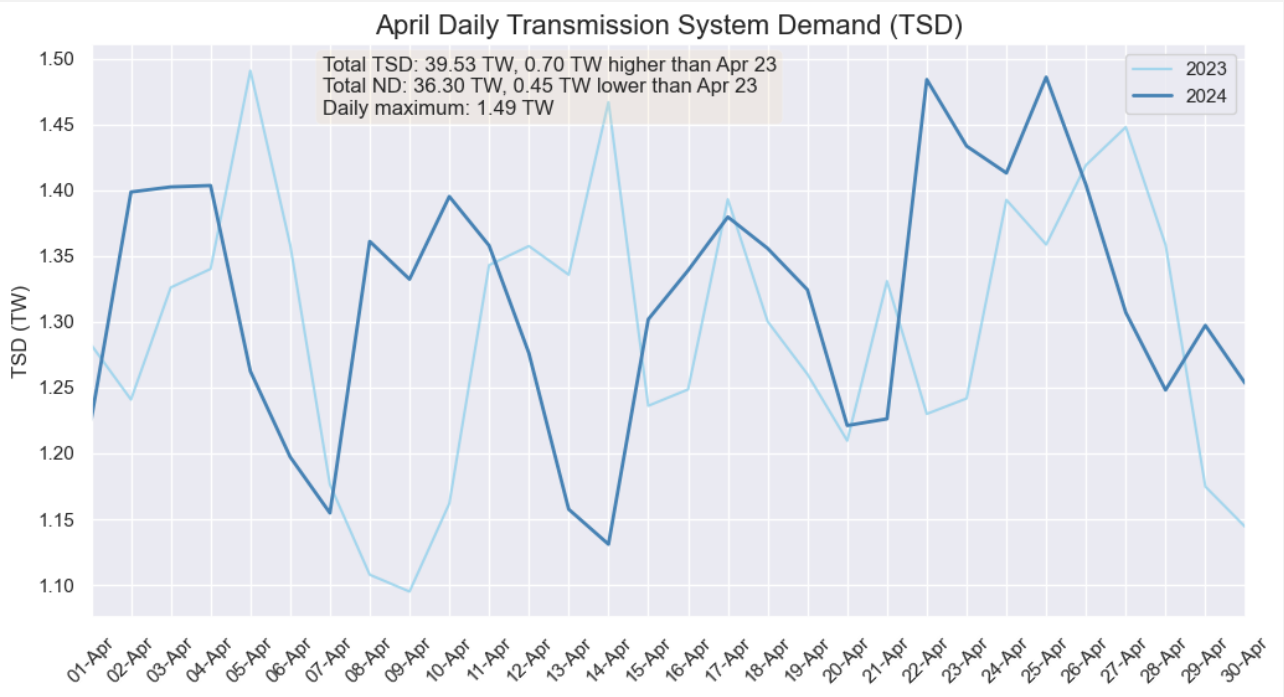
Non-constraint costs**	
Compared with the same month of the previous year:	Non-Constraint costs were £16.8m lower due to due to: • Significantly lower average wholesale prices* • 430GWh less Volume of actions.
Compared with last month:	Non-Constraint costs were £3.6m lower than March 2024, due to 570GWh less absolute volume of actions were required to balance the system.

* Average wholesale price for April 24: £59/MWh compared to £105/MWh for April 23.

** The non-constraint category consists of several subcategories including energy imbalance, response, reserve, and restoration

April daily Transmission System Demand (TSD*)

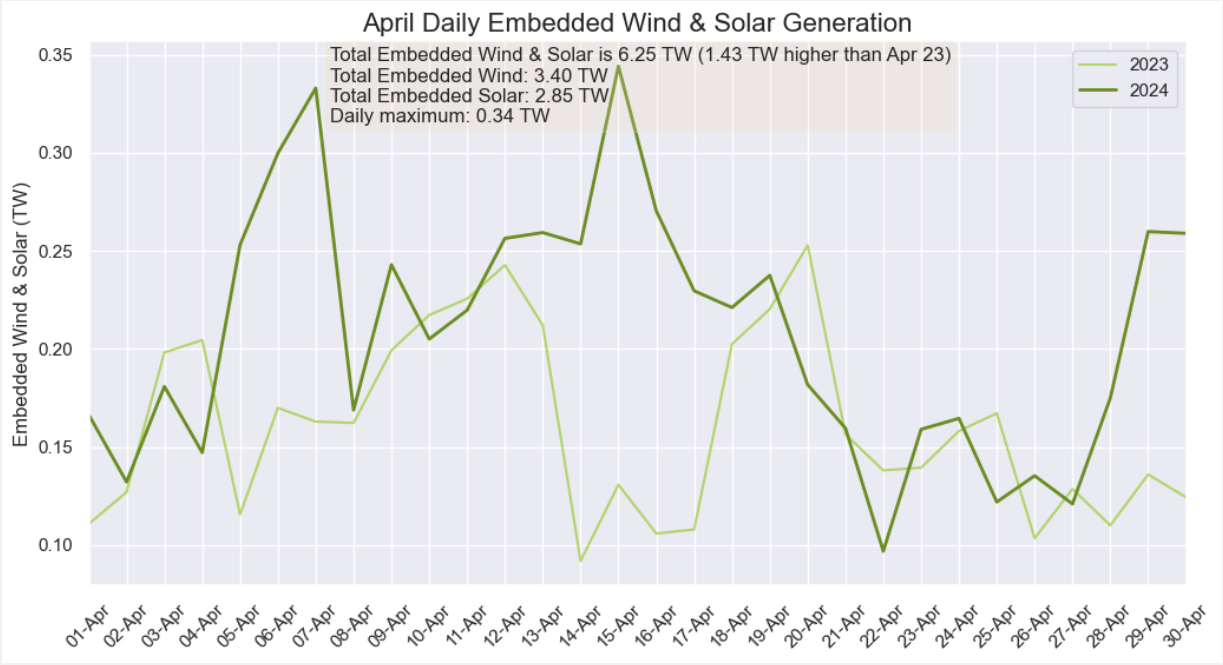
- National Demand (not shown below) was 0.45TW lower than April 2023.
- **Transmission System Demand*** was 0.7TW higher than April 2023.



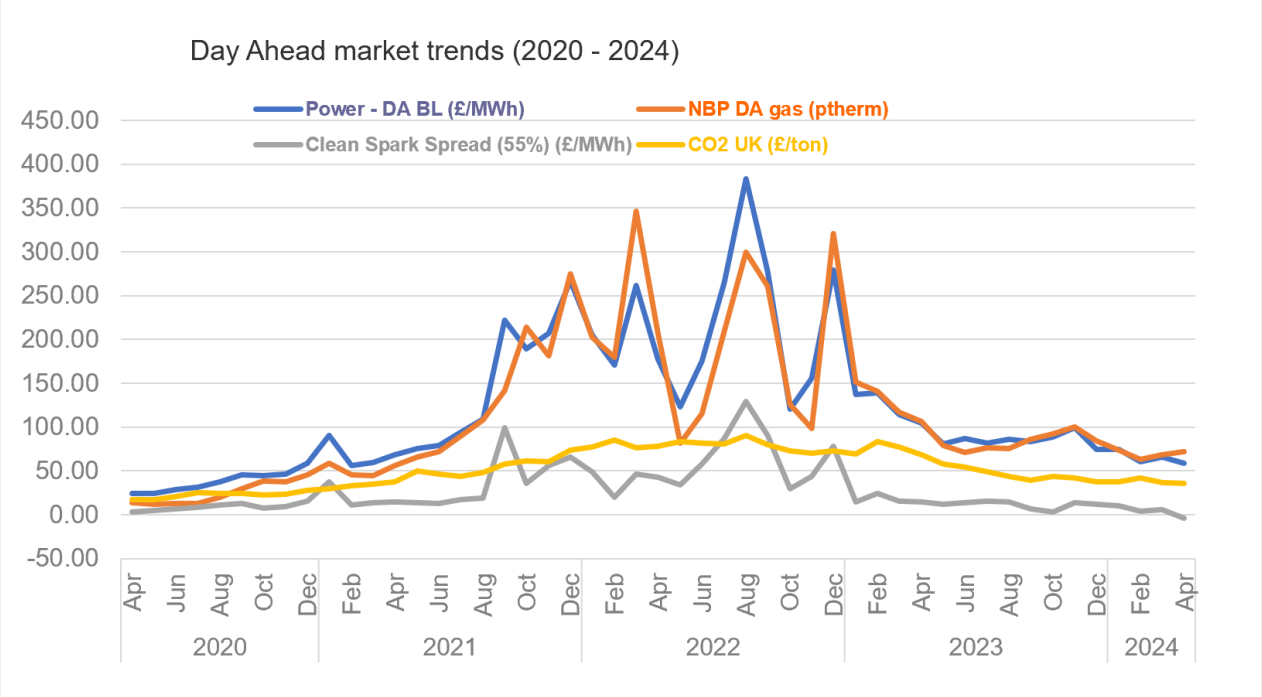
* Transmission System Demand is equal to the National Demand (ND) plus the additional generation required to meet station load, pump storage pumping and interconnector exports. Transmission System Demand is calculated using National Grid ESO operational metering. Note that the Transmission System Demand includes an estimate of station load of 500MW in BST (British Summer Time) and 600MW in GMT (Greenwich Mean Time).

April daily Embedded Wind and Solar Generation

- **Embedded wind & solar generation** was 1.43TW higher than in April 2023.
- The maximum embedded wind & solar generation occurred on 15 April 2024 (0.34TW).



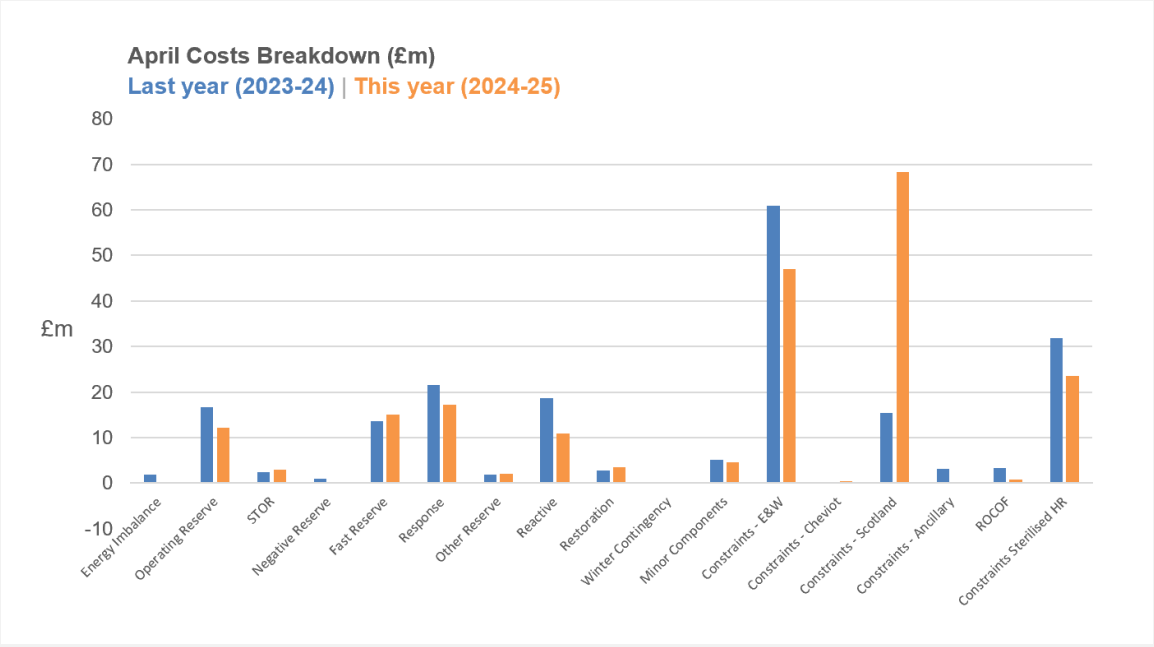
Price Trends in energy markets



DA BL: Day Ahead Baseload **NBP DA:** National Balancing Point Day Ahead

Power had a downward trajectory compared to last month with gas peaking up slightly. CO2 remains relatively steady with Clean Spark Spread below zero due to lower power to fuel spread. All trends remain lower compared to the previous year.

Balancing costs increases/decreases compared with the same period from last year



Comparing the non-constraint costs of April 2024 with those of April 2023, most categories showed a decrease or a small deviation:

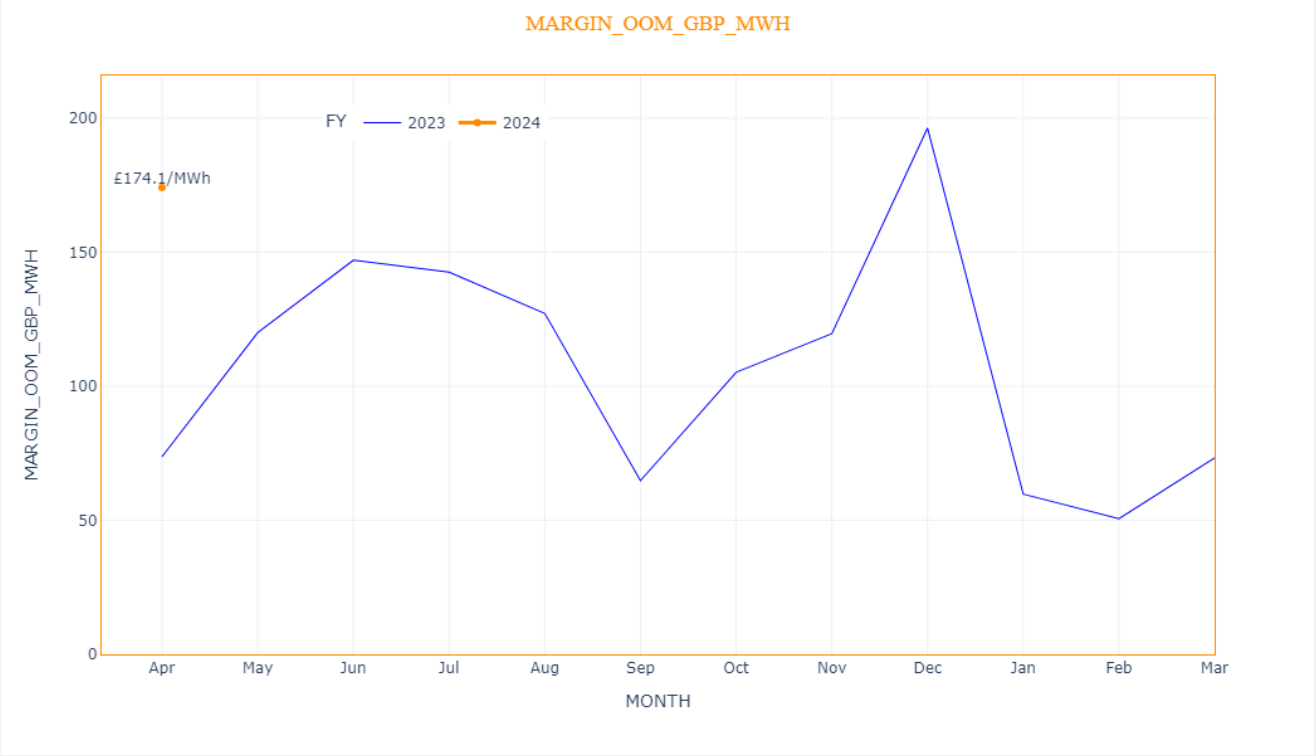
- **Reactive:** £7.8m decrease, due to a slight drop in the weighted average price, from £5.7 per MVAR to £3.4 per MVAR.

- **Operating Reserve** £4.5m decrease mainly due to 188GWh less volume of reserve required to balance the system, and the significant downward trajectory we have observed in all the energy related prices.
- **Response**: £4.4m decrease due to 30GWh less volume of actions taken.
- **Energy Imbalance:** £2m decrease due to 56GWh less volume of actions taken to balance the system.

Comparing the constraint costs of April 2024 with those of April 2023, most categories had small deviations, except:

- **Constraints – Scotland**: £53m increase despite a 542GWh decrease of volume of actions.
- **Constraints – E&W**: £16m decrease despite an 851GWh increase of volume of actions.
- **Constraints Sterilised headroom**: £8m decrease despite a 280GWh increase of volume of actions.

Drivers for unexpected cost increases/decreases



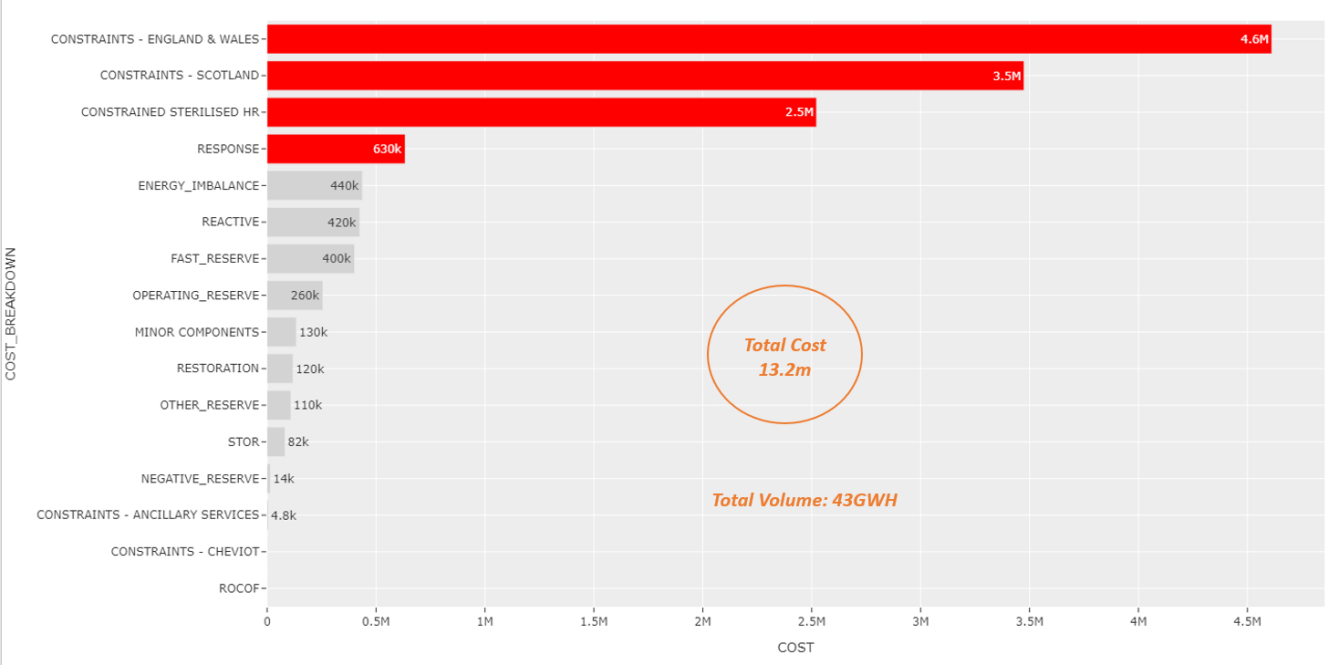
Margin prices (the amount paid for one MWh) have increased by £100/MWh compared to March 2024 (£73.3/MWh) and is also significantly higher than the corresponding period of the previous year (£73.7/MWh in March 2023).

Daily Costs Trends

April's balancing costs were £209m which is £12m higher than the previous month. None of the days were recorded with costs above £15m and around 20% of the days had a daily total cost over £10m, resulting in an increase of the average monthly daily cost by £0.8m (from £7m to £6.2m).

The lowest total daily cost of £1.9m was observed on 26 April, whilst the highest total cost was observed on 14 April when the total spend was £13.2m. Constraints in England & Wales, and Scotland areas were the major cost component driven by high renewable generation and low demand. No individual action was expensive, but high volumes of wind curtailment resulted in high total balancing costs for the day.

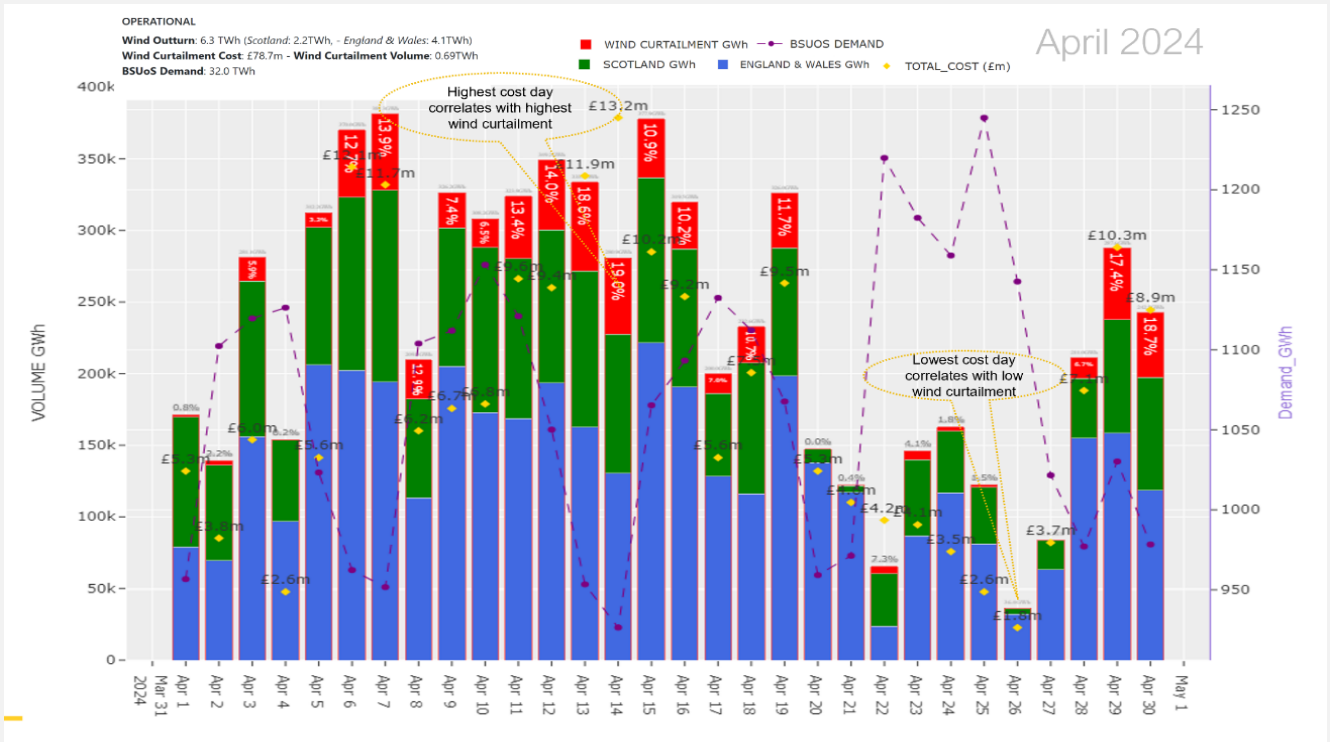
Cost breakdown for 14th April 2024



April Daily Wind Outturn – Wind Curtailment, Daily Costs and BSUoS Demand

The chart below serves the purpose of supporting the transparency and the descriptions above. It is the daily "tour" of wind performance (wind generation: **blue** & **green** bars, and wind curtailment: **red** bars, demand resolved by the balancing mechanism and trades – **purple** dotted line and daily cost – **orange** diamonds).

With this graph one can trace for example the relationship that may exist in how wind performance and low demand affect the cost of each day.



High-cost days and balancing cost trends are discussed every week at the Operational Transparency Forum to give ongoing visibility of the operability challenges and the associated ESO control room action.

Metric 1B Demand forecasting accuracy

This metric measures the average absolute MW error between day-ahead forecast demand (taken from Balancing Mechanism Report Service (BMRS[2]) as the National Demand Forecast published between 09:00 and 10:00) and outturn demand (taken from BMRS as the Initial National Demand Outturn) for each half hour period. The benchmarks are drawn from analysis of historical errors for the five years preceding the performance year.

A 5% improvement in historical 5-year average performance is required to exceed expectations, whilst coming within ±5% of that value is required to meet expectations.

In settlement periods where the Demand Flexibility Service (DFS) is instructed by the ESO, this will be retrospectively accounted for in the data used to calculate performance.

Performance will be assessed against the annual benchmark, but monthly benchmarks are also provided as a guide. The ESO will report against these each month to provide transparency of its performance through the year.

April 2024-25 performance

Indicative benchmark figures for 2024-25: Please note that the benchmark figures used below are indicative only. We have calculated these in line with the method specified by Ofgem, but we have not yet received the confirmed figures from Ofgem. We will update previous performance figures in subsequent reports once the benchmarks have been finalised.

Figure: 2024-25 Monthly absolute MW error vs Indicative Benchmark

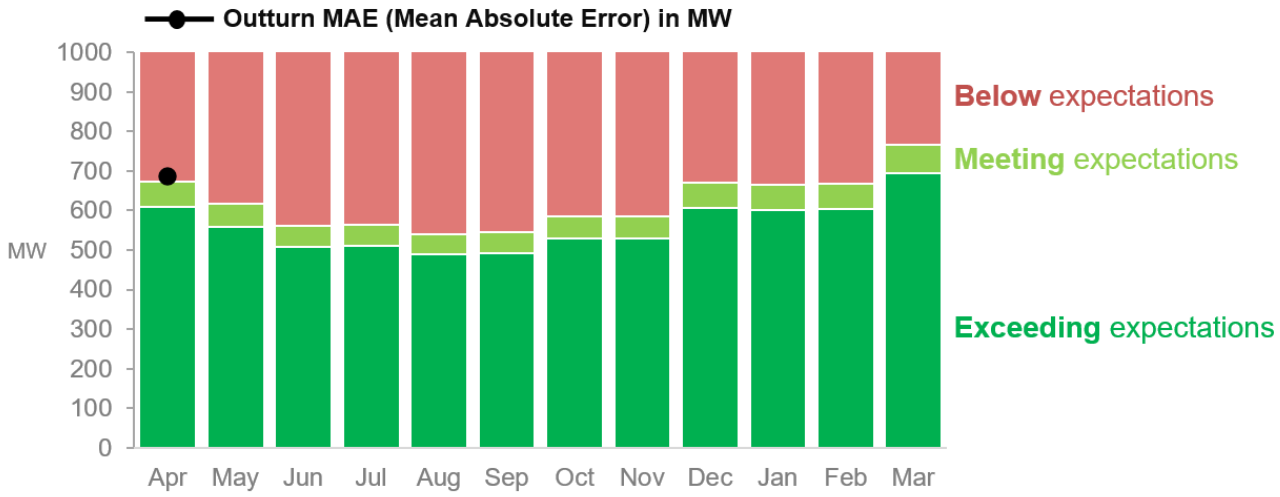


Table: 2024-25 Monthly absolute MW error vs Indicative Benchmark

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Indicative benchmark (MW)	642	588	534	538	515	519	558	557	639	632	636	730
Absolute error (MW)	**687**											
Status	●											

[2] Demand | BMRS (bmreports.com)

Performance benchmarks:

- **Exceeding expectations:** >5% lower than 95% of average value for previous 5 years
- **Meeting expectations:** ±5% window around 95% of average value for previous 5 years
- **Below expectations:** >5% higher than 95% of average value for previous 5 years

Supporting information

In April 2024, the mean absolute error (MAE) of our day ahead demand forecast was 687 MW compared to the indicative benchmark of 642 MW. A variance of more than 5% meant that performance was below expectations.

The Met Office reported that April continued to bring unsettled, wet and dull weather – with temperatures ranging from 20^{0}C, down to sub-zero in some places. After a warm start to the month, temperatures dropped, with the last two weeks of April being cooler than average.

The peak demand error was 3.3GW on 25 April, mainly as a result of a large positive solar forecast error. Similar errors were experienced on 1 April.

Easter occurred much earlier in the year than usual, with the last time this occurred being 2016. The coincident holiday and clock-change period resulted in a challenging weekend and period thereafter.

Errors in the second half of the month were largely due to solar forecast errors. This was coincident with other weather forecast errors (e.g. temperature) on 25 April as a large high-pressure system dissipated, causing the largest daily error of the month.

The distribution of settlement periods by error size is summarised in the table below:

Error greater than	Number of SPs	% out of the SPs in the month (1440)
1000 MW	330	23%
1500 MW	143	10%
2000 MW	52	4%
2500 MW	12	1%
3000 MW	4	0%

The days with largest MAE were Apr 17, 25 and 30.

Missed / late publications

There were 0 occasions of missed or late publications in April.

Triads

Triads run between November and February (inclusive) each year and therefore did not affect this month's performance.

Metric 1C Wind forecasting accuracy

This metric measures the average absolute percentage error (APE) between day-ahead forecast (between 09:00 and 10:00, as published on ESO Data Portal here) and outturn wind generation (settlement metering as calculated by Elexon) for each half hour period as a percentage of capacity for BM wind units only. The data will only be taken for sites that did not have a bid-offer acceptance (BOA) during the relevant settlement period.

2024-25 reporting: We have agreed with Ofgem that for 2024-25, alongside the reported monthly figures we will include a post-report updated APE% which aims to exclude some of the factors that are beyond ESO control. This view excludes sites that have redeclared to zero, and incorporates Initial Settlement Runs (+16 Working Days).

We will publish this data on our Data Portal for transparency purposes. The benchmarks are drawn from analysis of historical errors of the five years preceding the performance year. 5% improvement in performance expected on the 5-year historical average, with range of ±5% used to set benchmark for meeting expectations.

April 2024-25 performance

Indicative benchmark figures for 2024-25: Please note that the benchmark figures used below are indicative only. We have calculated these in line with the method specified by Ofgem, but we have not yet received the confirmed figures from Ofgem. We will update previous performance figures in subsequent reports once the benchmarks have been finalised.

Figure: 2024-25 BMU Wind Generation Forecast APE vs Indicative Benchmark

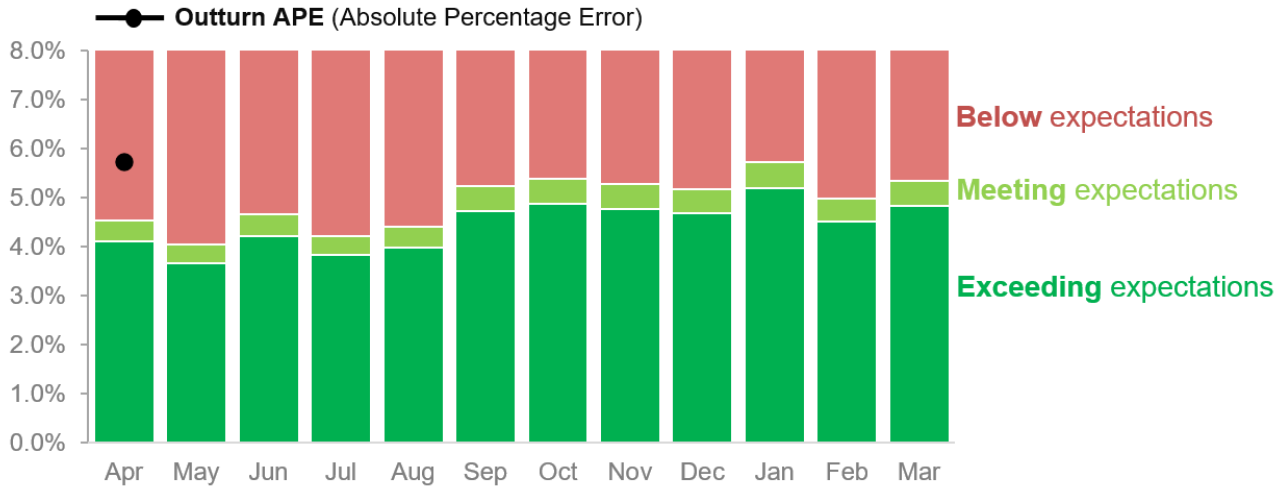


Table: 2024-25 BMU Wind Generation Forecast APE vs Indicative Benchmarks

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Indicative benchmark (%)	4.32	3.85	4.43	4.02	4.19	4.98	5.13	5.02	4.93	5.46	4.74	5.09
APE (%)	**5.73**											
Post-report APE (%)	4.73											
Status	●											

Performance benchmarks:

- **Exceeding expectations:** < 5% lower than 95% of average value for previous 5 years
- **Meeting expectations:** ±5% window around 95% of average value for previous 5 years
- **Below expectations:** > 5% higher than 95% of average value for previous 5 years.

Supporting information

In April 2024, the mean absolute percentage error (APE) of our day ahead Wind forecast was 5.73% compared to the indicative benchmark of 4.54%. A variance of more than 5% meant that performance was below expectations.

The post-report APE is 4.73%, once downward redeclarations have been removed and the latest Initial Settlement Runs completed. Note – the post-report APE is dynamic and can vary, until such time the entire Settlement process for that month is concluded.

April continued to bring unsettled weather, including storm Kathleen on Sunday 7 April.

The peak wind error was 5.3GW on 6 April, mainly as a result of Contracts for Difference (CfD) market activity. Similar scale errors were experienced on 16 April, but these were attributed to weather volatility and were coincident with a fault on our legacy forecasting system, plus a Settlement Metering failure on at least one windfarm.

During unsettled conditions, weather data accuracy in the latter period of the Day Ahead forecasts, continues to be a significant contributor to the source of daily errors.

Withdrawal of wind units

No units withdrew availability between time of forecast and time of metering.

Missed / late publications

In April there were no occasions of late or missing publications of the forecast.

Metric 1D Short Notice Changes to Planned Outages

This metric measures the number of short notice outages delayed by > 1 hour or cancelled, per 1000 outages, due to ESO process failure.

April 2024-25 performance

Figure: 2024-25 Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

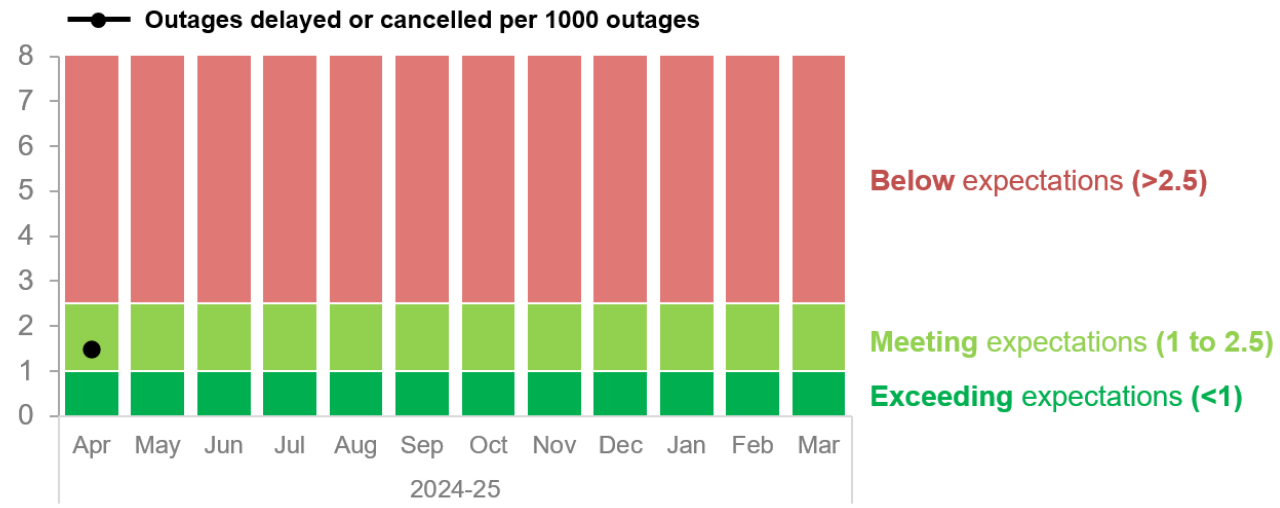


Table: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	YTD
Number of outages	673												673
Outages delayed/cancelled due to ESO process failure	1												1
Number of outages delayed or cancelled per 1000 outages	1.5												1.5
Status	●												●

Performance benchmarks:

- ● **Exceeding expectations:** Fewer than 1 outage delayed or cancelled per 1000 outages
- ● **Meeting expectations:** 1-2.5 outages delayed or cancelled per 1000 outages
- ● **Below expectations:** More than 2.5 outages delayed or cancelled per 1000 outages

Supporting information

For April, we successfully released 673 outages. There was one delay or cancellation due to an ESO process failure. The number of stoppages or delays per 1000 outages for April was 1.49, which is within the 'Meeting Expectations' benchmark of between 1 and 2.5. The single event this month is summarised below:

There was a delay on an outage as the proposed substation running arrangement from the planning department could not be achieved due to an inoperable isolator. The original substation configuration was

agreed with the Distribution Network Operator (DNO) and this technical limitation resulted in greater risk to the demand. Therefore, the outage was delayed until a new agreement could be reached with the DNO. It was identified that this technical limitation on the isolator had been missed during the planning assessment and was not picked up until the outage reached the ESO control room. An Operational Learning Note (OLN) is being written to capture any corrective actions to prevent a re-occurrence.

RRE 1E Transparency of operational decision making

This Regularly Reported Evidence (RRE) shows the percentage of balancing actions taken outside of the merit order in the Balancing Mechanism each month.

We publish the Dispatch Transparency dataset on our Data Portal every week on a Wednesday. This dataset details all the actions taken in the Balancing Mechanism (BM) for the previous week (Monday to Sunday). Categories and reason groups are allocated to each action to provide additional insight into why actions have been taken and ultimately derive the percentage of balancing actions taken outside of merit order in the BM.

Categories are applied to all actions where these are taken in merit order (Merit) or an electrical parameter drives that requirement. Reason groups are identified for any remaining actions where applicable. Additional information on these categories and reason groups can be found on our Data Portal in the Dispatch Transparency Methodology.

Categories include: System, Geometry, Loss Risk, Unit Commitment, Response, Merit

Reason groups include: Frequency, Flexibility, Incomplete, Zonal Management

The aim of this evidence is to highlight the efficient dispatch currently taking place within the BM while providing significant insight as to why actions are taken in the BM. Understanding the reasons behind actions being taken out of pure economic order allows us to focus our development and improvement work to ensure we are always making the best decisions and communicating this effectively to our customers and stakeholders.

We have been publishing the Dispatch Transparency dataset since March 2021, and it has sparked many conversations amongst market participants. As we continue to publish this dataset for BP2 we will also be providing additional narrative to help build trust by explaining:

- actions we are taking to increase understanding of the ESO's operational decision making
- insight into the reasons why actions are taken outside of merit order in the Balancing Mechanism
- activity planned and taken by the ESO to address and reduce the need for actions to be taken out of merit order.

April 2024-25 performance

Figure: 2024-25 Percentage of balancing actions taken in merit order to meet requirements in the Balancing Mechanism

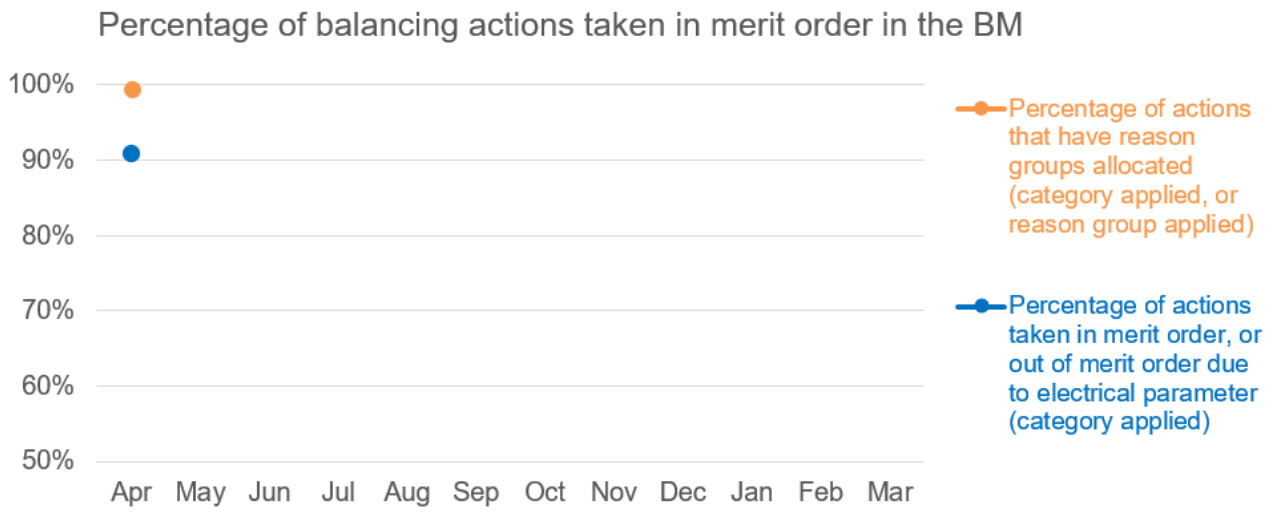


Table: Percentage of balancing actions taken outside of merit order in the BM

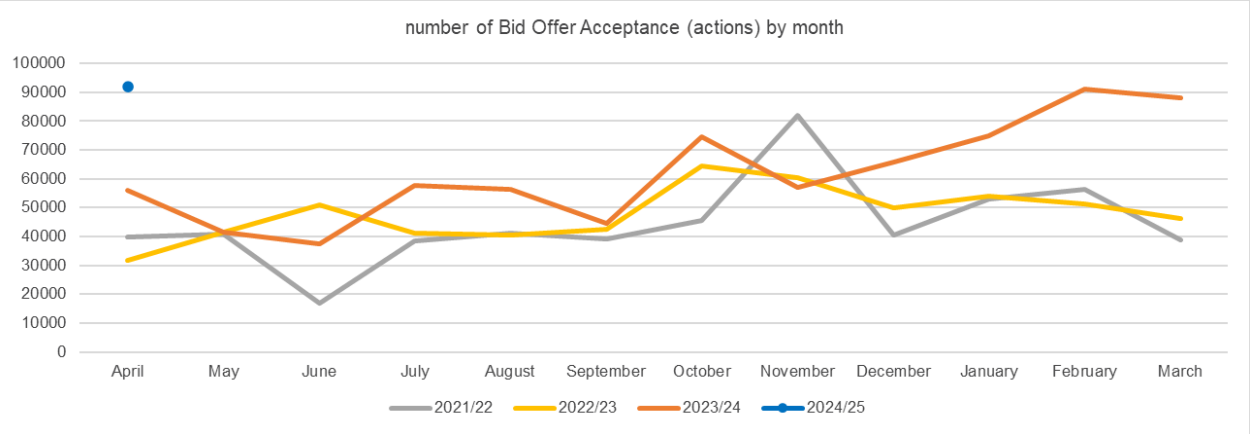
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Percentage of actions taken in merit order, or out of merit order due to electrical parameter (category applied)	90.9%											
Percentage of actions that have reason groups allocated (category applied, or reason group applied)	99.4%											
Percentage of actions with no category applied or reason group identified	0.6%											

Supporting information

April performance

This month 90.9% of actions were either taken in merit order or taken out of merit order due to an electrical parameter. 8.5% of actions were allocated to reason groups for the purposes of our analysis, and the percentage of actions with no category applied or reason group identified remained in line with previous months. During April, there were 92,005 BOA (Bid Offer Acceptances) and of these, only 543 remain with no category or reason group identified, which is 0.6% of the total.

The number of Bid Offer Acceptances in April 2024 is significantly higher than previous years but is in line with February and March 2024.



Other activities

We continue to closely support LCP for the second phase of their independent analysis, which is due to be delivered in June 2024.

RRE 1G Carbon intensity of ESO actions

This Regularly Reported Evidence (RRE) measures the difference between the carbon intensity of the combined Final Physical Notification (FPN) of machines in the Balancing Mechanism (BM) and the equivalent profile with balancing actions applied.

This takes account of both transmission and distribution connected generation and each fuel type has a Carbon Intensity in gCO2/kWh associated with it. For full details of the methodology please refer to the Carbon Intensity Balancing Actions Methodology document. The monthly data can also be accessed on the Data Portal here. Note that the generation mix measured by RRE 1F and RRE 1G differs.

It is often the case that balancing actions taken by the ESO for operability reasons increase the carbon intensity of the generation mix. More information about the ESO's operability challenges is provided in the Operability Strategy Report.

February 2024-25 performance

Figure: 2024-25 Average monthly gCO2/kWh of actions taken by the ESO (vs 2023-24)

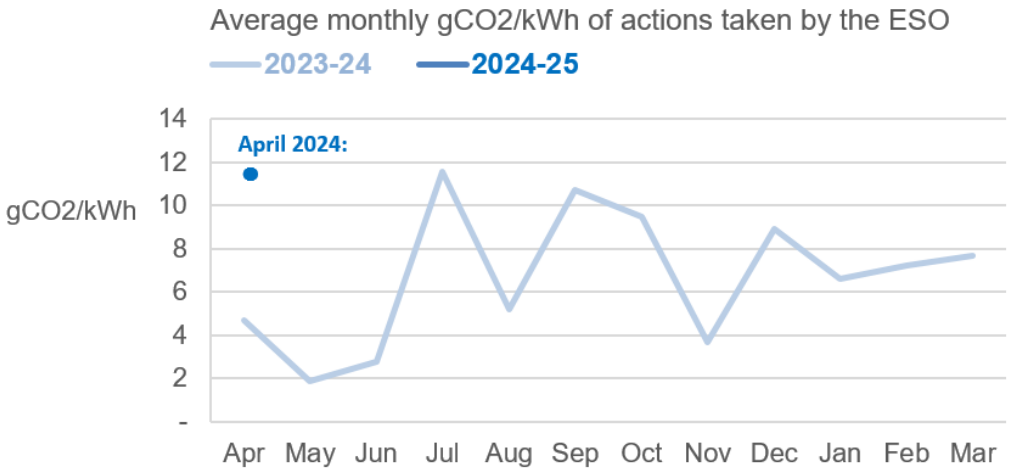


Table: Average monthly gCO2/kWh of actions taken by the ESO

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carbon intensity (gCO2/kWh)	11.87											

Supporting information

In April 2024 the average carbon intensity of balancing actions was 11.87gCO2/kWh. This is 4.1gCO2/kWh higher than last month and 7.27gCO2/kWh higher than the 4.7gCO2/kWh reported for April 2023

The majority of carbon intensity increase from ESO actions was seen between 12-15 April.

The largest increase to carbon intensity was on 19 April at 0930 (55.54 gCO2/kWh). This was due to the Feckenham 275kV circuit, recalled under Emergency Return to Service (ERTS) remaining out of service. It continued to be necessary to run a CCGT all day to help suppress system volts in the South West.

Voltages in the West Midlands continued to be an issue because of reduced wind output.

Between 21-26 April the average difference peaked at 5.42 gCO2/kWh on 23 April and remained consistently low.

RRE 1l Security of Supply

This Regularly Reported Evidence (RRE) shows when the frequency of the electricity transmission system deviates more than ± 0.3Hz away from 50 Hz for more than 60 seconds, and where voltages are outside statutory limits. On a monthly basis we report instances where:

- The frequency is more than ± 0.5Hz away from 50 Hz for more than 60 seconds
- The frequency was 0.3Hz - 0.5Hz away from 50Hz for more than 60 seconds.
- There is a voltage excursion outside statutory limits. For nominal voltages of 132kV and above, a voltage excursion is defined as the voltage being more than 10% away from the nominal voltage for more than 15 minutes, although a stricter limit of 5% is applied for where voltages exceed 400kV.

For context, the **Frequency Risk and Control Report** defines the appropriate balance between cost and risk, and sets out tabulated risks of frequency deviation as below, where 'f' represents frequency:

Deviation (Hz)	Duration	Likelihood
f > 50.5	Any	1-in-1100 years
49.2 ≤ f < 49.5	up to 60 seconds	2 times per year
48.8 < f < 49.2	Any	1-in-22 years
47.75 < f ≤ 48.8	Any	1-in-270 years

At the end of the year, we will report on frequency deviations with respect to the above limits and communicate any plans for future changes to the methodology.

April 2024-25 performance

Table: Frequency and voltage excursions (2024-25)

	2023-24											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Frequency excursions (more than 0.5 Hz away from 50 Hz for over 60 seconds)	0											
Instances where frequency was 0.3 – 0.5 Hz away from 50Hz for over 60 seconds	0											
Voltage Excursions defined as per Transmission Performance Report[3]	0											

Supporting information

April performance

There were no reportable voltage or frequency excursions in April.

[3] https://www.nationalgrideso.com/research-publications/transmission-performance-reports

RRE 1J CNI Outages

This Regularly Reported Evidence (RRE) shows the number and length of planned and unplanned outages to Critical National Infrastructure (CNI) IT systems.

The term ‘outage’ is defined as the total loss of a system, which means the entire operational system is unavailable to all internal and external users.

April 2024-25 performance

Table: 2024-25 Unplanned CNI System Outages (Number and length of each outage)

Unplanned	2024-25											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Balancing Mechanism (BM)	0											
Integrated Energy Management System (IEMS)	0											

Table: 2024-25 Planned CNI System Outages (Number and length of each outage)

Planned	2024-25											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Balancing Mechanism (BM)	0											
Integrated Energy Management System (IEMS)	0											

Supporting information

April performance

There were no outages, either planned or unplanned, encountered during April 2024.

Notable events during April 2024

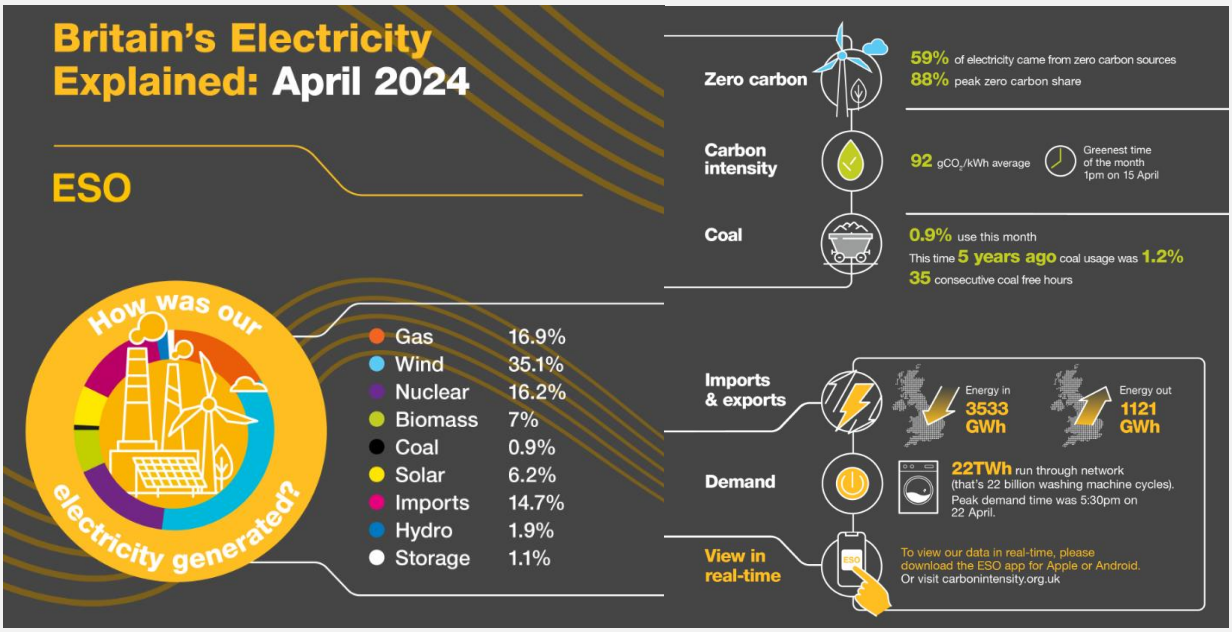
New low carbon records in April

On 15 April at 1pm, Great Britain achieved a new low carbon intensity record of 19gCO2/kWh, beating the record set earlier this month on 5 April of 21gCO2/kWh. The previous record of 27g CO2 per kWh was set on 18 September 2023. April's mild weather, coupled with high levels of wind and steady progress on connecting new sources of clean energy to our transmission network, have seen this comfortably beaten.

We continue to break records as we now have enough renewables connected to the network to meet weekday electricity demand. However we still require a small amount of fossil fuelled generation to provide inertia during periods of low demand to keep the system secure. By lowering the amount of inertia required to keep the system secure, we're using less fossil fuel. This means we are getting closer to operating a zero carbon electricity system.

Carbon intensity is a measure of how many grams of CO2 emissions are released to produce a kilowatt hour of electricity. Download our carbon intensity app to see real-time generations stats and our records.

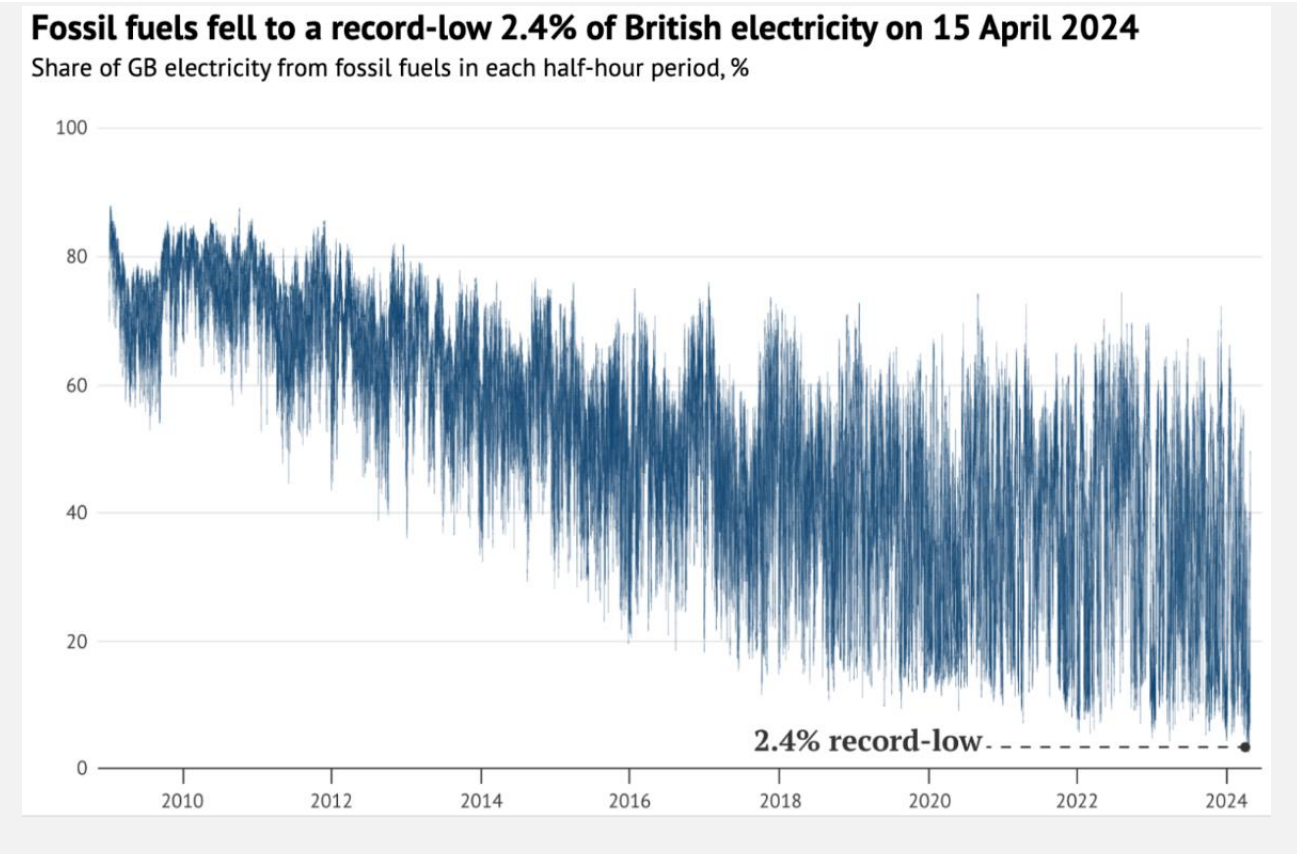
In April, wind was our largest source of generation for the third consecutive month, providing 35.1% of our electricity. 59% of electricity came from zero-carbon sources, peaking at 88% on 15 April at 1pm.



Fossil fuel use falls to record low

On 15 April the share of Great Britain's electricity being generated by fossil fuels fell to a record low of 2.4%. So far in 2024 there have been 75 half-hour periods when fossil fuels accounted for less than 5% of demand electricity demand compared to 16 in 2023 and 5 in 2022. Read Carbon Brief's interview with our System Operations Director on our progress to operating a zero-carbon electricity system and some of the challenges we're facing along the way.

The graph below shows the share of electricity in Great Britain being generated by fossil fuels in each half-hour period since 2009, including the record-low of 2.4% in April.


Fossil fuels fell to a record-low 2.4% of British electricity on 15 April 2024
Share of GB electricity from fossil fuels in each half-hour period, %
100
80
60
40
20
0
2.4% record-low
2010
2012
2014
2016
2018
2020
2022
2024

Role 2 (Market developments and transactions)

ESO

RRE 2E Accuracy of Forecasts for Charge Setting – BSUoS

This Regularly Reported Evidence (RRE) shows the accuracy of Balancing Services Use of System (BSUoS) forecasts used to set industry charges against the actual outturn charges.

The BSUoS charge (£/MWh) is now based upon a fixed tariff that was published in January 2023 and implemented in April 2023. Daily balancing costs (and other costs that ultimately make up the costs recovered through the BSUoS charge) were forecast for the year ahead, and two 6-month tariffs were set to cover the 2023/24 charging year.

We continue to forecast balancing costs monthly and measure our performance against this forecast. It remains an important metric to support the fixed tariff methodology by being the main component of the fixed BSUoS tariff. The BSUoS cost forecast (costs rather than what is charged against the fixed tariff) is probabilistic and therefore produces percentile values. The published forecast for each month is based on the central value of the BSUoS cost forecast (50th percentile). If the outturn BSUoS costs are below the 50th percentile of the cost forecast, then the actual costs for that month would be lower than the forecast predicted, provided the actual volume is at or above the estimate (and vice versa).

April 2024-25 performance

Figure: 2024-25 Monthly BSUoS forecasting performance (Absolute Percentage Error)

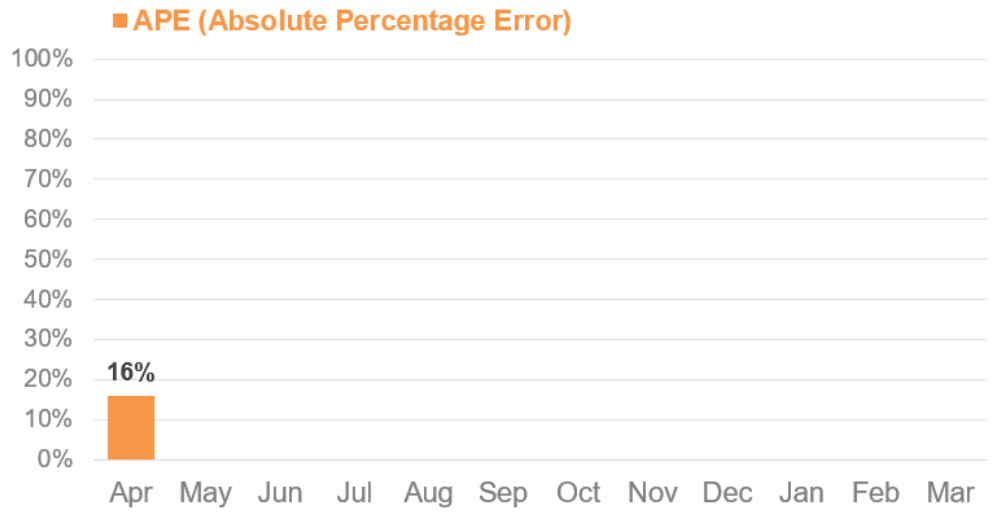


Table: Month ahead forecast vs. outturn BSUoS (£/MWh) Performance[4] - one-year view

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Actual (£ / MWh)	11.5											
Month-ahead forecast (£ / MWh)	9.7											
APE (Absolute Percentage Error)[5]	**16.0**											

[5] Monthly APE% figures may change with updated settlements data at the end of each month. Therefore, subsequent settlement runs may impact the end of year outturn.

Supporting information

April Performance:

Actuals out-turned above forecast for April, with an Absolute Percentage Error of 16.0. The increase in absolute percentage error from last month was a result of above forecast costs.

Costs:

April outturn costs were around the 70th percentile of the forecast produced at the beginning of March. Constraint costs were the main driver in the increase, which were £46m higher than our forecast, although only £19m higher than March outturn. Previous analysis has shown that one of the key drivers of constraint costs is the proportion of demand which is met by renewable generation. There was a 7% increase in the proportion of demand met by renewables in the April outturn compared to our April forecast.

Volumes:

April volume was broadly in line with the forecast for April made at the beginning of March. Forecast for April made at the start of March: 21.7TWh Outturn volume for February: 21.6TWh

Notable events during April 2024

Frequency Response and Reserve Roadshows

On 25 April in London and 1 May in Edinburgh, we held in-person Frequency Response and Reserve Roadshows. During this event, we presented on some upcoming IT and Policy changes for Response Reform that will be coming into effect or to consultation in the near future as well as a longer-term view of future reforms. Reserve Reform also presented on the new Quick and Slow Reserve products as well as highlighting some of the benefits the ESO have seen from the introduction of the new Balancing Reserve Service. We have published the slides from these events.

As well as presenting on some of these key topics, we were able to participate in valuable face-to-face conversations with a wide range of industry participants and stakeholders to answer any particular questions that they had as well as discuss their thoughts on some of the coming reforms. Views from providers during these events will help shape future developments.

Should anyone have any follow up questions or if they were unable to attend these events and would like to discuss the content further, please reach out to the team:
box.futureofbalancingservices@nationalgrideso.com

Role 3
(System insight, planning and network development)

ESO

Metrics and RREs: Please note there are no metrics or monthly RREs for Role 3

Notable events during April 2024

Summer Outlook 2024 published

On 11 April, we published our 2024 Summer Outlook, setting out our operational expectations for the national electricity network over the coming summer months. The full Summer Outlook and associated data workbook are published on our website or you can watch a short video here.

Security of Supply

We expect there to be sufficient available supply to meet demand at all times this summer. We expect to be able to support exports to neighbouring European countries if needed, continuing the close-working and coordinated support with our neighbouring transmission system operators.

Managing the System

Managing low demand is one of the most complex scenarios we face and can require a greater number of everyday actions to protect the network. These everyday actions include trading on the interconnectors to reduce imports or pumping and charging storage to increase demand.

We will continue to derive significant operability and efficiency benefits from the pathfinder projects, our suite of dynamic frequency services, new balancing products, new systems and the delivery and implementation of the 2023 Frequency Risk & Control Report (FRCR) recommendations. These measures reduce cost, save carbon and provide significant additional flexibility at times of low demand.

Market Prices and Balancing Costs

We expect balancing costs for summer 2024 to be lower than those incurred in summer 2023.

This summer, although we expect a minor increase in the volume of balancing actions, the cost of these will be offset by a combination of falling wholesale prices and activities undertaken by the ESO to minimise costs to consumers as outlined in our Balancing Costs Portfolio. The forecast cost of our balancing actions for summer 2024 is prepared based on seasonal average conditions.

In the coming months we will be publishing our first Annual Balancing Costs Report which will offer projections on balancing costs over the next decade and detail the impact of the wide range of our activities to minimise these costs.

Retrospective Application of Upcoming Long-Term Connections Reform

On 16 April, we published our initial proposals to further develop our First Ready, First Connected approach originally announced in December, which would now apply to the whole queue and not just new projects. We refer to this proposal as TMO4+ (Target Model Option 4). This development on last year's initial proposal, if implemented, could potentially more than halve the size of the queue, enabling earlier connection dates for projects ready to connect, allowing our First Ready customers to be connected first.

We are aiming for this process to go live in January 2025. It is important that everyone understands how these proposed changes may impact their projects. Also how it impacts what criteria and processes will be required in order for projects to demonstrate 'readiness' and secure a queue position (we refer to these criteria as 'Gate 2').

Current projects would be given a time period following approval of the relevant code modifications, to demonstrate whether they have met Gate 2 under the TMO4+ process. For projects which do, they will have the option to retain their current connection date, or request an accelerated connection date.

Projects which do not meet the Gate 2 criteria, will receive an indicative connection date and connection point. These projects can apply for a queue position and confirmed connection date and location when they have met the Gate 2 criteria.

Industry code modification working groups started in May and Ofgem expects to make a decision on the relevant code modification proposals by early November. For more information on the Connections Reform process, please see here.

Connections: Customer Seminar and Reform Progress

On 23 April, we hosted our bi-annual Customer Connections Seminar for over 160 guests in Glasgow. Through a series of panel discussions, breakout sessions and drop-in rooms, customers and stakeholders had the opportunity to engage in conversations around key connections topics. These included: reform, delivery of tactical initiatives, compliance, connections operations and digitalising the application process. In line with our commitment to offering transparency through a time of great change, speakers from Department for Energy Security and Net Zero (DESNZ), Ofgem, Energy Networks Association (ENA), SP Transmission (SPT), Scottish and Southern Electricity Networks Transmission (SSENT) and National Grid Electricity Transmission (NGET) joined us to share views from across government and the industry.
A key topic of conversation at the seminar and our ongoing monthly forums was Connections Reform, following the recently published Retrospective Application of Upcoming Long-Term Connections Reform.