ESO RIIO2 Business Plan 2 (2023-25)

July 2023 Incentives Report

23 August 2023

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.

Please see our website for more information.

Summary of Notable Events

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

- On 28 July, we released our latest features for the Connections Portal. This release included the ability to submit multiple connection applications whilst other applications are in flight, automation of the application fee invoice process, and the ability for Customers to provide feedback directly via the Portal.
- On 17 July, we ran an industry webinar signifying the conclusion of the Stability Market Design innovation project, followed by the launch of the Mid-term (Y-1) Stability Market RFI.
- On 4 July, we hosted our Net Zero Market Reform (NZMR) Phase 4 conclusions webinar. During the event we presented an overview of the NZMR programme to date, our assessment of investment policy options for net zero, our latest conclusions, and our next steps.
- On 6 July, we published the first phase of the DFS Consumer Evaluation and held a webinar to discuss the findings in more detail. The webinar was attended by over 160 external stakeholders including energy suppliers, aggregators, DNOs, regulators, government and consultancies.
- On 10 July, we launched our 2023 Future Energy Scenarios report which set out a range of different, credible ways to decarbonise our energy system as we strive towards the 2050 net zero target. We were joined by nearly 100 stakeholders at the Science Museum in London for the first of our 2023 launch events, where we presented the key messages from FES and provided the opportunity for questions to our panel of speakers.
- On 26 July, we published the Innovation Annual Summary. It features case studies which introduce some of our key innovation projects. Each case study has a useful 1-minute explainer video from our project leads, these can be found as part of our interactive 2022/23 Innovation Annual Summary here. It's a great introduction to innovation and learning more about how we're tackling the challenges of the energy transition throughout the ESO.
- On 25 July, the Market Monitoring team and the Balancing Costs team hosted a two-and-a-half-hour industry workshop to 40 industry participants to discuss our analytical capability into Balancing Costs and its utility across the industry, as well as a review of our Balancing Costs Strategy. The engagement was incredibly productive and a great way of increasing transparency.

Summary of Metrics and RREs

The tables below summarise our Metrics and Regularly Reported Evidence (RRE) for July 2023.

Metric/RRE		Performance	Status
Metric 1A	**Balancing Costs**	£238m vs benchmark of £212m	●
Metric 1B	**Demand Forecasting**	Forecasting error of 569MW vs indicative benchmark of 481MW	●
Metric 1C	**Wind Generation Forecasting**	Forecasting error of 6.34% vs indicative benchmark of 3.57%	●
Metric 1D	**Short Notice Changes to Planned Outages**	0 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**	92.5% of actions taken in merit order	N/A
RRE 1G	**Carbon intensity of ESO actions**	11.6gCO_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 29.1%	N/A

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

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

Adelle Wainwright

Acting ESO Regulation Senior Manager

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 has been 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 has been derived using the historical relationships between those two drivers and balancing costs:

1. The benchmark has been created using monthly data from the preceding 3 years.

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

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

4. Ex-post actual data inputted 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 = 54.48 + (Day Ahead baseload x 0.52)
Constraint costs = -32.66 + (Day Ahead baseload x 0.34) + (Outturn wind x 25.72)

Benchmark (Total) = 21.82 + (Day Ahead baseload x 0.86) + (Outturn wind x 25.72)

**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.

July 2023-24 performance

Figure 1: 2023-24 Monthly balancing cost outturn versus benchmark

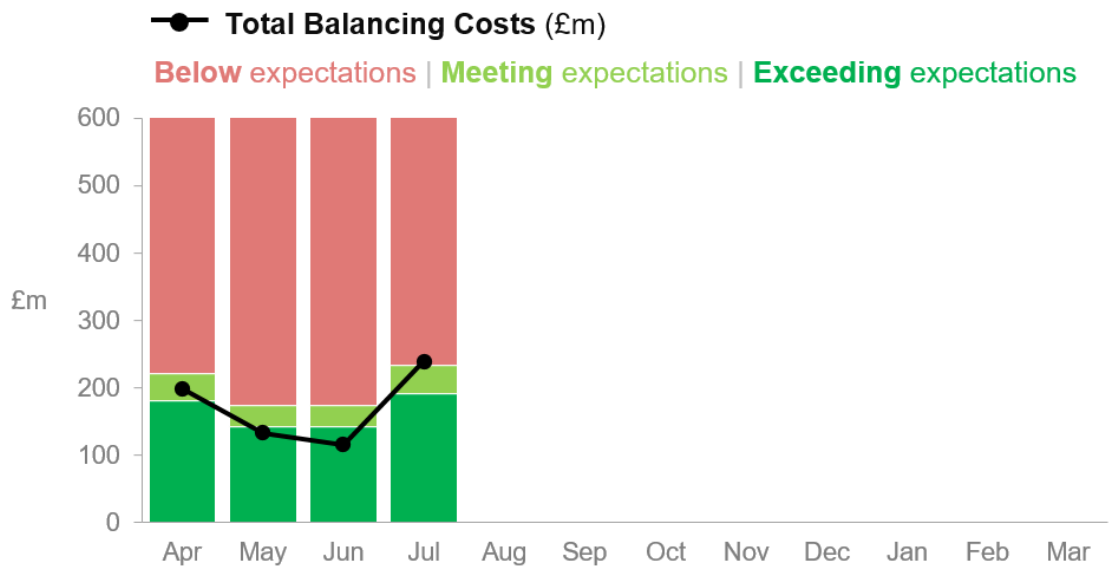


Table 1: 2023-24 Monthly breakdown of balancing cost benchmark and outturn

All costs in £m	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	YTD
Outturn wind (TWh)	3.4	2.6	2.4	4.6									12.9
Average Day Ahead Baseload (£/MWh)	105	81	87	82									356
Benchmark	200	157	158	212									727
Outturn balancing costs[1]	**198**	**132**	**115**	**238**									**684**
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

Ongoing data issue:

Please note that due to a data issue over the previous months, the Minor Components line in Non-Constraint Costs is capturing some costs 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.

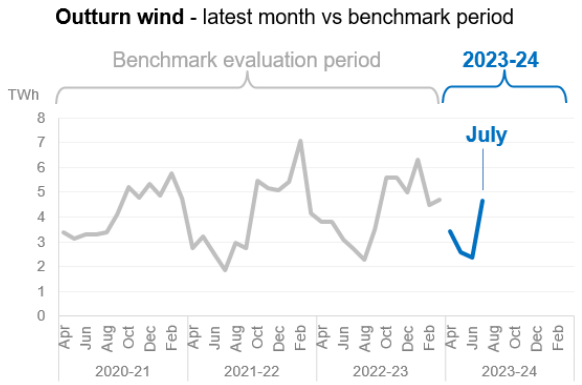
We continue to investigate and will advise when we have a resolution.

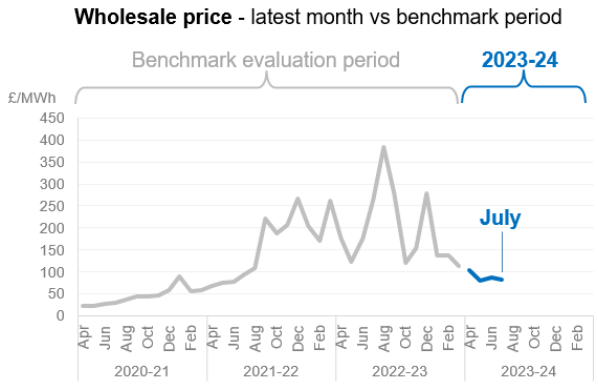
This month's benchmark

The benchmark of £212m reflects:

- a higher-than-average **outturn wind** figure compared to the benchmark evaluation period (the last three years).
- a relatively low average monthly **wholesale price** (Day Ahead Baseload) compared to the 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.





July performance

July's total balancing costs were £238m which is £26m above the benchmark of £212m, and therefore below expectations. As you can see from the above graphs, although this month the average wholesale price remained low, the wind out-turn had a significant increase compared to the relevant benchmark period. Therefore, we would expect a significant change in actuals between June and July. This is broadly the case, with actual balancing costs of £238m in July compared to £115m in June.

Additional Operability actions in Scotland: Since 12 June we have experienced occasions of 8Hz frequency oscillations on the electricity transmission system in Scotland. This is not a new phenomenon and has been seen before on our network, however following the oscillations, we have implemented mitigating measures to optimise the operation of the system to prevent the re-occurrence of the oscillations. We are working out the costs of these mitigating actions.

Breakdown of costs vs previous month

Balancing Costs variance (£m): July 2023 vs June 2023

		(a) Jun-23	(b) Jul-23	(b) - (a) Variance	decrease ◂▸ increase Variance chart
Non-Constraint Costs	Energy Imbalance	-4.5	7.6	12.1	
	Operating Reserve	26.0	23.2	(2.7)	
	STOR	3.2	3.2	(0.0)	
	Negative Reserve	0.1	0.3	0.3	
	Fast Reserve	13.9	16.9	2.9	
	Response	17.2	25.1	7.9	
	Other Reserve	1.4	2.0	0.6	
	Reactive	15.7	16.1	0.4	
	Restoration	2.6	3.8	1.3	
	Winter Contingency	0.0	0.0	0.0	
	Minor Components	8.5	13.1	4.7	
Constraint Costs	Constraints - E&W	15.7	53.6	37.9	
	Constraints - Cheviot	0.7	2.5	1.8	
	Constraints - Scotland	1.8	20.8	19.0	
	Constraints - Ancillary	0.2	0.2	0.1	
	ROCOF	8.4	24.1	15.6	
	Constraints Sterilised HR	4.5	25.6	21.1	
Totals	Non-Constraint Costs - TOTAL	84.0	111.5	27.5	
	Constraint Costs - TOTAL	31.3	126.8	95.5	
	Total Balancing Costs	**115.2**	**238.3**	**123.0**	

As shown in the total rows from the table above, the non-constraint & constraint costs both increased by £27.5m & £95.5m respectively, resulting in an overall increase of £123m compared to June 2023.

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

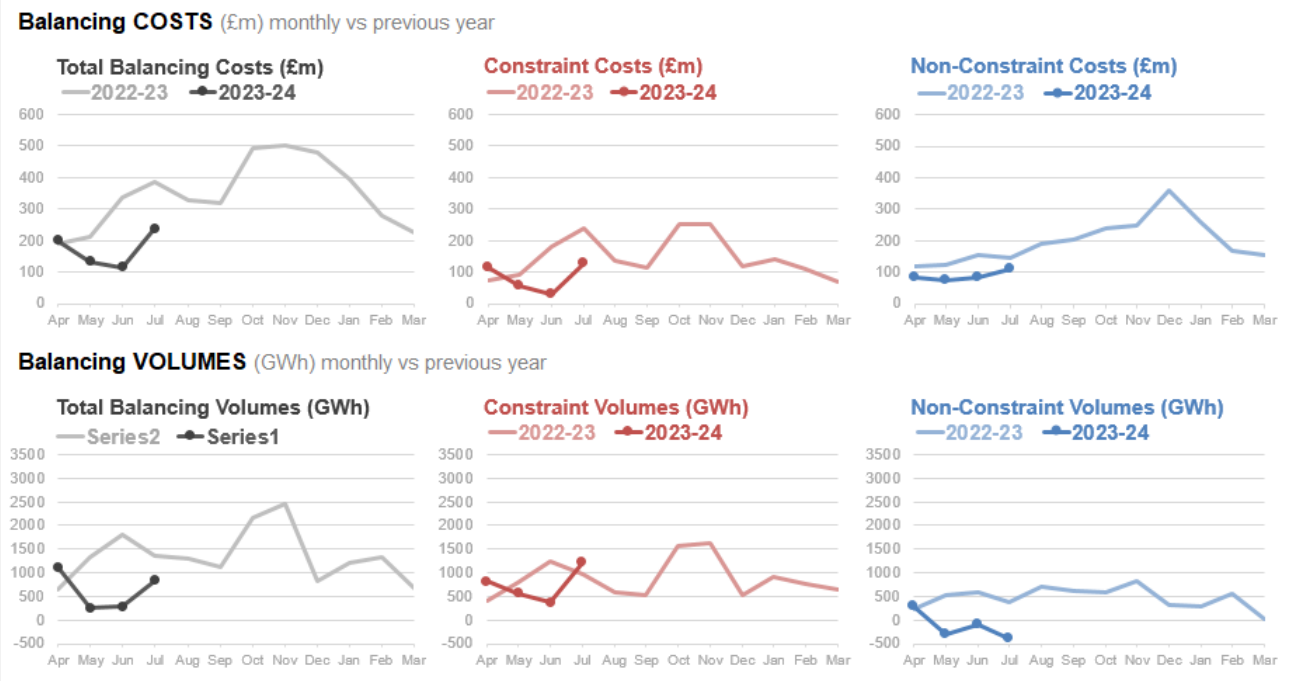
- **Constraint-England & Wales**: £38m increase, due to 44GWh more than the previous month*
- **Constraint-Scotland**: £19m increase, over 100GWh more than the previous month.
- **Constraints Sterilised Headroom**: £21.1m increase. Cost increase is in line with the increasing of constraint actions because more headroom had to be replaced using Balancing Mechanism (BM) actions on the system outside the constraint.
- **ROCOF**: £15.6m increase, more than 240GWh compared to the previous month*

* High wind generation, low demand and extra operability actions in Scotland resolved a higher volume of constraint actions.

Non-constraint costs: The main drivers of the biggest variances this month are detailed below:

- **Energy Imbalance**: £12.1m increased, 80GWh more than the previous month.

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 mainly Operating Reserve cost and volume. The narrative below discusses the broad themes of spend. The figures will be revised once the data issue is resolved.

Constraint costs

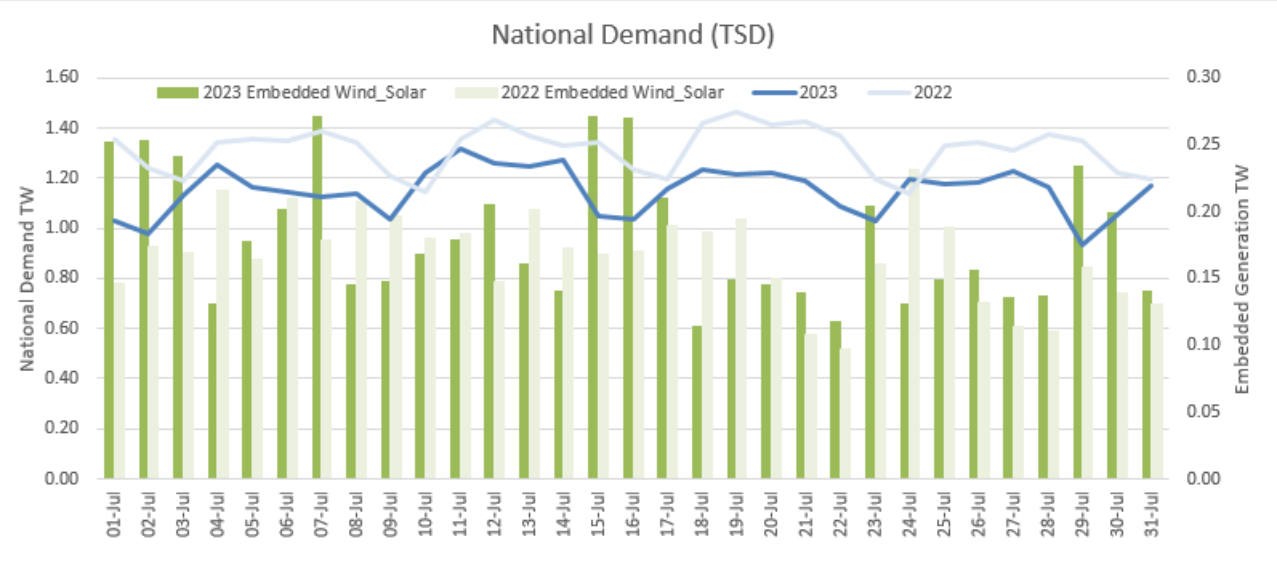
Compared with the same month of the previous year:	Constraint costs were £112m lower than in July 2022 due to: • Lower average wholesale prices**
Compared with last month:	Constraint costs were £95.5m higher than in July 2023 due to: • significantly higher volume of actions (over 840GWh more than last month)

Non-constraint costs	
Compared with the same month of the previous year:	Non-Constraint costs were £35.4m lower than in July 2022 due to: • Significant decrease of the volume of actions (780 GWh less than the previous year) • Lower average wholesale prices **
Compared with last month:	Non-Constraint costs were £27.5m higher than in July 2023 due to: • 290 GWh higher* volume of actions * The Non-Constraint category consists of several subcategories including imbalance, response, reserve and restoration.

****** Average wholesale prices July-23 £82 /MWh instead of £265/MWh of July-22

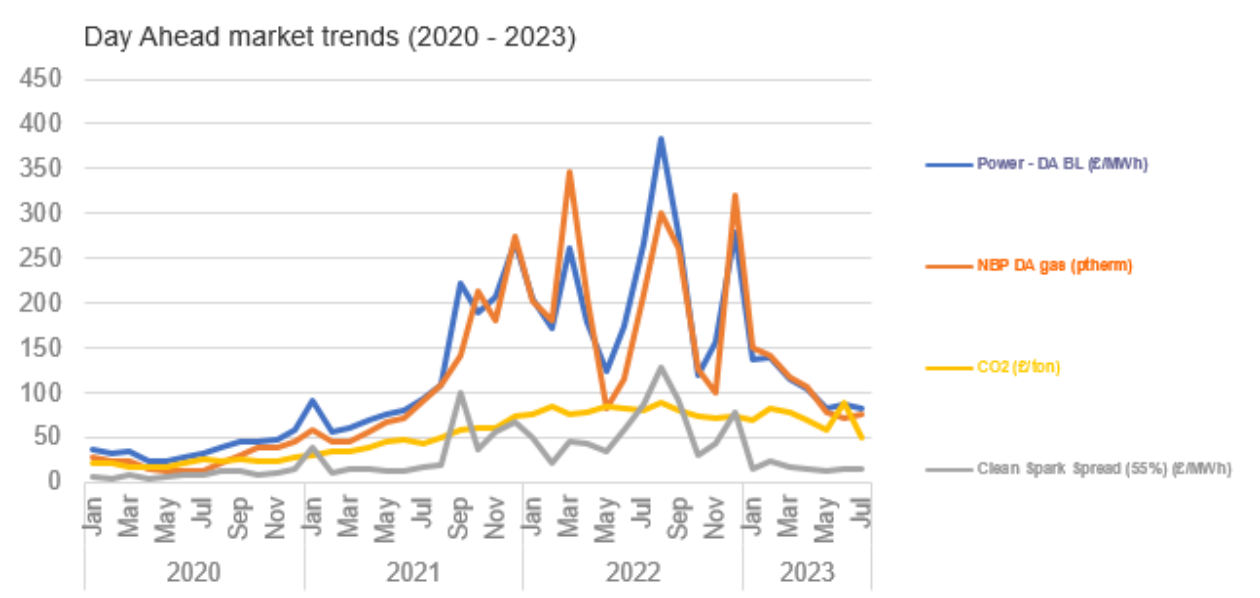
July daily National Demand (TSD*), Embedded Wind and Solar Generation

National Demand lower than the same period last year, but embedded wind & solar generation are higher (National Demand: 5.1TW lower – Embedded Generation: 420GW higher).



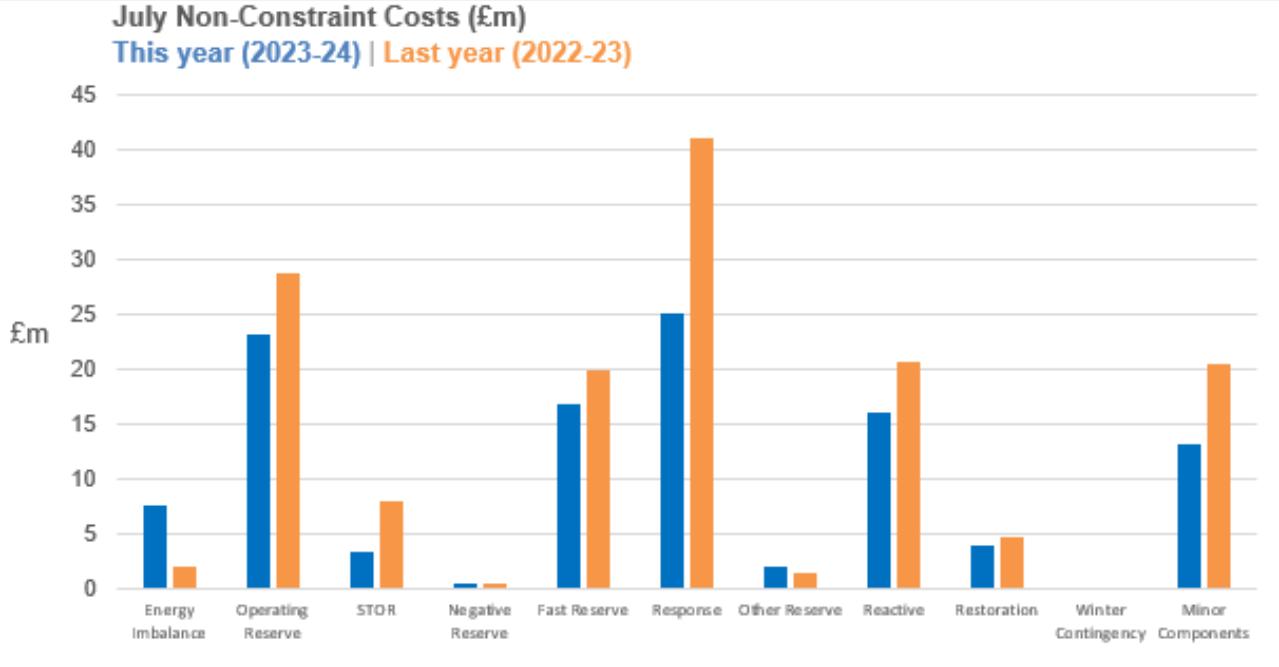
* Transmission System Demand is equal to the National Demand (ND) plus the additional generation required to meet station load, pump storage pumping and interconnector exports. Transmission System Demand is calculated using National Grid ESO operational metering. Note that the Transmission System Demand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

Changes in energy balancing costs



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

All trends decreased or had a small deviation from last month and remain lower compared to the previous year.



Comparing the non-constraint costs of July 2023 with those of July 2022, all the categories showed a decrease or a small deviation except the Energy Imbalance

- **Energy Imbalance** £5.6m increase due to ~80GWh more volume of actions taken to balance the system
- **Response decreased** by £16m, due to lower average wholesale prices and a 150GWh decrease in the absolute volume of actions.

Drivers for unexpected cost increases/decreases

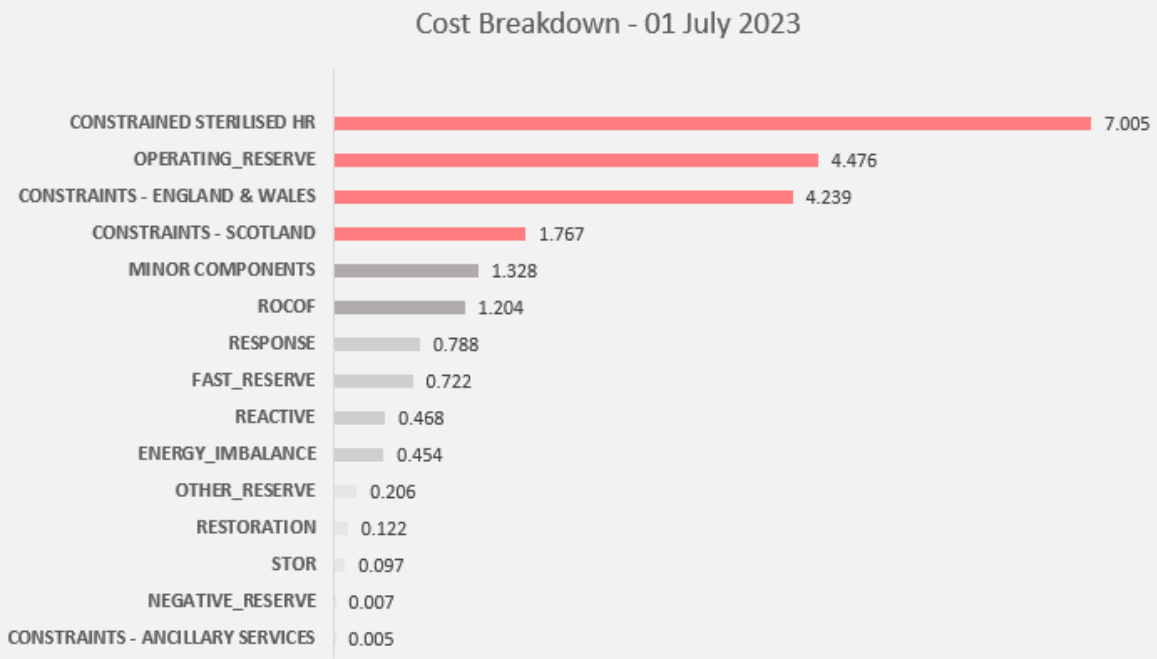
Margin prices (the amount paid for one MWh) have decreased compared to June 2023 and the corresponding period of the previous year.

Daily Costs Trends

As mentioned above, July's balancing costs were £123m higher than the previous month due to a significant increase in the wind generation which led to higher volume of actions taken to manage constraints.

At the date of publication, we have recorded 4 days with a spend of more than £15m.

On the weekend 01 & 02 July when the total spend were slightly below £46m, the major cost components were driven by high renewable generation, low demand and extra operability actions in Scotland. No individual action was extremely expensive, but high volumes of wind curtailment, combined with a large volume of voltage and RoCoF actions resulted in very high total balancing costs.



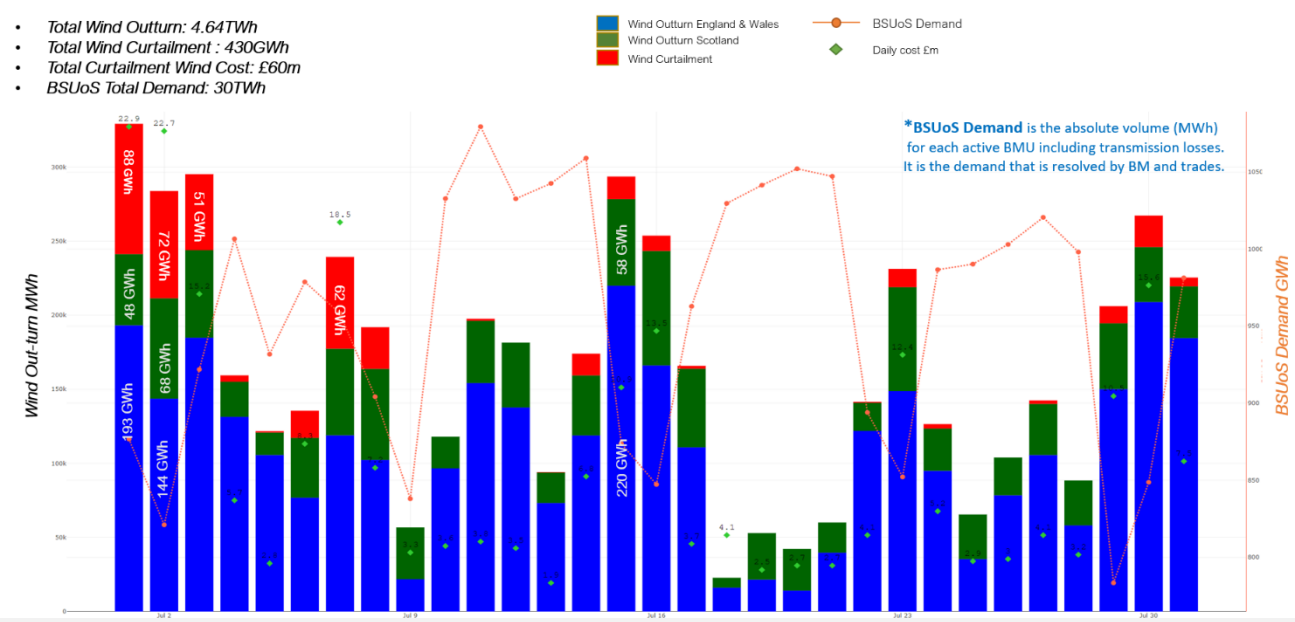
The minimum cost of £1.9m was observed on 13 July.

The average daily spend for the month was £7.8m, a £4m increase from the previous month.

Daily Wind Outturn – Wind Curtailment and BSUoS Demand

The chart below serves the purpose of supporting the transparency and the narrative 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 – orange dotted line) and daily cost (green 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 Optional Downward Flexibility Management (ODFM) and/or Demand Flexibility Service (DFS) are instructed by the ESO, this will be retrospectively accounted for in the data used to calculate performance. The ESO shall publish the volume of instructed ODFM to enable this to be done.

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.

July 2023-24 performance

Indicative benchmark figures for 2023-24: 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 2: 2023-24 Monthly absolute MW error vs Indicative Benchmark

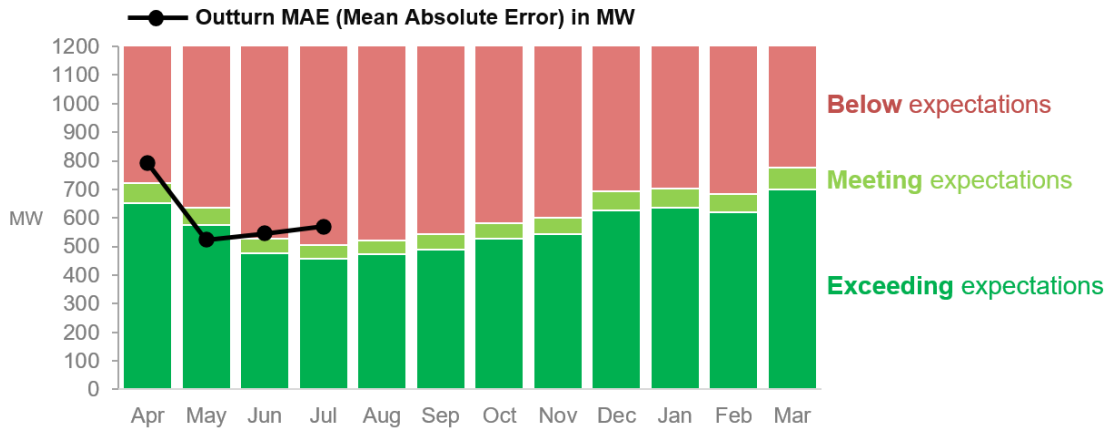


Table 2: 2023-24 Monthly absolute MW error vs Indicative Benchmark

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Indicative benchmark (MW)	687	606	503	481	497	516	554	571	659	669	651	738
Absolute error (MW)	**791**	**523**	**546**	**569**								
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 July 2023, the mean absolute error (MAE) of our day ahead demand forecast was 569 MW compared to the indicative 'meeting expectations' target of 505 MW, and therefore below expectations.

The weather in July was 'unsettled', and 'autumnal in character' as reported by the Met Office. This included below average temperatures and sunshine, above average rainfall, and a succession of frontal systems progressing west-to-east across the UK.

Forecasting performance across the month was reasonable with the exception of 3 particularly bad days - July 3, 8 and 31. The remainder of the month included a mixture of performance, including 12 days with accuracies better than the monthly 'exceeding expectations' target.

Solar forecasting errors played a large part in these poor accuracy days, with all 3 having much lower embedded generation outturn than expected. This is mostly due to cloud cover which is difficult for weather forecasters to predict at day ahead and can change rapidly even at 1 hour ahead. 8 Jun was also affected by lower than forecast winds, reducing the embedded wind generation and increasing demand error. ESO have engaged with the Met Office with a view to improving solar irradiance forecasts at the earliest opportunity.

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 (1488)
1000 MW	239	16%
1500 MW	90	6%
2000 MW	39	3%
2500 MW	22	1%
3000 MW	14	1%

The days with largest MAE were July 4, 8 and 31.

Missed / late publications

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

Triads

Triads only take place between November and February and therefore did not impact on forecasting performance during Q2.

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.

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.

July 2023-24 performance

Indicative benchmark figures for 2023-24: 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 3: 2023-24 BMU Wind Generation Forecast APE vs Indicative Benchmark

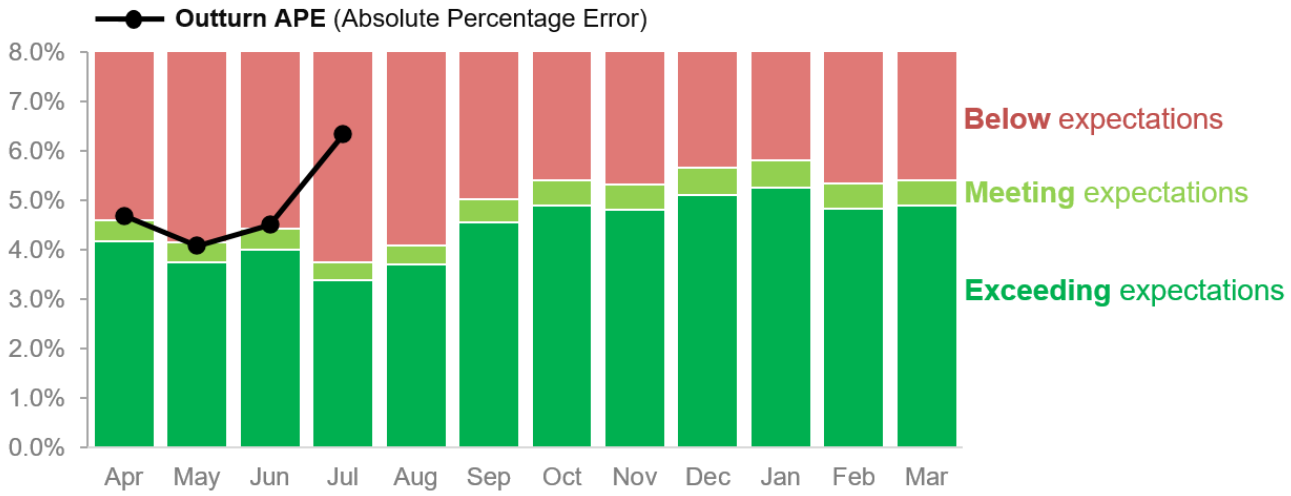


Table 3: 2023-24 BMU Wind Generation Forecast APE vs Indicative Benchmarks

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Indicative benchmark (%)	4.38	3.95	4.21	3.57	3.89	4.79	5.15	5.06	5.38	5.53	5.08	5.14
APE (%)	**4.69**	**4.08**	**4.50**	**6.34**								
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

July is normally a calm month with regards to weather, but due to the location of the Jet Stream for much of the month, low pressure weather systems were pushed across the UK with a conveyor belt of wet and windy weather. This made accurate forecasting of wind power more of a challenge during these changeable conditions. July 2023 is a massive contrast to July 2022 where temperature records were broken during the period of sustained predictable weather.

Unfortunately, July 2023 was overwhelmed with a sustained period of unusually poor weather, with numerous low pressure systems and tropical storms passing through.

For the month of July the wind power forecast accuracy achieved was 6.34% with a target of 3.57%. On this occasion the monthly target was missed.

Withdrawal of wind units

CfD activity was observed on several weekends, of which ESO currently do not make any forecast adjustments for this. However, work is ongoing to investigate this, with an aim to model this market behaviour at the earliest opportunity. Sunday 2 July experienced significant commercial activity.

Missed / late publications

In July 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.

July 2023-24 performance

Figure 4: 2023/24 Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

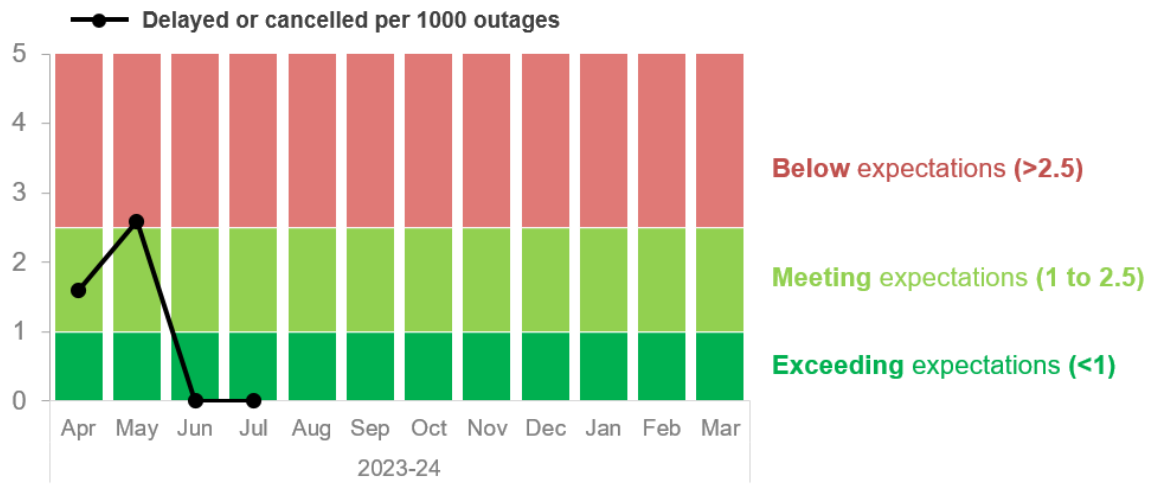


Table 4: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	YTD
Number of outages	624	739	645	644									2652
Outages delayed/cancelled due to ESO process failure	1	2	0	0									3
Number of outages delayed or cancelled per 1000 outages	1.6	2.6	0	0									1.13
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 July, the ESO has successfully released 644 outages and there has been zero delays or cancellations that occurred due to an ESO process failure. The number of stoppages or delays per 1000 outages is 0, which is inside the 'Exceeds Expectations' target of less than 1 delays or cancellations per 1000 outages. The number of outages released in July 2022 was 660 and has decreased in July 2023 to 644, this is due to the reduced number of outage requests received from the TOs/DNOs for this period. Overall, the ESO is continuing to liaise with the TOs and DNOs to effectively facilitate system access through weekly or month liaison meetings to maximize system access.

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.

July 2023-24 performance

Figure 5: 2023-24 Percentage of balancing actions taken in merit order in the BM

Table 5: 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)	94.1%	90.9%	98.0%	92.5%								
Percentage of actions that have reason groups allocated (category applied, or reason group applied)	99.7%	99.6%	99.9%	99.7%								
Percentage of actions with no category applied or reason group identified	0.3%	0.4%	0.1%	0.3%								

Supporting information

July performance

This month 92.5% of actions were taken in merit order or taken out of merit order due to an electrical parameter. For the remaining actions, where possible, we allocate actions to reason groups for the purposes of our analysis. During July 2023, there were 57500 BOAs (Bid Offer Acceptances) and of these, only 188 remain with no category or reason group identified, which is 0.3% of the total.

Other activities

During July we continued to meet bilaterally with some individual customers to answer their questions and discuss their concerns. We have begun our own analysis of the Dispatch Transparency datasets to provide insights into the overall trends in dispatch decision making as well as the specific concerns for particular customer segments. We will use the outputs from this analysis to inform the ongoing coordinated engagement by teams from across the ESO.

We responded to The Electricity Storage Network's (ESN) open letter calling for reforms to the Balancing Mechanism. Details of the letter and our response can be found at: ESO responds to ESN call for Balancing Mechanism reforms | ESO (nationalgrideso.com) . Our response included detailing the actions the ESO has already taken to support batteries entering the market:

- Developed a new suite of frequency response markets that are currently only accessed by battery storage;
- Run battery trials to improve how we dispatch these assets; and
- We have taken the decision to update legacy dispatch tools that have already started to deliver a positive change in storage dispatch.
- We have made additional, incremental changes to our legacy dispatch systems to improve dispatch options in the control room prior to this December 2023 release.
- To further help with the utilisation of battery assets in the BM. We have prioritised the first release of the new Open Balancing Platform, due to be released from December 2023

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.

July 2023-24 performance

Figure 6: 2023-24 Average monthly gCO2/kWh of actions taken by the ESO (vs 2022-23)

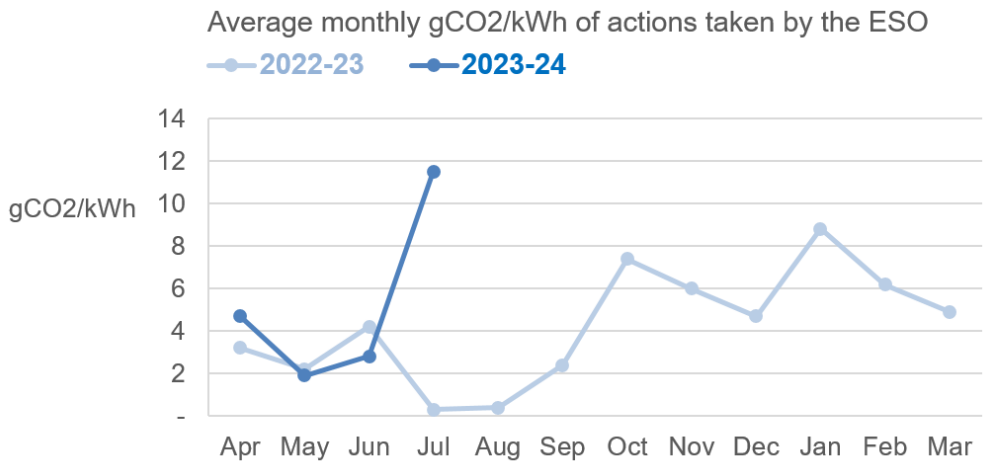


Table 6: Average monthly gCO2/kWh of actions taken by the ESO

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Carbon intensity (gCO2/kWh)	4.7	1.9	2.8	11.6								

Supporting information

In July 2023, the average carbon intensity of balancing actions was 11.55gCO2/kWh. This is 11.29g higher than July 2022.

Across the month, our actions reduced the carbon intensity in 43% of settlement periods. The greatest impact of our actions on carbon intensity was seen throughout the day on 1 July, at its highest during the early evening to late evening and peaking at +77 gCO2/kWh. During this period, renewable generation was high and peaked at 15GW at 17:00. Multiple generation units were also synchronised to provide stability services throughout the day. This pattern was similar for a number of days in July, including 8 July and the weekend of 15-16 July. Due to high wind throughout July, this resulted in an increased volume of BOA actions being taken to manage inertia and voltage when compared with prior months. This is coupled with an increase in actions taken to manage system security in July.

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.

July 2023-24 performance

Table 7: Frequency and voltage excursions (2023-24)

	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	0	0	0								
Instances where frequency was 0.3 – 0.5 Hz away from 50Hz for over 60 seconds	0	0	1	0								
Voltage Excursions defined as per Transmission Performance Report[3]	0	0	0	0								

Supporting information

There were no reportable voltage or frequency excursions in July.

[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.

July 2023-24 performance

Table 8: 2023-24 Unplanned CNI System Outages (Number and length of each outage)

Unplanned	2023-24											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Balancing Mechanism (BM)	0	0	0	0								
Integrated Energy Management System (IEMS)	0	0	0	0								

Table 9: 2023-24 Planned CNI System Outages (Number and length of each outage)

Planned	2023-24											
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Balancing Mechanism (BM)	0	0	1 outage (185 mins)	0								
Integrated Energy Management System (IEMS)	0	0	0	0								

Supporting information

July performance

There were no outages, either planned or unplanned, encountered during July 2023.

Notable events during July 2023

Industry workshop to discuss Balancing Costs and share our Balancing Costs Strategy

On the 25 July, the Market Monitoring team and the Balancing Costs team hosted a two-and-a-half-hour industry workshop open to market participants, DESNZ, and Ofgem to discuss our analytical capability into Balancing Costs and its utility across the industry, as well as a review of our Balancing Costs Strategy. Balancing Costs have increased significantly over the last few years and have become a major topic of interest from the industry as they are forecast to continue to rise. We have been providing insights and have been developing a strategy to minimise Balancing Costs.

The session was attended by over 40 industry participants and provided an open forum where we could share our insights and strategy, but also receive feedback and listen to the views of industry. We received useful feedback on drivers of Balancing Costs, how we can improve our reporting and analysis of Balancing Costs, and what initiatives we can emphasise or push to make the Balancing Mechanism a better functioning market. The engagement was incredibly productive, and it has been remarked by DESNZ as a great initiative in increasing transparency. The outputs of these sessions will feed into our balancing costs strategy document which will be published in the next few weeks.

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. 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 as 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).

July 2023-24 performance

Figure 7: 2023-24 Monthly BSUoS forecasting performance (Absolute Percentage Error)

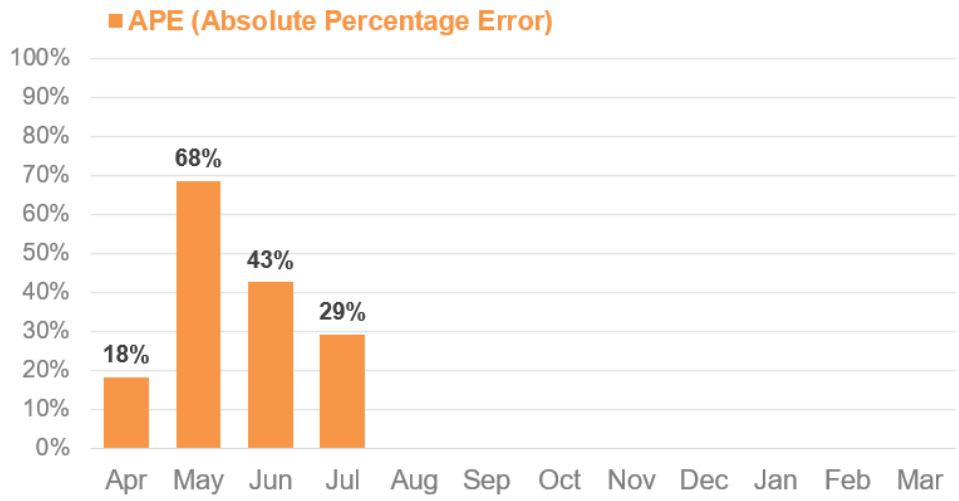


Table 10: Month ahead forecast vs. outturn BSUoS (£/MWh) Performance[4] - one-year view

	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Actual (£ / MWh)	10.8	8.2	7.5	13.7								
Month-ahead forecast (£ / MWh)	12.7	13.8	10.8	9.7								
APE (Absolute Percentage Error)[5]	**18.0**	**68.4**	**42.5**	**29.1**								

[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

July Performance:

Actuals out-turned above forecast in July 2023, but the Absolute Percentage Error (APE) decreased from 43% in May 2023 to 29% in June 2023. The main driver was constraint costs being significantly higher than forecast.

Costs:

July outturn costs were around the 95th percentile of the forecast produced at the beginning of June.

This was primarily due to constraint costs being significantly higher in outturn (£127m) than in the forecast in June (£67m).

Forecast for June made at the start of May: £142m

Outturn costs for June: £237m

Volumes:

July actual volume was slightly below forecast.

Forecast BSUoS volume (made at the start of June): 20.5TWh

July actual BSUoS volume: 20.0TWh

Notable events during July 2023

Stability Market Webinar and launch of mid-term (Y-1) stability market RFI

On 17 July 2023 we ran an industry webinar signifying the conclusion of the Stability Market Design innovation project, followed by the launch of the Mid-term (Y-1) Stability Market RFI.

The webinar, jointly hosted by consultants Afry, who we have worked closely with on the design of future stability markets, summarised the key outputs and the recommendations that have been reached throughout the two-year project. It was open to all industry participants and provided an opportunity to share thoughts and ask questions on the recommended market designs. The key outputs from this work signalled the need for three distinct future market designs: long term (Y-4), mid-term (Y-1) and day ahead (DA).

The second half of this webinar marked the launch of the first of these markets, the mid-term (Y-1) market, with the publication of our Request for Information (RFI) to gather industry perspectives on a variety of topics, to help us design the tender process for this market. Once all RFI responses have been gathered and assessed, we will use this feedback to design and finalise the tender process to formally begin the process of procuring stability services through our new market design.

Net Zero Market Reform Phase 4 conclusions webinar

On 4 July, we hosted our Net Zero Market Reform (NZMR) Phase 4 conclusions webinar. The NZMR programme was launched in early 2021 to examine holistically the changes to GB electricity market design that would be required to achieve the power sector's 2035 decarbonisation targets cost-efficiently and securely, while laying the foundation for a net zero economy by 2050.

During the event we presented an overview of the NZMR programme to date, our assessment of investment policy options for net zero, our latest conclusions, and our next steps. As part of the webinar, we hosted a panel discussion titled "How should investment policy evolve to support a net zero market", and were joined by James Samworth from Schroders Greencoat, Rachel Fletcher from Octopus Energy, and Andrew McAleavey from Penso Power Ltd. The webinar also included a dedicated question and answer session with the Market Strategy team. The recording, slides and Q&A can be found on our NZMR website.

This event will be followed up with a more detailed report in the autumn. Sign-up to our mailing list to keep up to date with the programme.

Demand Flexibility Service (DFS) Consumer Evaluation report and webinar

On 6 July, we published the first phase of the DFS Consumer Evaluation and held a webinar to discuss the findings in more detail. The ESO commissioned the Centre for Sustainable Energy through Network Innovation Allowance (NIA) funding to carry out a consumer evaluation of DFS to understand how consumers participated over winter 2022/23, what the barriers to participation were and what could be improved for future flexibility services. The project is in 2 phases: the first phase carried out social research with participating domestic consumers and the second phase will analyse smart meter data and link this to social research where consumers have allowed us to do so.

We were joined on the webinar by colleagues from the Centre for Sustainable Energy (CSE) who carried out the work on behalf of the ESO. The webinar was attended by over 160 external stakeholders including energy suppliers, aggregators, DNOs, regulators, government and consultancies.

We are aiming to publish the second phase report (smart meter data analysis) in early winter 2023.

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 July 2023

Launch of Future Energy Scenarios (FES)

On 10 July, we launched our 2023 Future Energy Scenarios report which set out a range of different, credible ways to decarbonise our energy system as we strive towards the 2050 net zero target. Our Future Energy Scenarios report sets out the key messages and recommendations for delivering a net zero whole energy system. Alongside the report, we published our data workbook which includes all of the data and charts behind the report.

We were joined by nearly 100 stakeholders at the Science Museum in London for the first of our 2023 launch events, where we presented the key messages from FES and provided the opportunity for questions to our panel of speakers. We live-streamed the event direct to YouTube, where over 500 stakeholders watched. The event now has over 2k views. We followed the event in London with four virtual webinars, each one taking a deeper look at the main chapters from the main FES report. We were delighted to be joined by over 2,000 stakeholders across all webinars. Again, we had plenty of time for questions from attendees, receiving over 430 in total. After each webinar we hosted themed-based virtual networking sessions for attendees, over 200 stakeholders took part.

During the 2023 launch week (10 July – 16 July) we saw a total of 4,342 document downloads from the FES website and 8,914 pageviews.

New Connections portal features

On the 28 July we released our latest features for the Connections Portal. This is in line with our regular release plan for the Portal improving upon the Minimum Viable Product (MVP) release in March 2023. July's release included the ability to submit multiple connection applications whilst other applications are in flight, automation of the application fee invoice process and the ability for Customers to provide feedback directly via the Portal.

The Connections Portal has been designed to transform the connections journey and account management for all customers. The Portal already includes the following high-level functionality:

- Apply for connections and other agreements online
- Monitor live applications and track progress
- View of key milestones/milestone management
- Communicate directly with your Connections Contract Manager.

We are always looking for ways to continuously improve the Connections Portal for our customers, and will be running a series of webinars in September to understand users experience of the Portal so far and what features they would like to see in the future.

For more information on the Portal and our future release plans please visit;
https://www.nationalgrideso.com/industry-information/connections/connections-portal

Publication of our Innovation Annual Summary 2022/23

Innovation, and the new solutions and technologies it generates, is playing an important role in shaping the ESO and energy landscape of the future.

In the 12 months, from April 2022 to March 2023, we have grown our capabilities, and our team, making full use of the Network Innovation Allowance (NIA) and Strategic Innovation Fund (SIF) to address our strategic priorities. We have launched the highest number of innovation projects in any year to date.

On 26 July we published the Innovation Annual Summary. It features case studies which introduce some of our key innovation projects. Each case study has an accompanying explainer videos from our project leads, these can be found as part of our interactive 2022/23 Innovation Annual Summary here.

You can find out more about these innovation projects and activities in our interactive 2022/23 Innovation Annual Summary here. We have also created a pdf version that is available to download here.