Public

Balancing Costs Summer Report

December 2024

NESO
National Energy System Operator

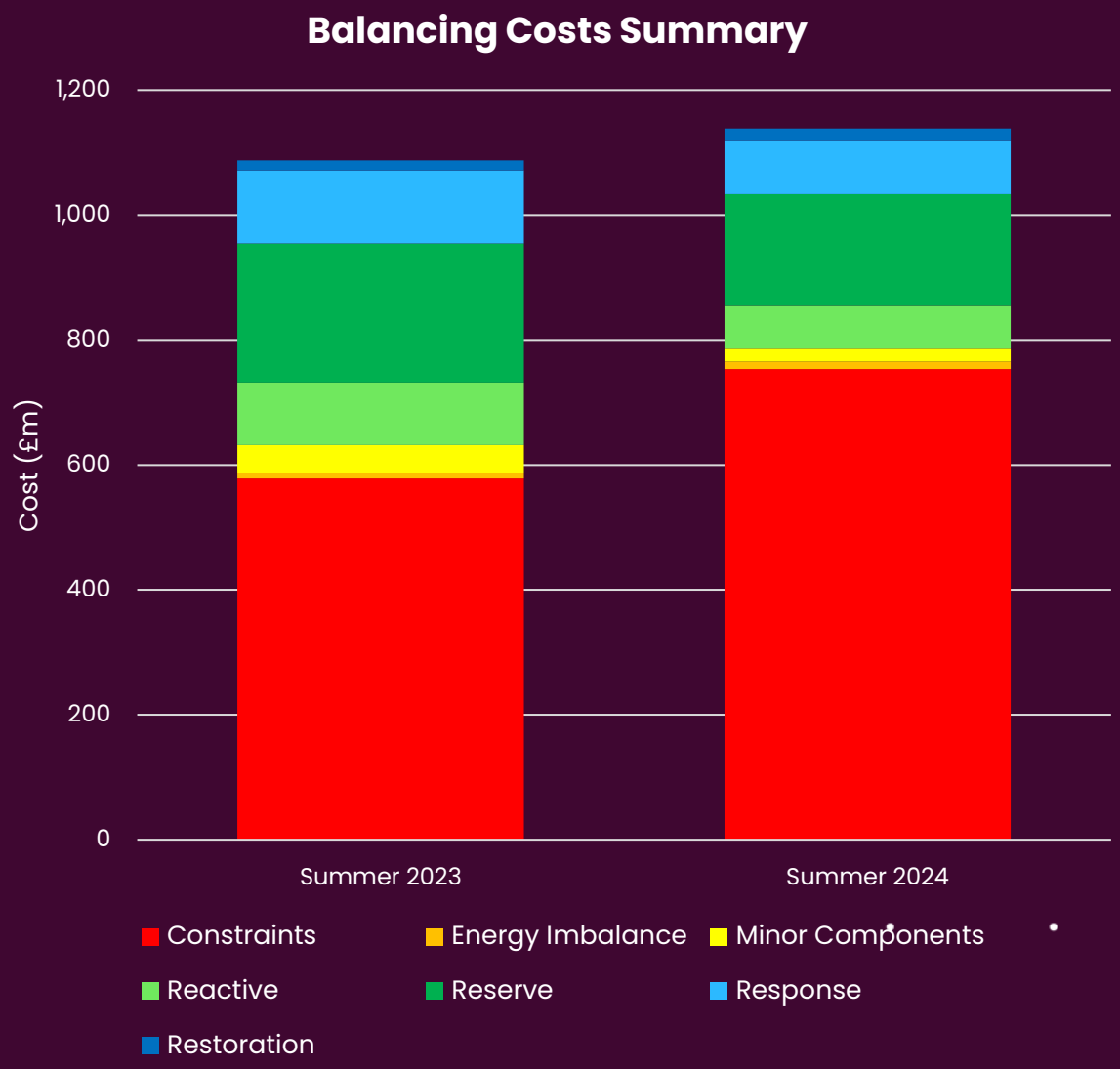
Contents

Executive Summary

Welcome to the Summer 2024 Balancing Costs Report. This report provides a look back at balancing costs and associated market dynamics from April to September 2024.

Key messages:

- Overall, balancing costs and volumes across summer 2024 were up 4% and 46% respectively compared to summer 2023.
- An increase in constraint volumes (particularly in June and August) was the main driver of these increases, rising 60% across the summer 2024 period year-on-year. This was linked to a sizable increase in wind generation, especially in Scotland, combined with reduced constraint limits driving up wind curtailment.
- Battery dispatch volumes have increased significantly compared to last year with the volume of bid and offers accepted for batteries increasing by 409% and 348% respectively.
- NESO has made reductions to the system's inertia requirements since summer 2023 which has contributed to significant stability cost savings across summer 2024.



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Balancing Costs Overview

Key messages:

- Monthly balancing costs across summer 2024 were 12% higher on average than summer 2023, driven by an increase in balancing volume over this period.
- Higher costs were linked to an increase in constraint costs year-on-year while non-constraint costs were lower.
- The month with the highest balancing cost was August, due to high levels of wind curtailment.

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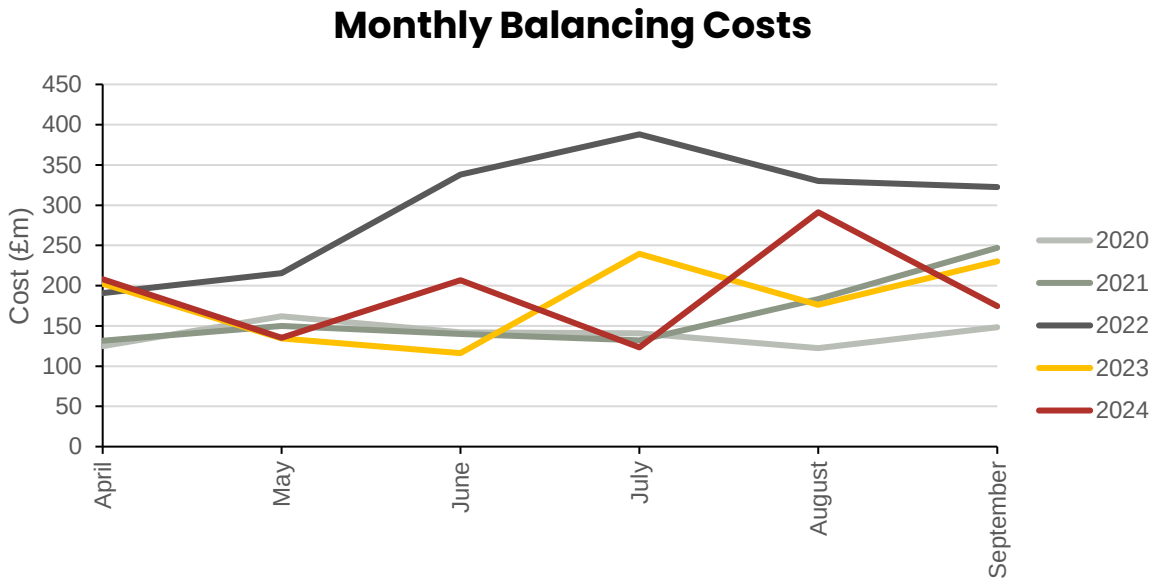
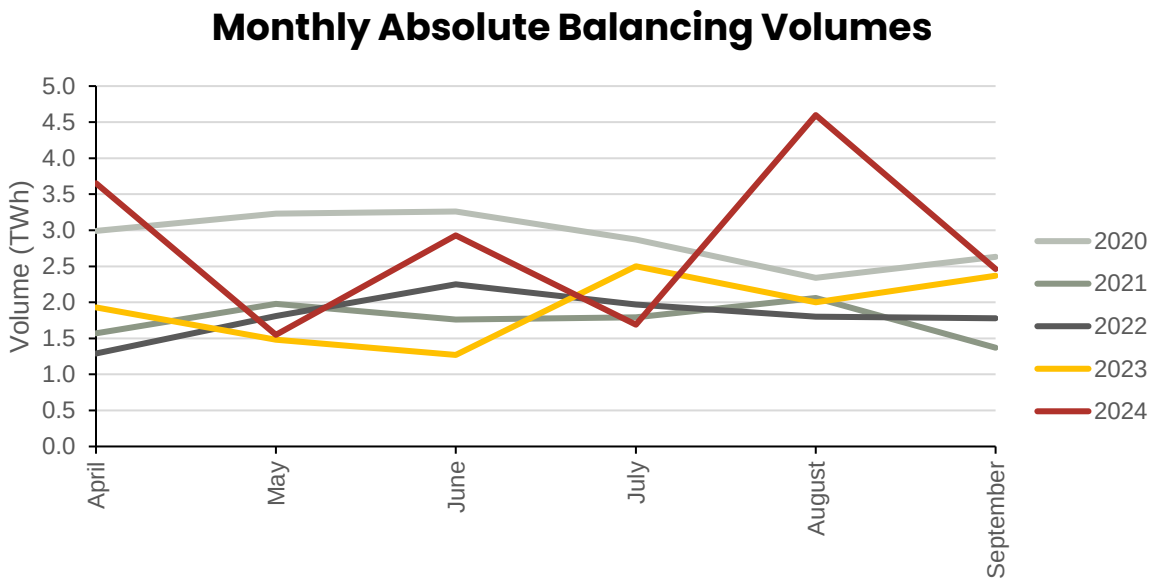
Balancing Costs Overview





Overall, monthly balancing costs across summer 2024 were on average 12% higher compared with summer 2023. However, there was significant monthly variation with June and August having much higher balancing costs than in their respective months in 2023, while July and September had lower costs.

A similar trend is observed with the monthly absolute balancing volumes, where both June and August each saw a 130% increase in volume over their respective periods in 2023, mirroring the rise in balancing costs in these months. A notable exception to this was in April 2024 which saw an 89% increase in absolute balancing volumes but only a 3% increase in balancing costs, which is largely explained by an almost 45% reduction in the Day Ahead price between April 2023 and April 2024.

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Cost bracket comparisons

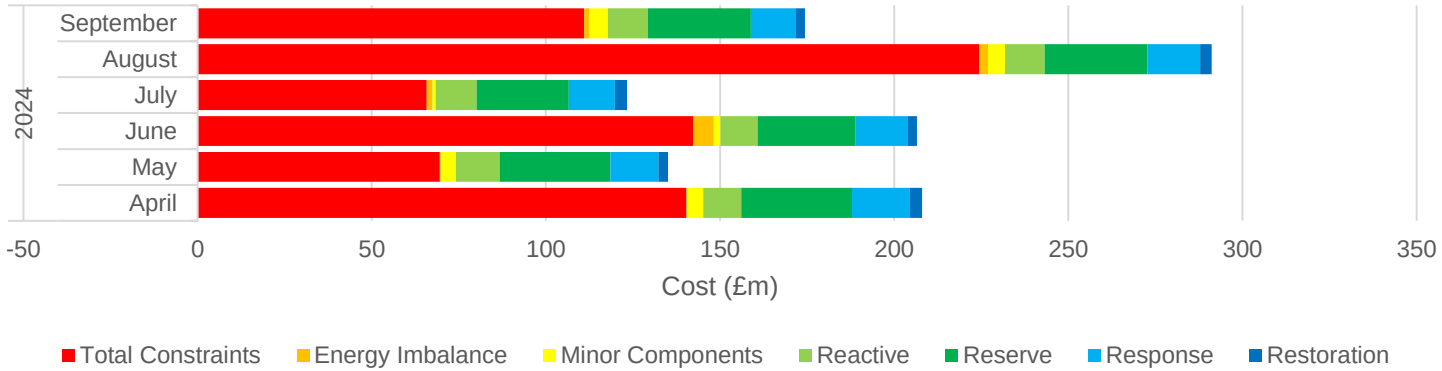
Constraint costs in summer 2024 have increased by 30% compared to last year, due to an increase in constraint volumes linked to a rise in wind generation year-on-year.

In contrast, non-constraint costs have decreased by 24%, largely due to lower wholesale prices. The continued development of balancing services over the last year has also contributed to lower prices across many cost components.

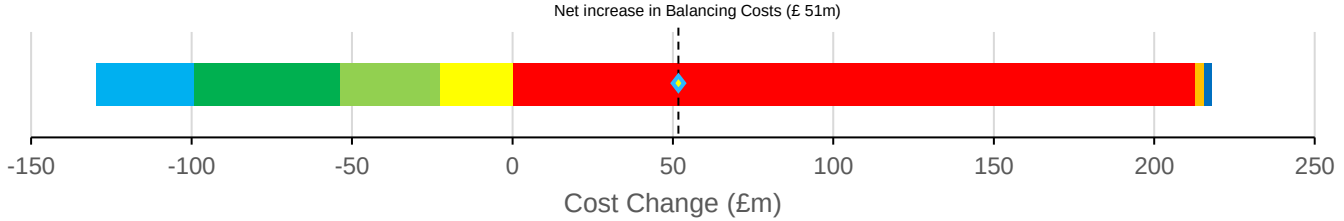
Key trends S23 to S24:

Constraint costs	Non-constraint costs
↑ 30%	↓ 24%

Actual Cost Breakdown – Summer 2024



Total cost change - Summer last year



Total balancing costs across the summer of 2024 decreased in most categories. There was some relatively small increases in the energy imbalance cost and restoration cost between April and September, but most of the increase has been driven by a sizeable increase in constraint costs. This is reflected unequally across the summer, with July and September having lower constraint costs than in the same period in 2023, while June and August had significantly higher constraint costs compared to 2023. This has led to a net increase of £51m in balancing costs between summer 2023 and summer 2024.

Constraint costs were high in June due to a sizable increase in wind generation, especially in Scotland. Meanwhile in August there were a combination of active constraints, some outages in Scotland and extreme weather with Storm Lilian and the remnants of Hurricane Ernesto in the latter half of August pushing up constraint volumes.

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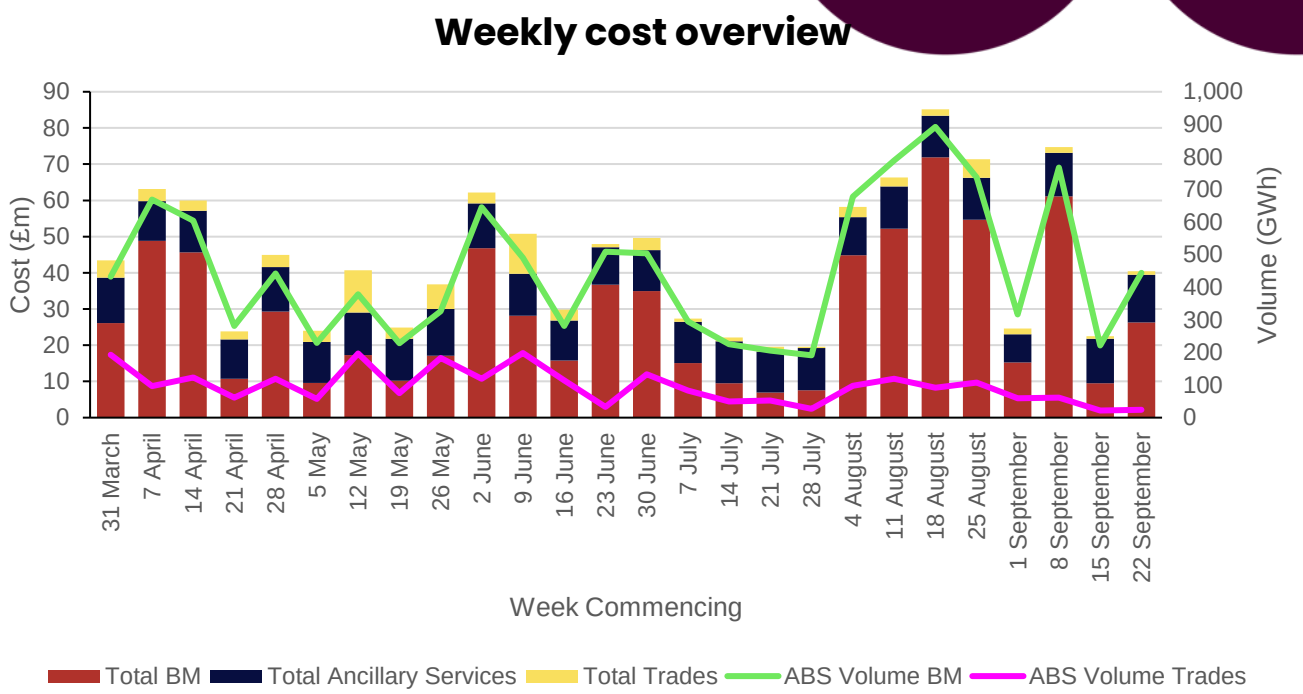
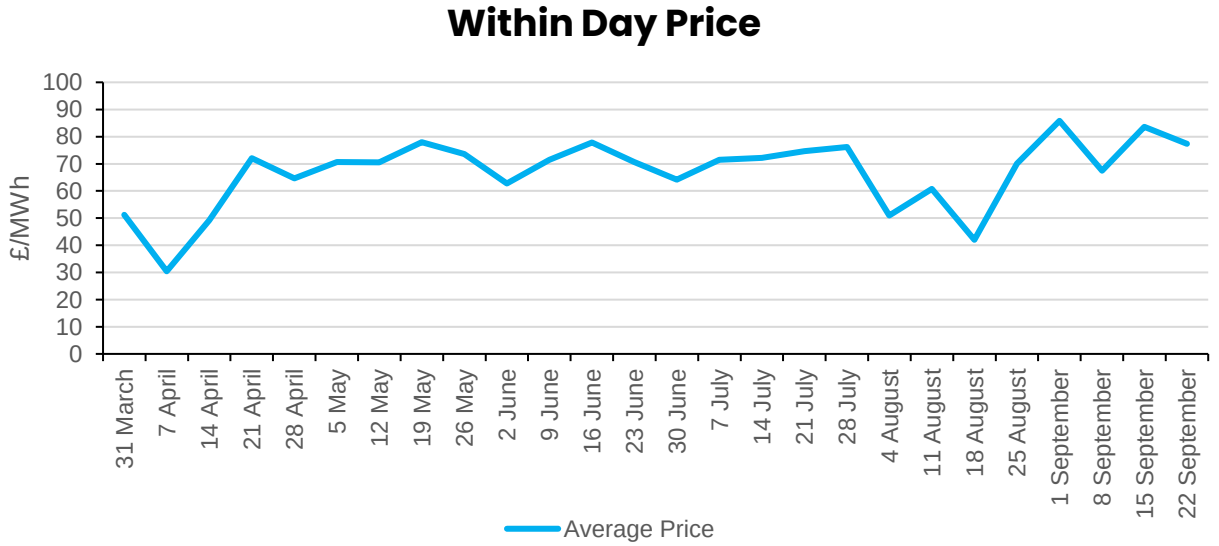
Weekly Balancing Costs

Higher BM costs in August were linked to high levels of wind curtailment, with wind generation up 37% compared to August last year.

- The highest weekly balancing costs were observed in August. This also corresponds with the highest absolute volume procured from the BM and Trades. August also saw the highest volumes of wind being curtailed over the summer period at 1.2 TWh, though the average within day price went down during the month.
- The highest cost week was w/c 18th August due to the remains of Hurricane Ernesto on the 21st and 22nd August, and Storm Lillian on the 23rd August.
- Outside of August, high cost weeks were seen in April, June and early September. These are due to higher wind curtailment and thus a need to procure replacement energy. This can be seen in the drop in the average Within Day Price on these weeks.





Market Dynamics

Key messages:

- Average demand in summer 2024 was broadly consistent with last year, while energy prices were 20% lower year-on-year.
- The average balancing mechanism offer acceptance price has fallen compared to summer 2023.
- There has been greater utilisation of battery units in the BM across summer 2024 and the Volume Weighted Average (VWA) offer price for batteries has fallen 24% year-on-year.

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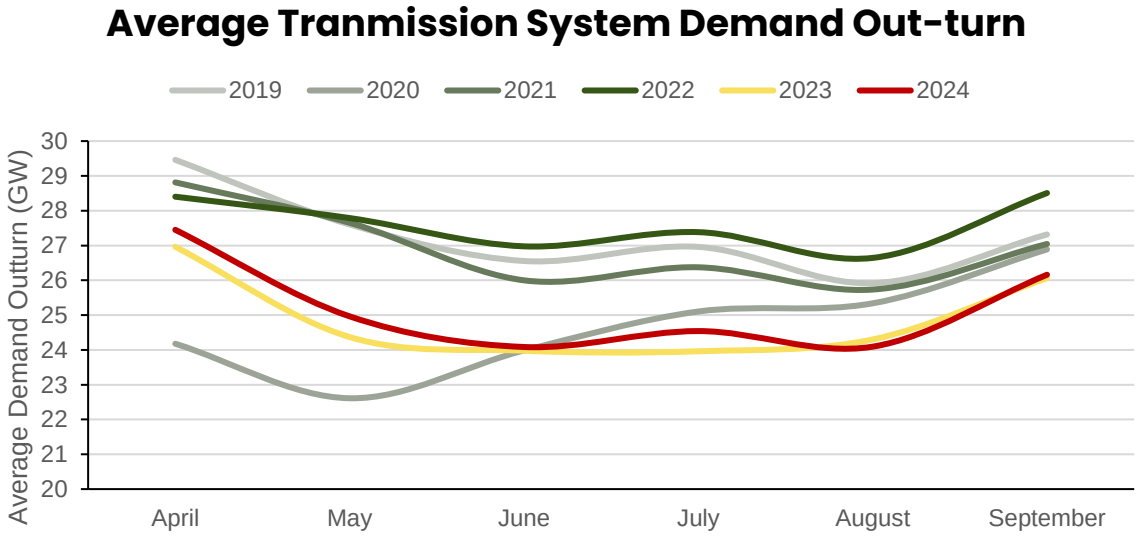
Transmission System Average Demand

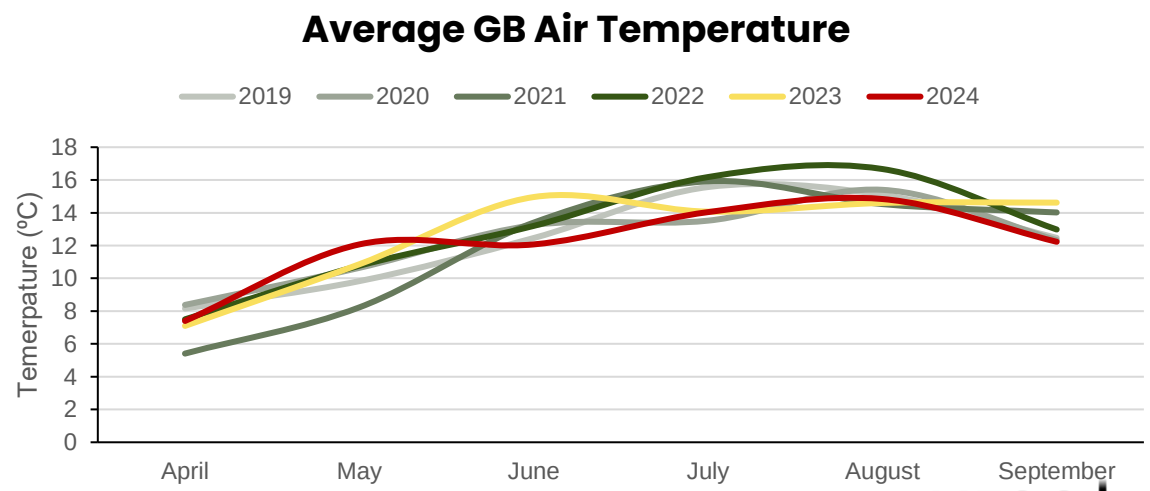
Average demand across summer 2024 remained broadly consistent with summer 2023.

Similar to summer 2023, transmission system demand across summer 2024 has been lower than previous years (excluding 2020, which was impacted by the pandemic). The key factors impacting demand this summer were colder temperature conditions and the continued high retail prices meaning that demand reduction observed in the previous summer was maintained. Despite the continued decrease in wholesale energy prices, the transmission system demand did not increase significantly compared to the previous year.

Key highlights for summer 2024:

- August was the month with the lowest electricity demand.
- Summer 2024 saw slightly cooler weather conditions than last year with an average air temperature of 12.1°C, down 0.6 °C compared to summer 2023.
- Although summer 2024 saw historically low demand, monthly trends remained similar to previous years.





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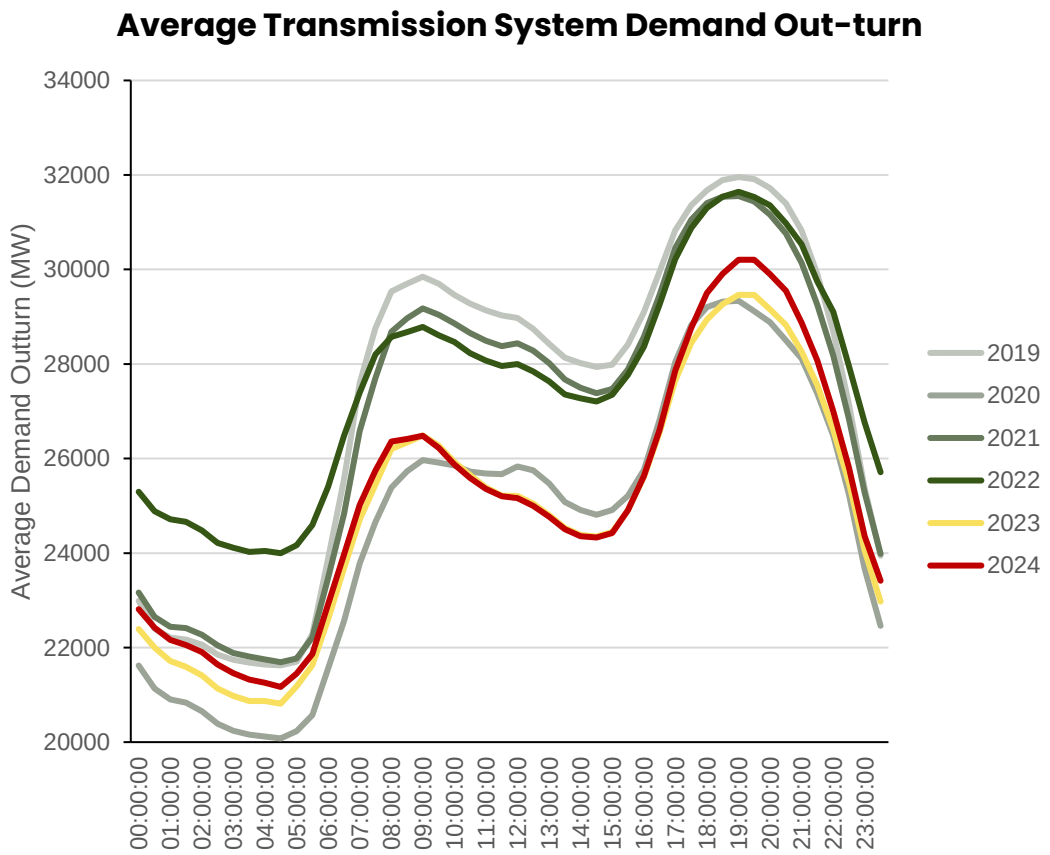
Transmission System Average Demand Hourly Profile

The hourly demand profile for summer 2024 remains similar to 2023.

The hourly demand profile has remained similar to last year, although is slightly higher across the evening peak and early morning. In line with previous summer periods the demand profile shows a clear morning and evening peak and lower demand overnight.

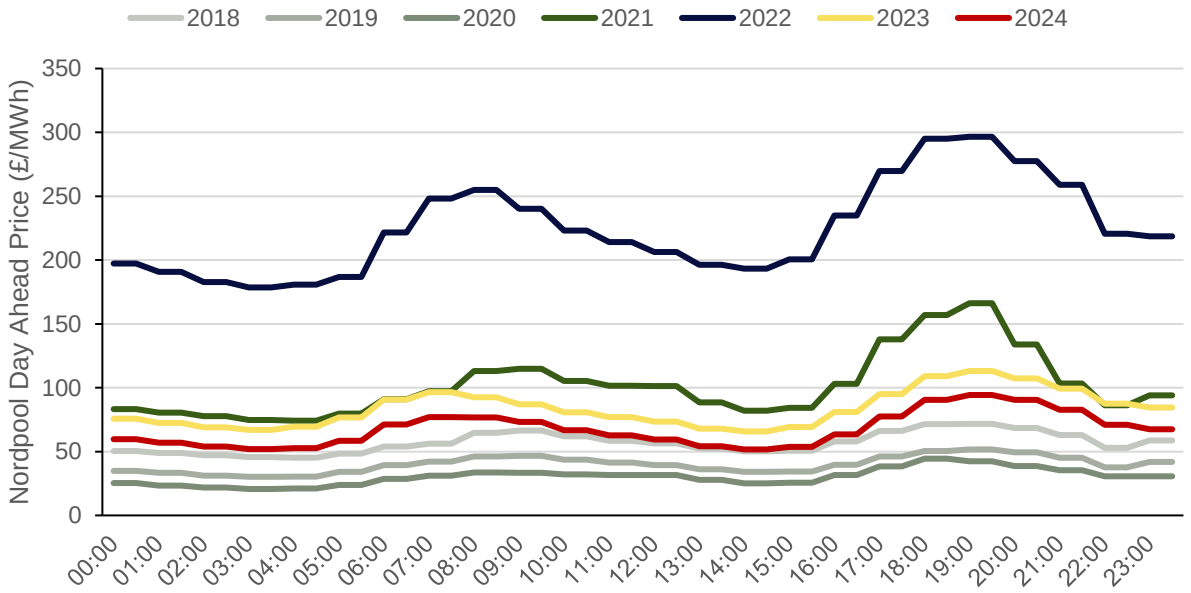
Key highlights for summer 2024:

- Very similar to the demand curve across summer 2023 when high power prices saw price based demand reduction.
- The first summer since 2021 where average demand did not fall significantly from the previous winter.
- Demand over the evening (5-10pm) was up 2.0% on 2023 and up 1.9% across the early morning (Midnight – 6am).
- Demand profile across the whole day up 1.1% compared to 2023.
- No significant change to the profiles of time of consumption.



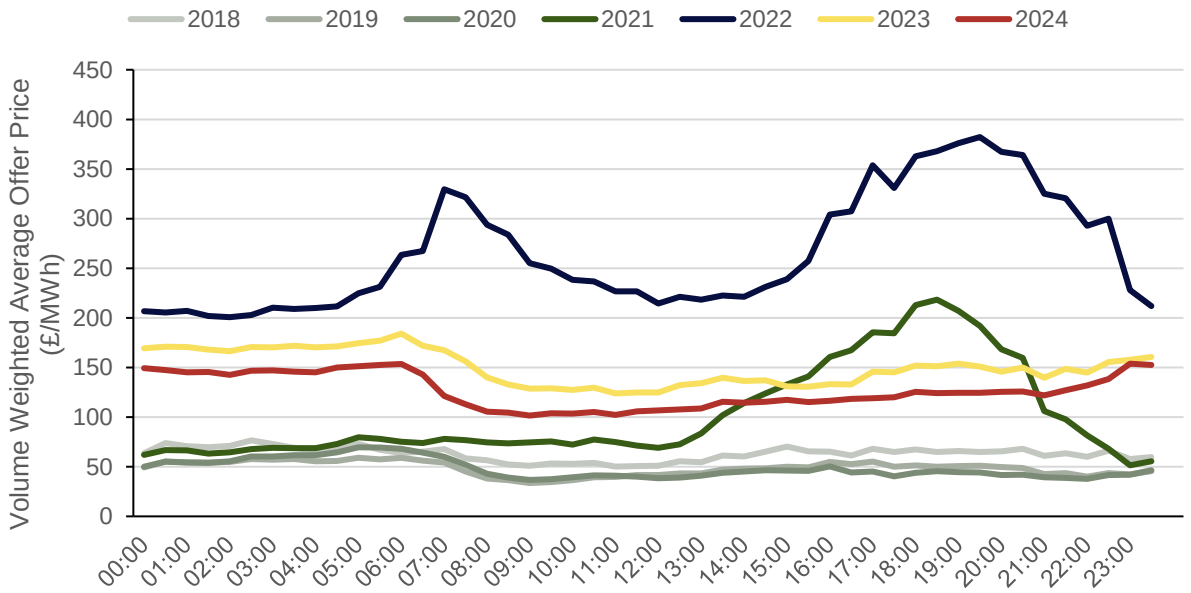
Day-Ahead Market and Balancing Mechanism Prices

Average Day Ahead Wholesale Market Price



- Year-on-year, Nordpool day-ahead market prices have decreased by 20% and are 70% lower compared to the global energy price spike in 2022
- However, prices remained 18% above the 2018 level
- Trends were similar to summer 2023 with daily peaks less significant than the summers of 2021 and 2022.

Volume Weighted Average BM Offer Price



- The average balancing mechanism offer acceptance price has fallen compared to summer 2023.
- Lower market prices have supported this fall year-on-year.
- There has been a greater utilisation of battery units in the BM since the implementation of the Open Balancing Platform (OBP) and VWA offer prices for batteries have fallen 24% year-on-year.

*Note graph above includes trades

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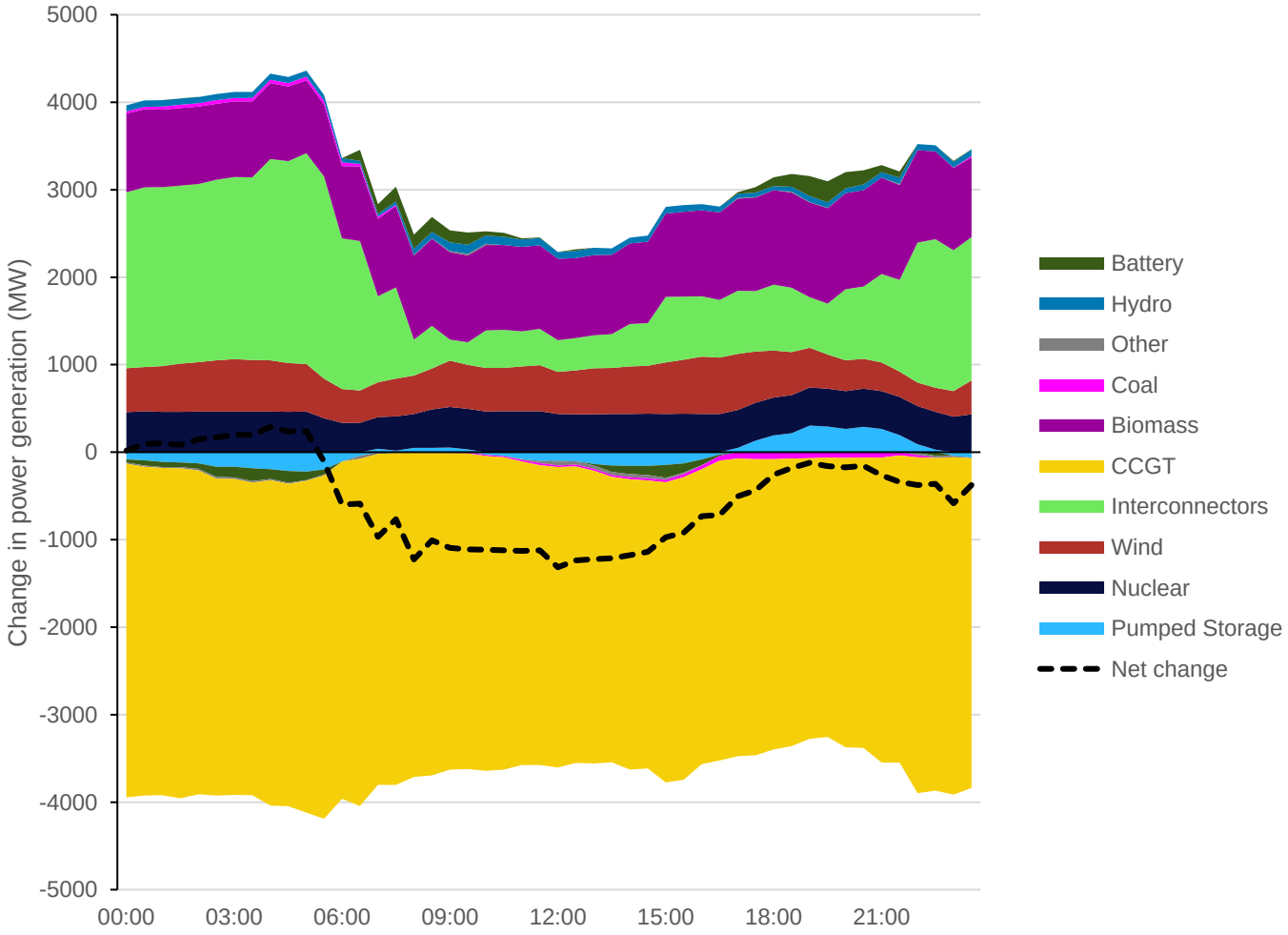
Power Generation Change by Technology Type

Change in Power Delivered By Fuel Types Between Summers



Across summer 2024 there was a significant decrease in energy provided by gas. This was displaced by energy provided across most other fuel types, but notably by wind, interconnectors, and biomass.

There was a significant increase in biomass generation volumes as units which previously did not dispatch due to their subsidy economics became cost efficient to run as baseload.

Windier conditions across summer 2024 and newly commissioned generation also led to a significant increase in wind generation compared to the previous year. Although constraint management limited the overall increase realised.

There was an increase in interconnector imports over summer 2024 as higher gas prices in GB than continental Europe incentivised flows into GB. Additional interconnector capacity would have also contributed to this change, as Viking interconnector became operational in December 2023. Interconnector imports were also used to manage constraints in South East England across the first half of the summer period.

Storage saw an overall increase in utilisation which is particularly prominent over the morning and evening peaks, however given their requirement to cycle this increased utilisation also shows an increase in periods charging during off peak hours

In particular, battery volumes dispatched through the BM were much more significant with the launch on the OBP since summer 2023.

Note: Dataset is comprised of Summer months only (April – September)

Balancing Actions

Key messages:

- The total cost of bids has increased in summer 2024 reflecting an increase in offers accepted for wind, while the total cost of offers has fallen despite an increase in accepted volume.
- Total constraint costs across summer 2024 were 30% higher, following a 60% increase in constraint volume. The main driver of this increase was thermal constraints which were impacted by a combination of high wind outturn and reduced constraint limits due to outages.
- Our Dynamic Services continued to see a decrease in clearing prices this summer as a result of more liquid markets and the continued development of the Single Market Platform.

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Bid costs and volumes

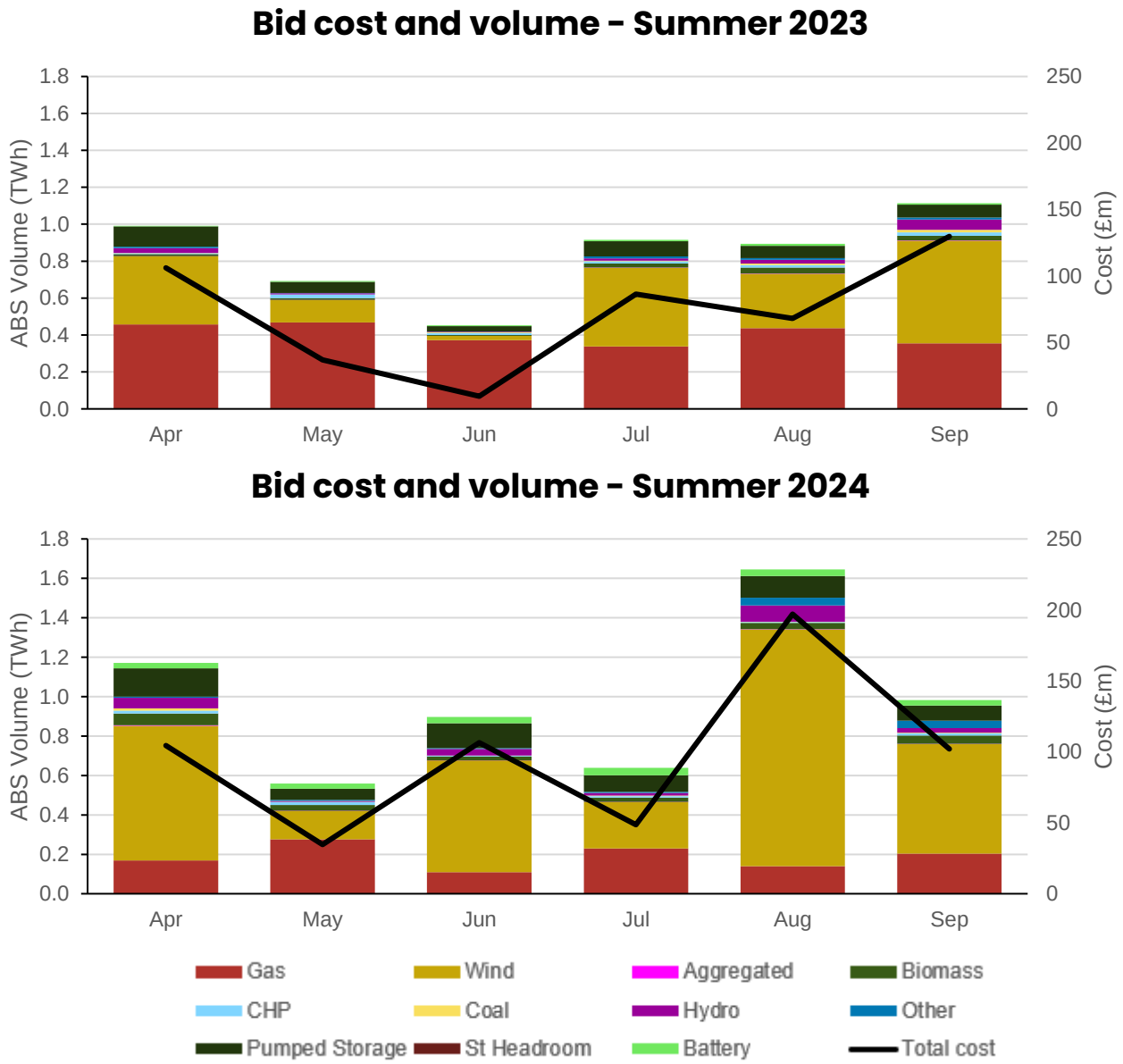
The total cost of bids has increased in summer 2024 reflecting an increase in offers accepted for wind.

The total cost of bids across summer 2024 was £593m. This is an increase of 35% compared to summer 2023.

This increase is primarily driven by an increase in the total volume of bids accepted between the two periods, up by 16% year-on-year, and specifically a larger volume of bids accepted for wind, which was up 89%. Bid actions on wind generators tend to cost more than conventional fuel types as wind generators often need to factor subsidies (which are based on metered output) into their bid prices to avoid losing this revenue when turned down. Due to higher wind outturn across summer 2023, combined with reduced constraint limits due to outages, a larger number of wind bid were accepted, consequently pushing up the total bid cost.

Key highlights for summer 2024:

- The total cost of bids accepted for wind across summer 2024 was £454m, up 54% compared to the previous summer.
- Wind outturn increased 14% between summer 2024 and summer 2023, with the two highest wind months occurring in April and August.
- The volume of bids accepted for battery units increased by 409% year-on-year (totalling 182GWh in summer 2024). The launch of the Open Balancing Platform In December 2023 is supporting greater utilisation of battery units in the BM.



Offer costs and volumes

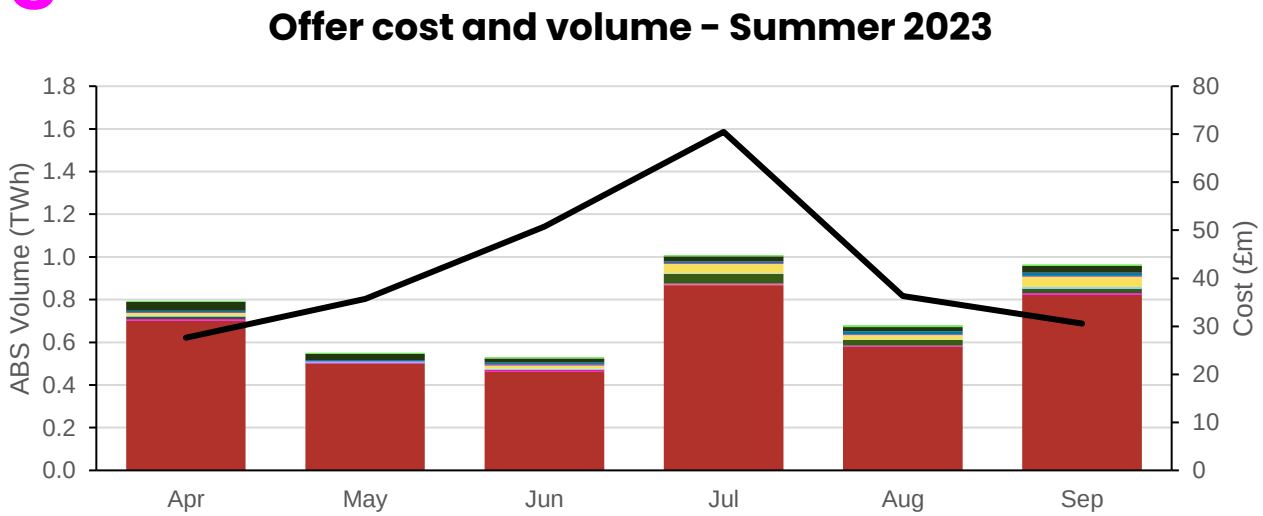
The total cost of offers has fallen in summer 2024, although volumes increased.

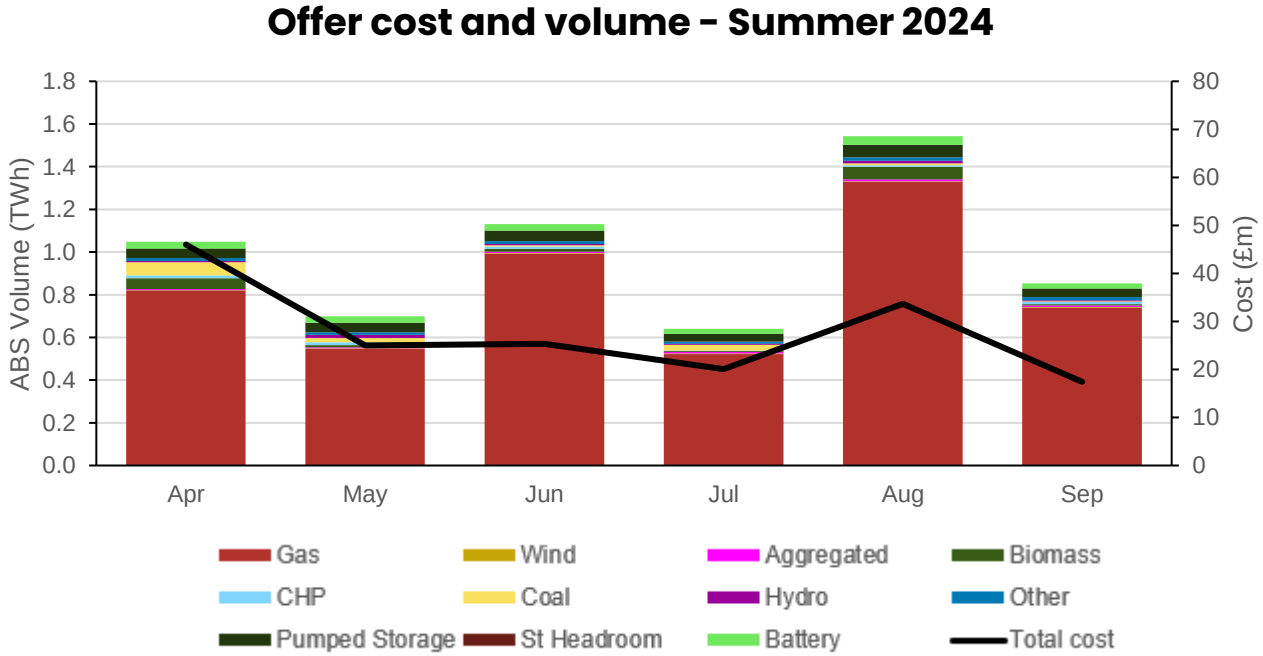
The total cost of offers across summer 2024 was £168m. This is a decrease of 33% compared to summer 2023.

Despite this reduction in cost the total volume of offers accepted was up 31% on the previous year. Lower costs are instead linked to a reduction in wholesale prices between the two periods which was 20% lower across summer 2024. The generation mix of offers is similar across both summer periods with gas offers continuing to dominate. However, the volume of battery offers has increase by 348% year-on-year, following the launch of the OBP which is supporting greater utilisation of batteries in the BM.

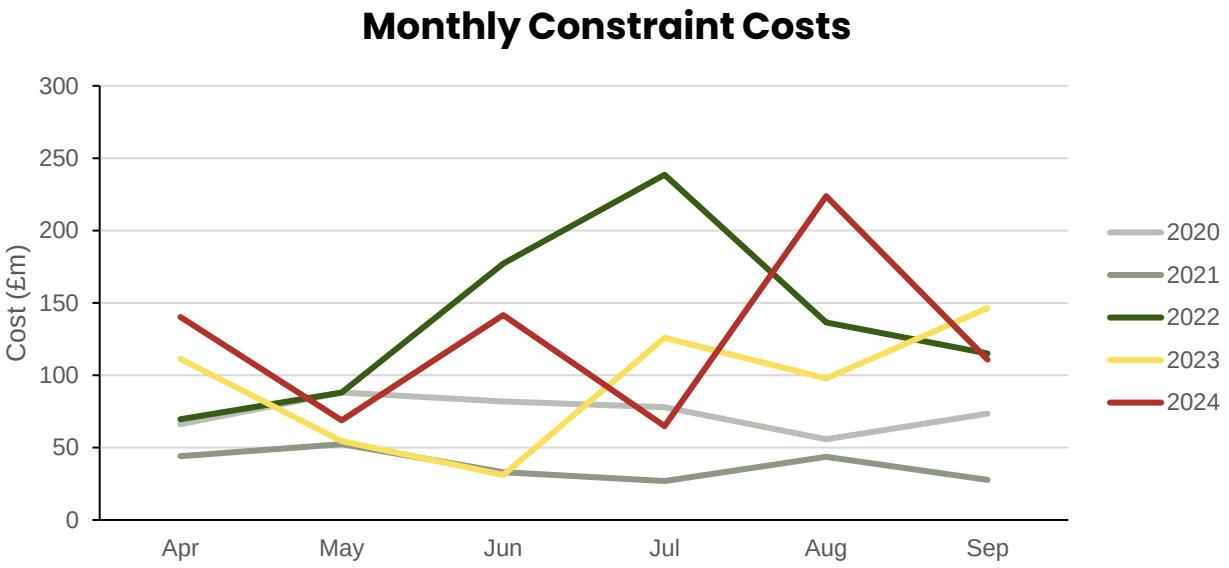
Key highlights for summer 2024:

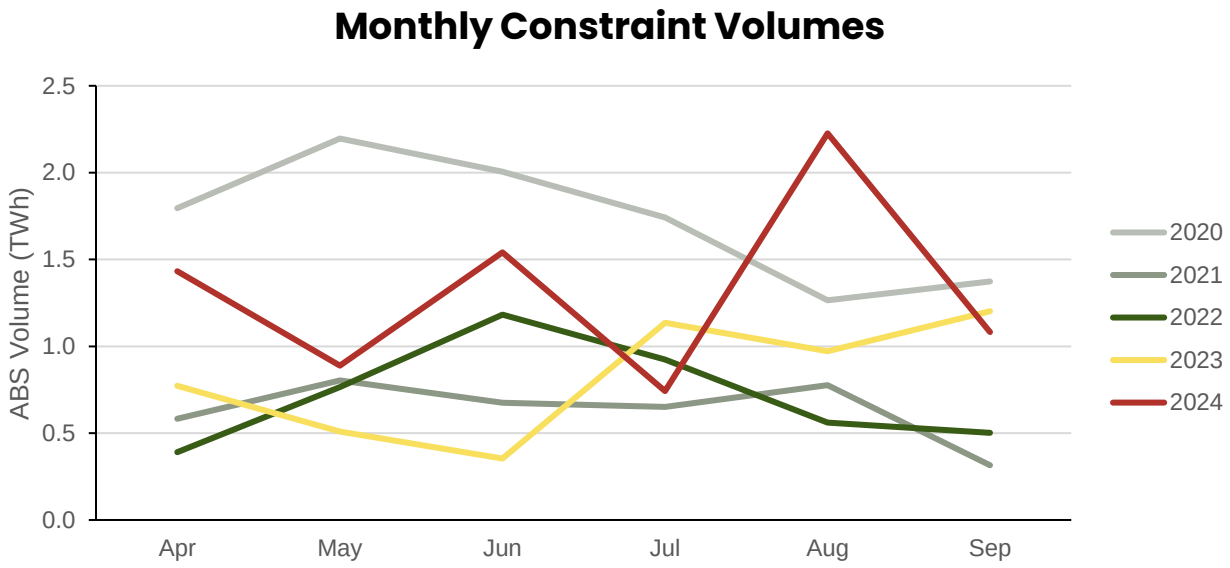
- April was cost month for offers totalling £46.0m, while August was the highest volume month at 1.5TWh.
- Similar to previous years, gas dominated offer costs and volume at £142m and 5.0TWh respectively across the summer period.
- Offer costs and volumes for battery units increased significantly compared to summer 2023, with a total offer cost of £4.0m and volume of 183GWh.





Constraint Costs





Total constraint costs across summer 2024 were 30% higher compared to summer 2023. This was due to a significant increase in constraint volumes, up 60% between the two periods. The main driver of this increase in volumes was thermal constraints which were impacted by a combination of higher wind outturn (up 14% year-on-year) and increased system constraints.

Higher costs and volumes were largely attributed to two specific months, June and August. August was the month that saw the highest constraint costs and volumes. Wind outturn in August was abnormally high for the time of year at 5.2TWh, including storm conditions during the second half of the month. August wind outturn was also particularly high in Scotland and coincided with outages in this region which restricted transfer capacity and subsequently led to greater requirements for constraint management. Although not as high as August, June also saw a very regional impact from wind, with Scottish wind outturn twice as high as the previous year, leading to notably high overall constraint volumes.

Weekly Constraint Costs

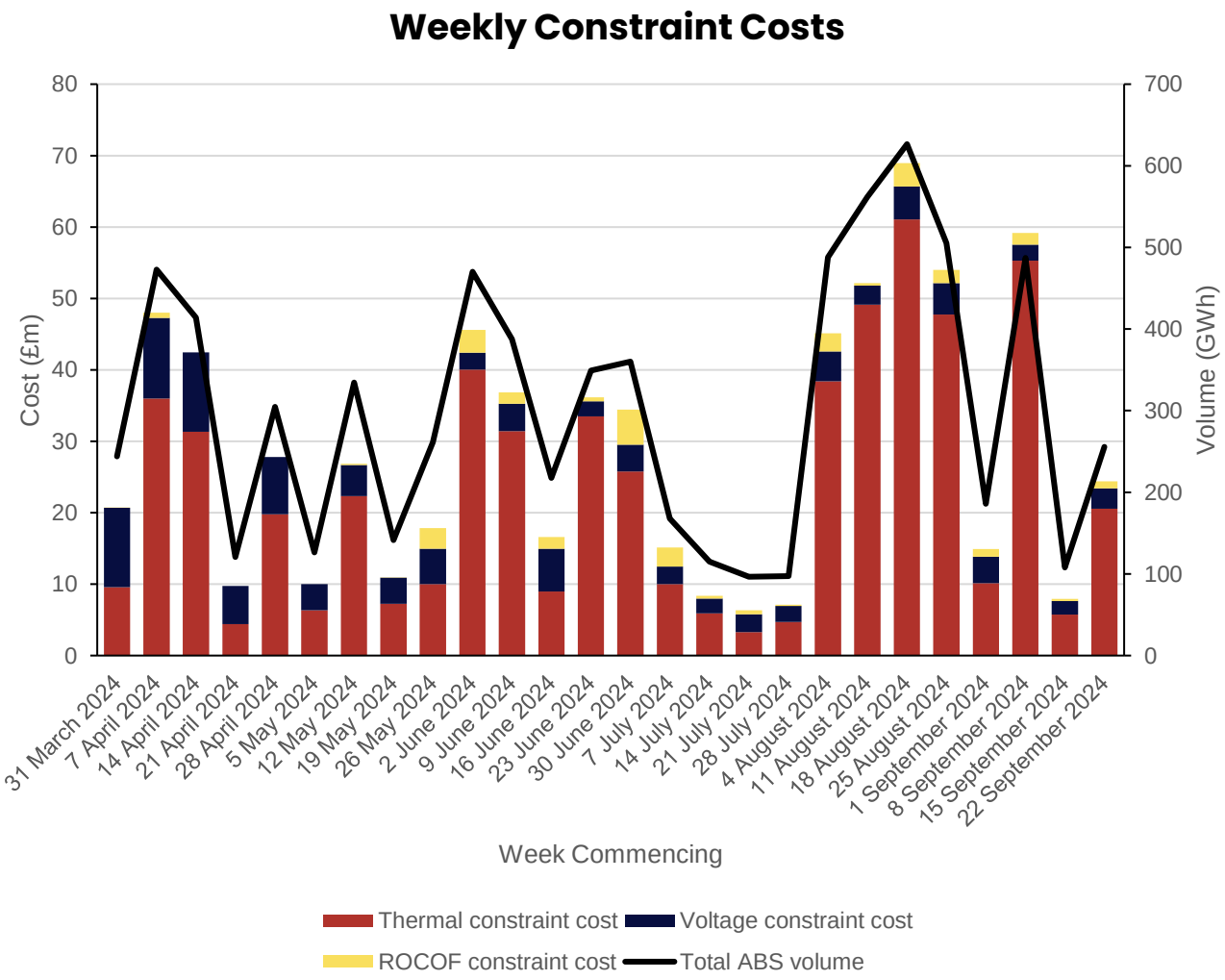
Cost trends S23 to S24:

Thermal	Voltage	Stability
↑ 51%	↑ 4%	↓ 41%

Thermal constraint costs were highest in June (£117m) and August (£199m), coinciding with higher wind outturn and increased system constraints during these months. Notably, w/c 18 August saw several high cost days due to the impact of Storm Lilian.

Voltage costs were highest in April, totalling £40.7m due to high utilisation of assets for voltage in South West England to manage low demand/generation periods across the month.

ROCOF peaked in June, at £8.8m. Multiple occurrences of Sub-Synchronous Oscillation (SSO) were observed in Scotland during this period. Additional measures, such as running generators overnight to provide inertia, were subsequently implemented to maintain stability.

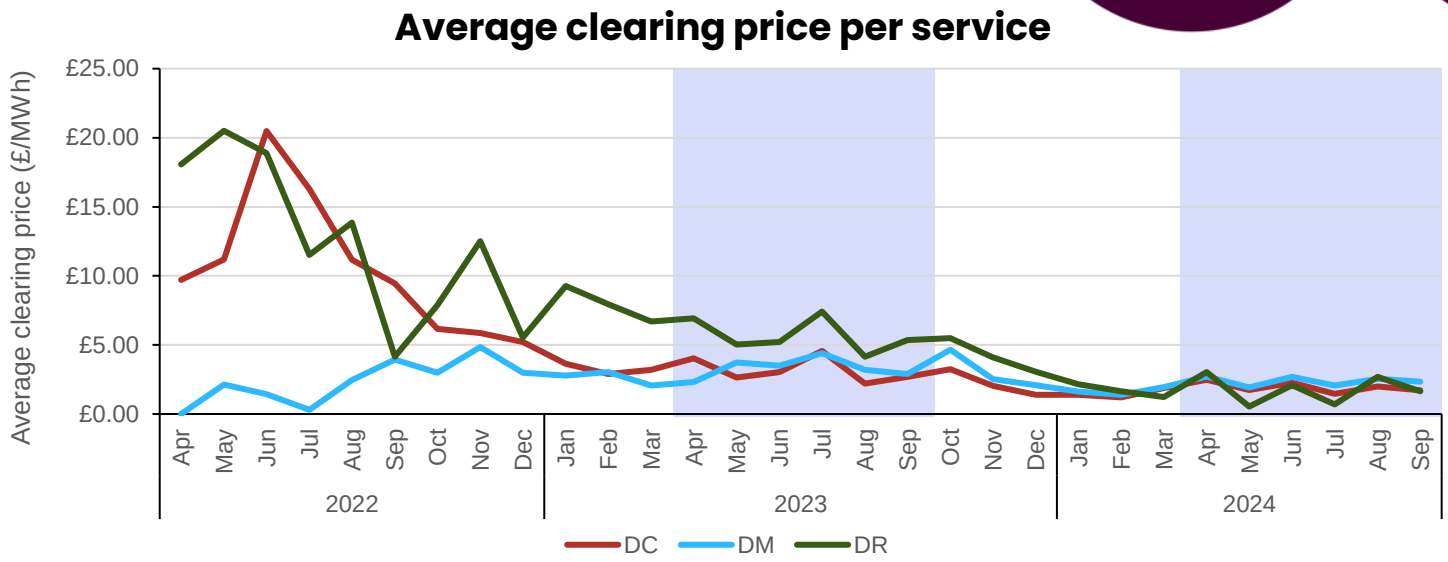


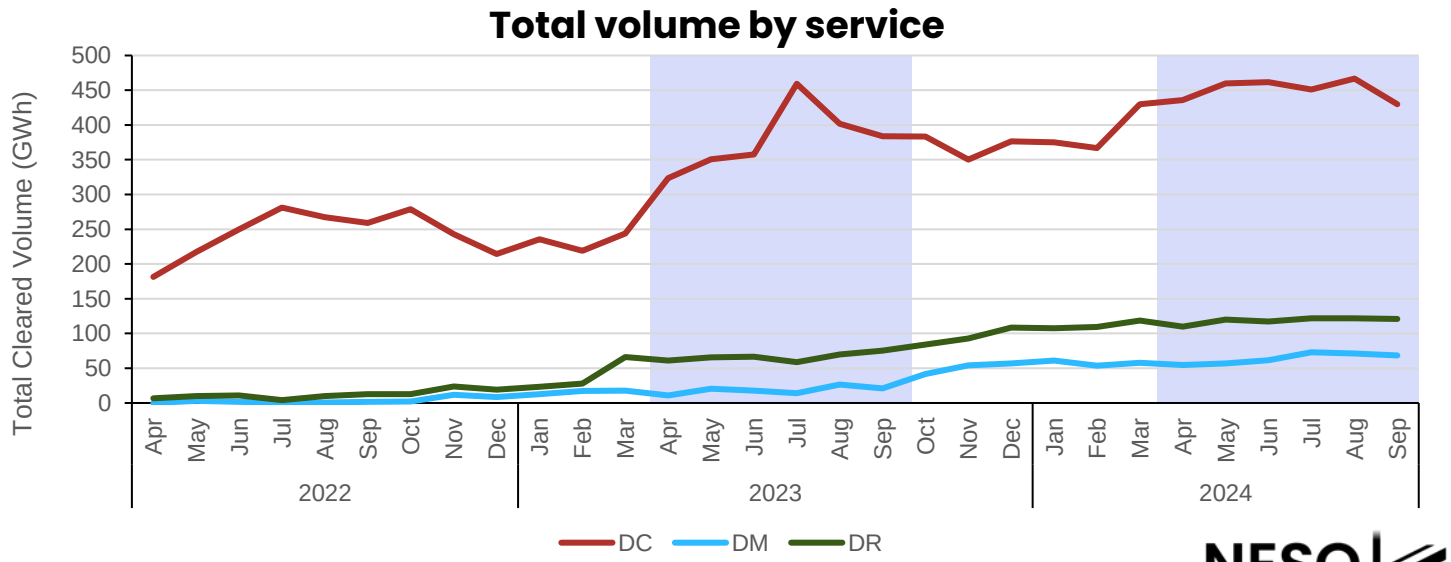
Ancillary Service Prices

Our Dynamic Services for response, Dynamic Containment (DC), Dynamic Moderation (DM) and Dynamic Regulation (DR) continue to see the benefit of more competitive and liquid markets and the continued development of the Single Market Platform.

Key trends S23 to S24:

Clearing Prices	Volume
↓ 50%	↑ 37%





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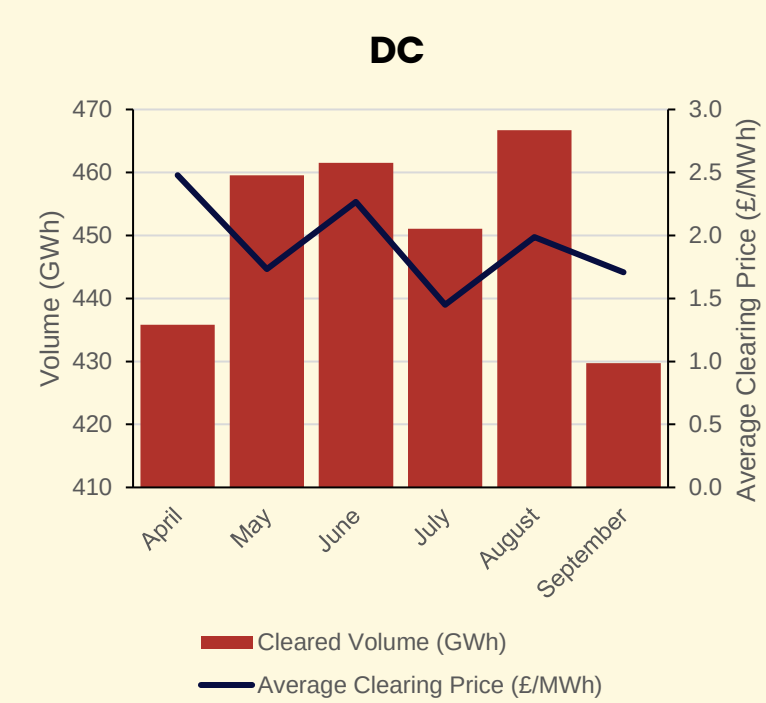
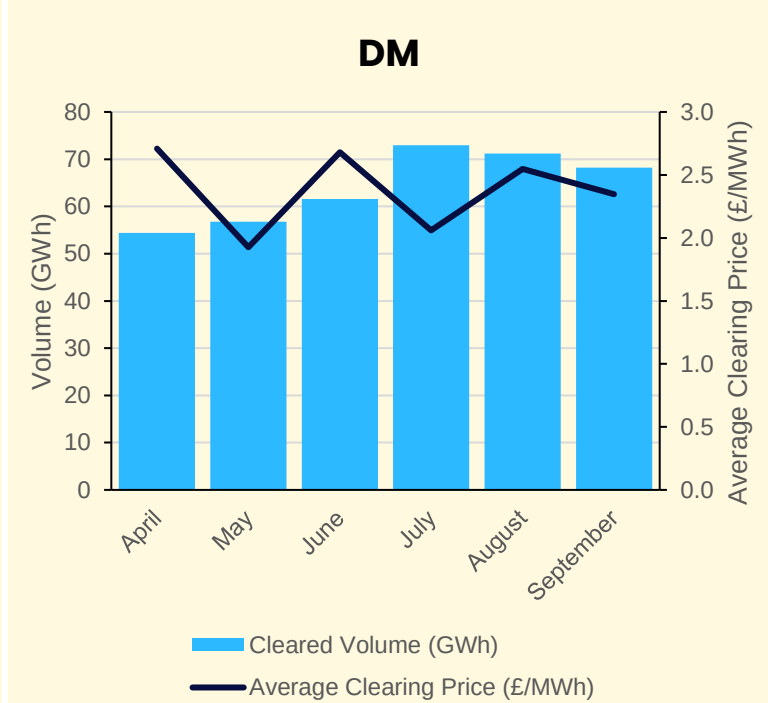
Ancillary Service Prices



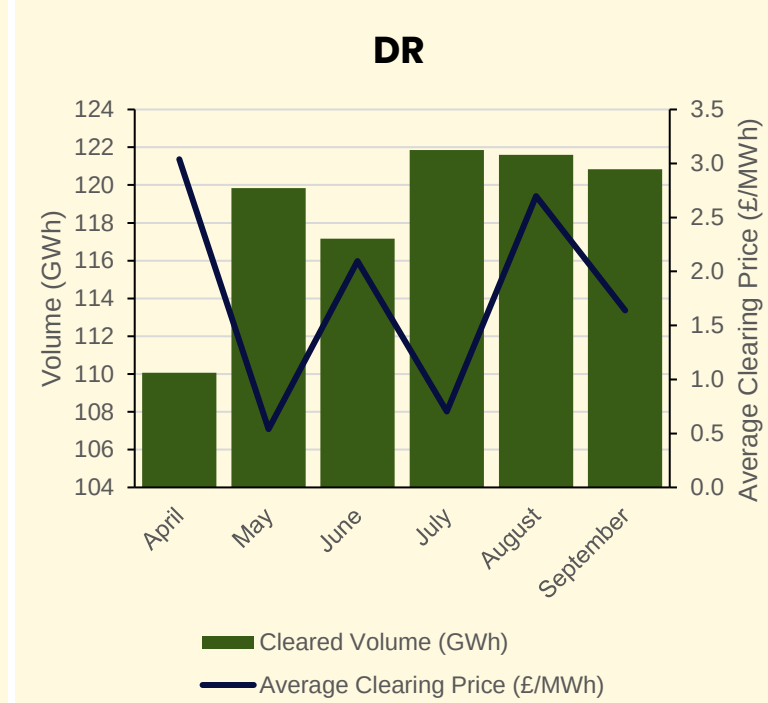
Summer 2024 outturn (comparison with Summer 2023)

Average Clearing Price	Total Cleared Volume
£1.93/MWh (-39%)	2,704GWh (+19%)



Summer 2024 outturn (comparison with Summer 2023)

Average Clearing Price	Total Cleared Volume
£2.41/MWh (-28%)	385GWh (+248%)



Summer 2024 outturn (comparison with Summer 2023)

Average Clearing Price	Total Cleared Volume
£1.71/MWh (-70%)	711GWh (+79%)

April to September 2024 has been a relatively benign period for the Dynamic Services markets. The Dynamic Services are now well established and the change to the Enduring Auction Capability (EAC) co-optimised market platform (November 2023) has settled with the markets finding their new normal. The markets have been well supplied over the summer 2024 period, with significant liquidity giving relatively stable low prices.

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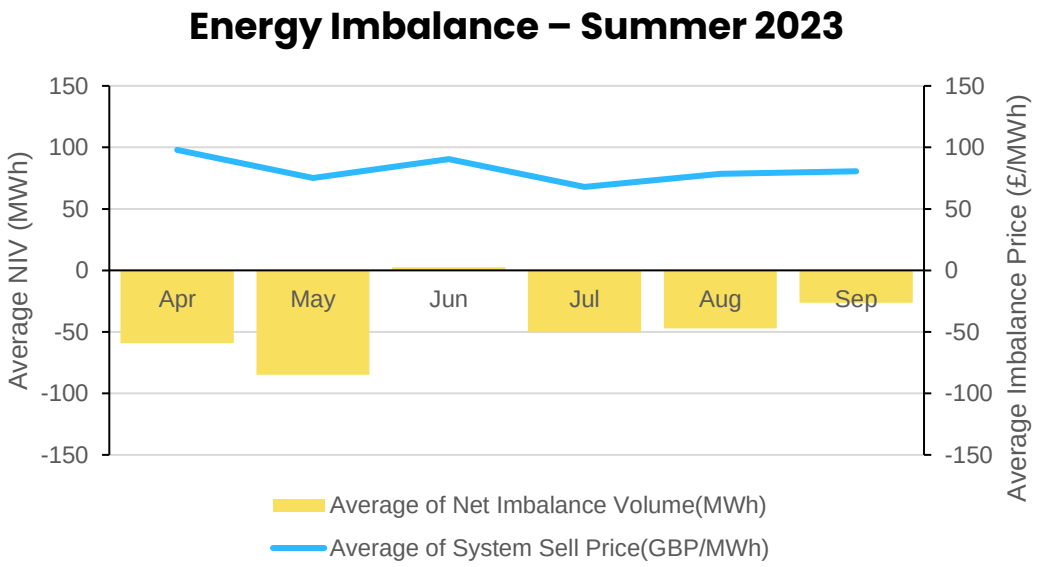
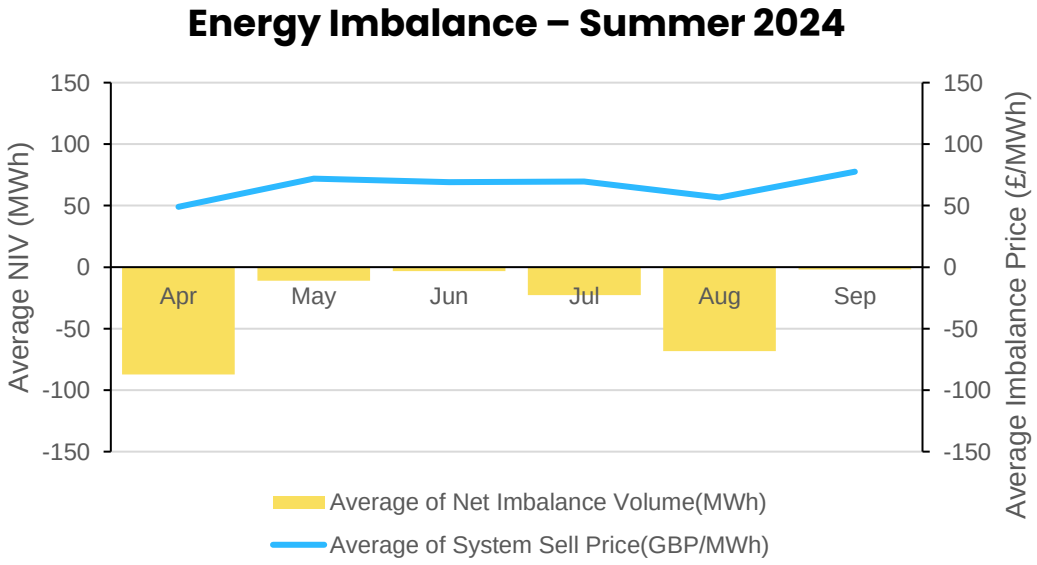
Imbalance price

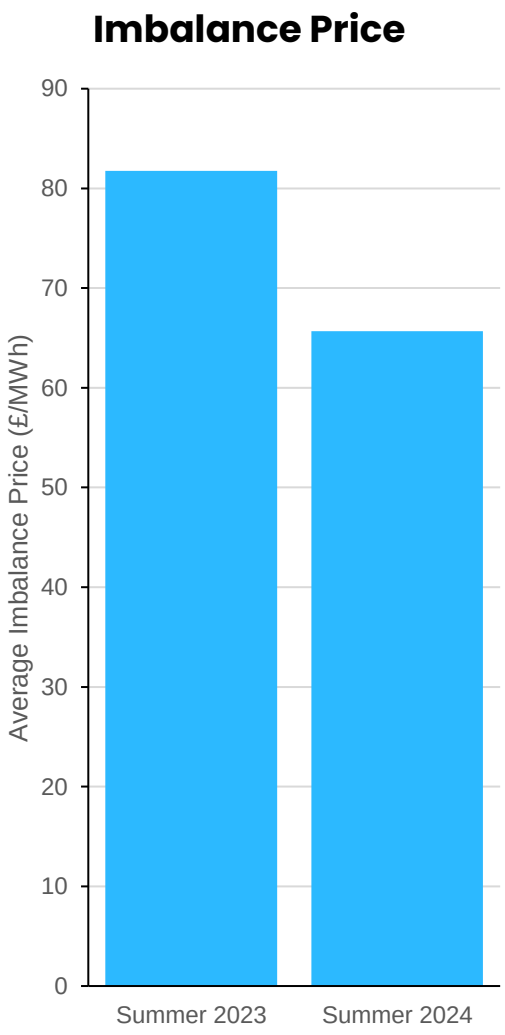
The average imbalance price has fallen in summer 2024 (£66/MWh), compared to summer 2023 (£82/MWh).

The market was mainly long throughout the summer except for morning and evening peaks.

The monthly average Net Imbalance Volume (NIV) was lowest in April, and both the lowest and highest daily average NIV occurred during this month, on 13 April at -1.5GWh and 17 April at 1.3GWh, respectively.







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Market Developments

Key messages:

- NESO successfully reduced the system's inertia requirements to 120GVAs from 12 June.
- Battery dispatch volume has increased significantly since in the implementation of the OBP, reaching 74.3 GWh in August.
- Balancing Reserve has now been running for over 6-months, and we routinely fulfil our 400MW procurement target via the Positive BR market.
- 30th September marked the end of coal fired generation in in GB.

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FRCR Requirement Reduction

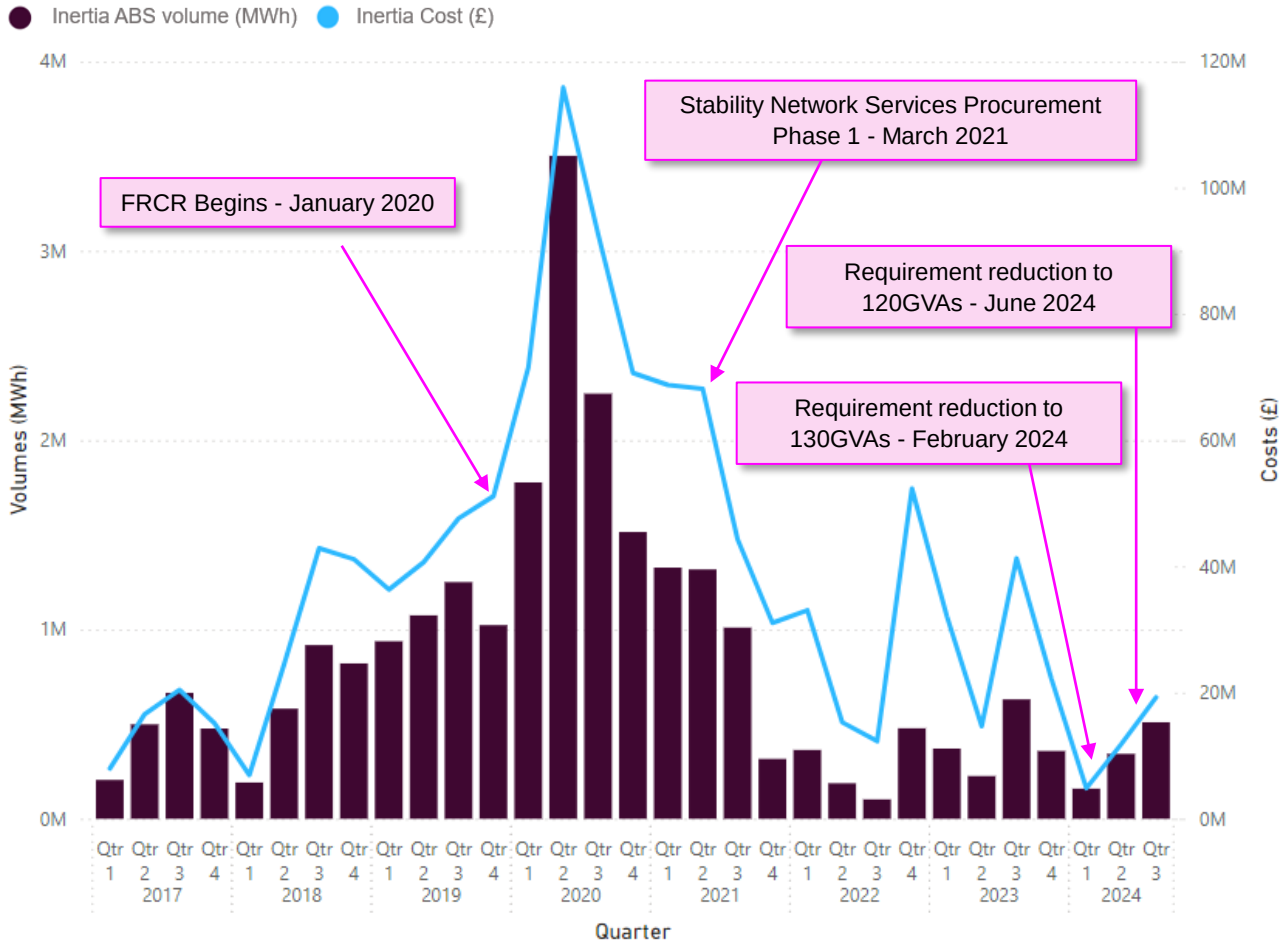
The FRCR requirement reduction to from 140 to 120 GVAs has contributed to >£100m in savings so far this year (to end of September).

This year significant reductions have been made to the system's inertia requirements, including a reduction on 28th February from 140 GVAs to 130 GVAs and a further reduction on 19th June to 120 GVAs.

These reductions allow the system to operate with 20 GVAs less without an increased risk of frequency deviations. As a result, fewer machines need to be instructed to meet the reduced inertia requirement.

Reductions to inertia requirements and the introduction of Stability Network Service Procurement have together realised notable savings in balancing costs compared to their peak across 2020-21.

Quarterly inertia costs and volumes since 2017



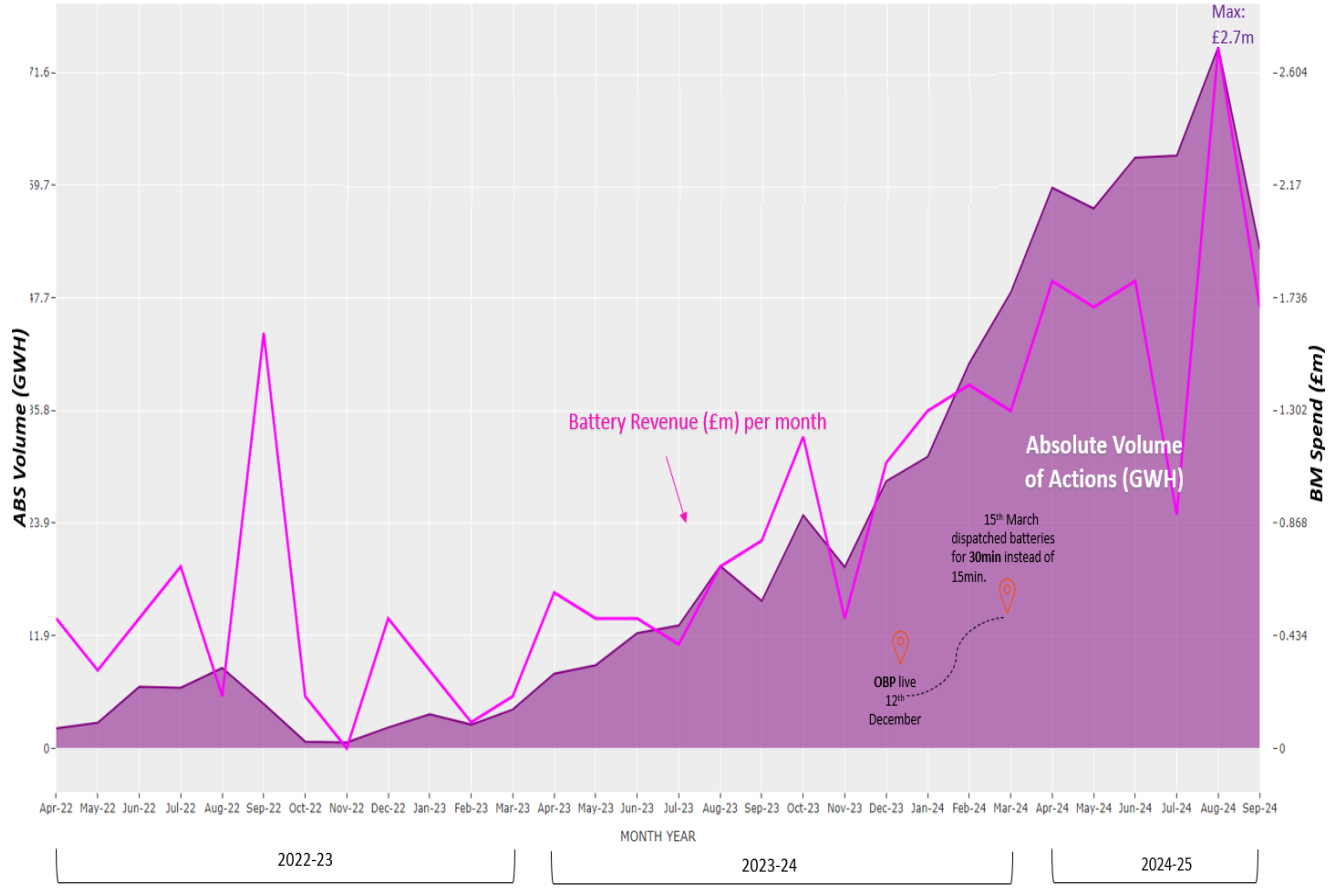
*FRCR: Frequency Risk and Control Report

Battery Dispatch Update

The Open Balancing Platform (OBP), went live on 12 December 2023, unlocking capability to send bulk instructions to smaller BMU and battery storage units at the press of a button.

Utilisation of storage assets has continued to grow in the last 6-months. August 2024 saw a battery dispatch volume of 74.3 GWh compared to 59.4 GWh in April 2024 and has grown significantly compared to ~4 GWh in March 2022. We are committed to maximising the flexibility of energy offered by battery storage and expect the utilisation of battery dispatches in the BM to provide substantial environmental and financial benefits.

Monthly Absolute Volume of actions and spend for Batteries in the Balancing Mechanism - April 2022 to September 2024



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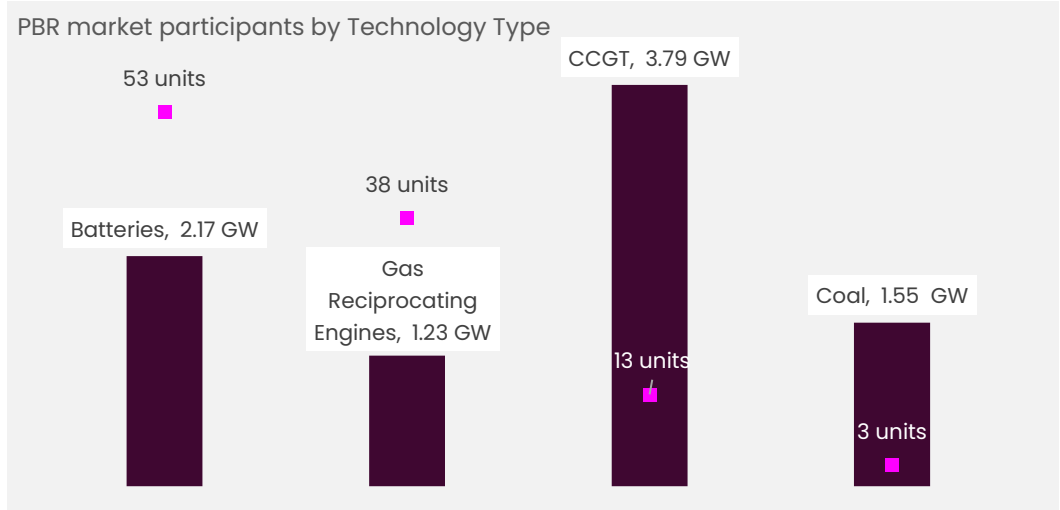
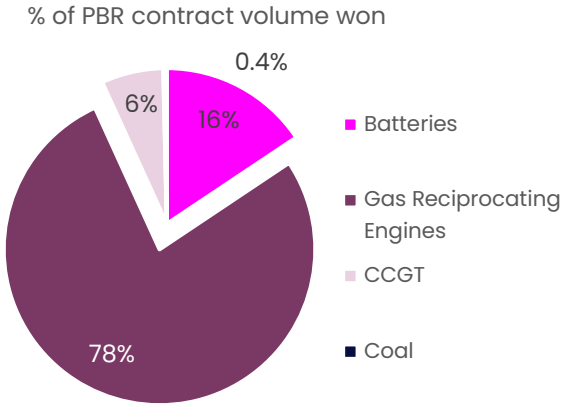
Positive Balancing Reserve

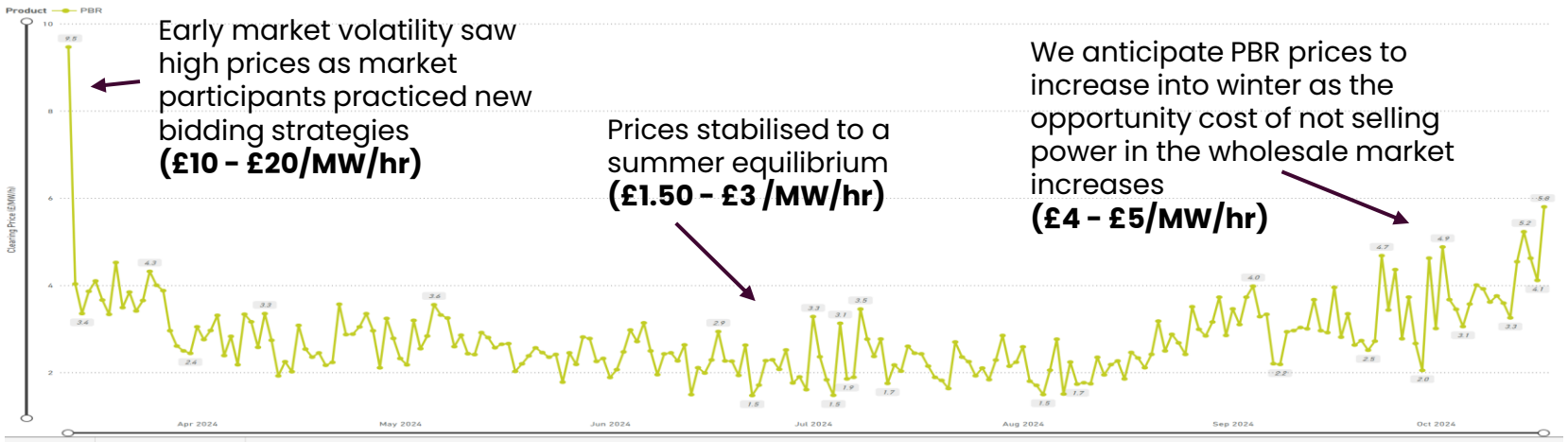
Balancing Reserve (BR), went live on 12 March 2024. We are now able to look back at the key market trends from the first 6-months of service for the Positive and Negative BR markets.

Market Analysis

- We routinely fulfil our 400MW procurement target via the Positive BR market.
- Clearing prices are below the ESO buy order, set through competition between market participants.
- Small Gas BMUs win most of the volume with Battery Storage filling in the gaps particularly over the peaks.
- Whilst larger Gas participates, they are rarely successful with offered prices much higher than Small Gas and Batteries.







Total spend:
Auction: £7.022m | BM Dispatch: £154k

*Data range 13-Mar – 17-Oct '24

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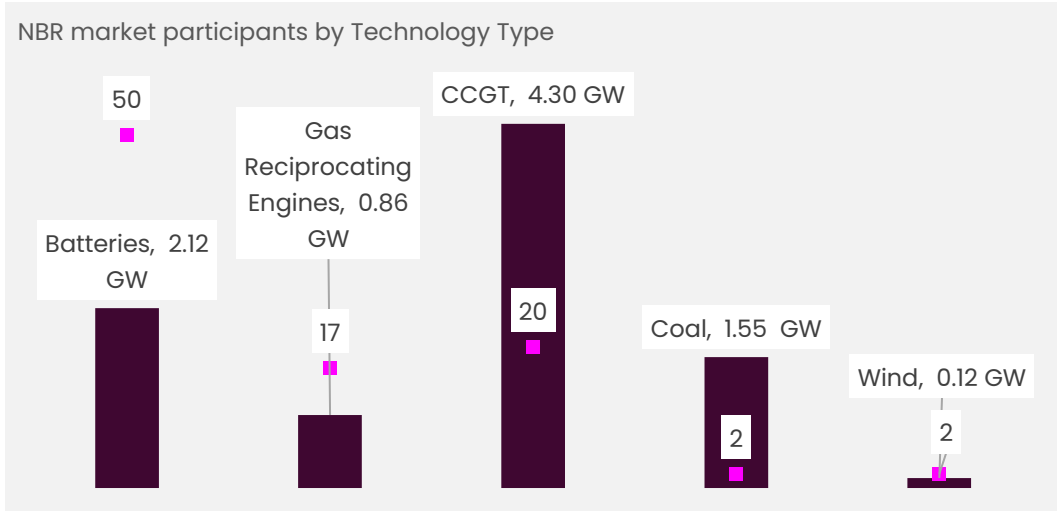
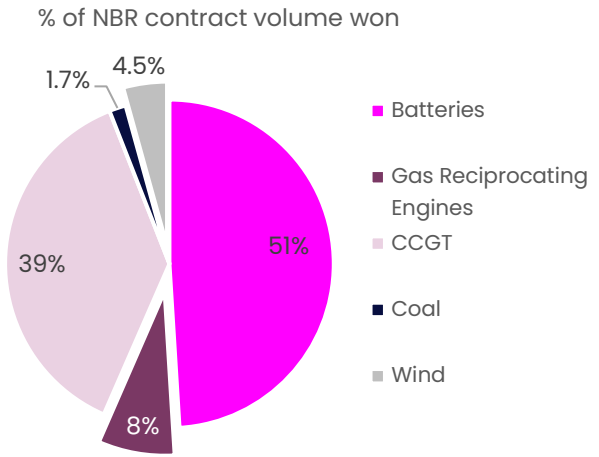
Negative Balancing Reserve

Balancing Reserve (BR), went live on 12 March 2024. We are now able to look back at the key market trends from the first 6-months of service for the Positive and Negative BR markets.

Market Analysis

- We rarely fulfil our 400MW procurement target via the NBR market.
- Clearing prices are set by NESO's buy order at £1.54/MW/hr.
- There are a range of technologies participating in the market including: Batteries, Wind and Large Gas CCGTs.
- The loss of opportunity appears to be more valuable to market participants than NESO values firm negative reserve.





Prices stabilised with a guaranteed contract for any unit willing to offer firm negative reserve for our buy price **(£1.54/MW/hr)**

We expect the volumes clearing in the market to increase as new providers have joined which may put competitive pressure on NBR prices **(£1 - £1.54/MW/hr)**

Early market volatility where market participants submitted prices higher than NESO will pay and therefore the market didn't clear **(£0 - £1.54/MW/hr)**

Total spend:
Auction: £464k | BM Dispatch: £2k

*Data range 13-Mar – 17-Oct '24

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Goodbye to Coal

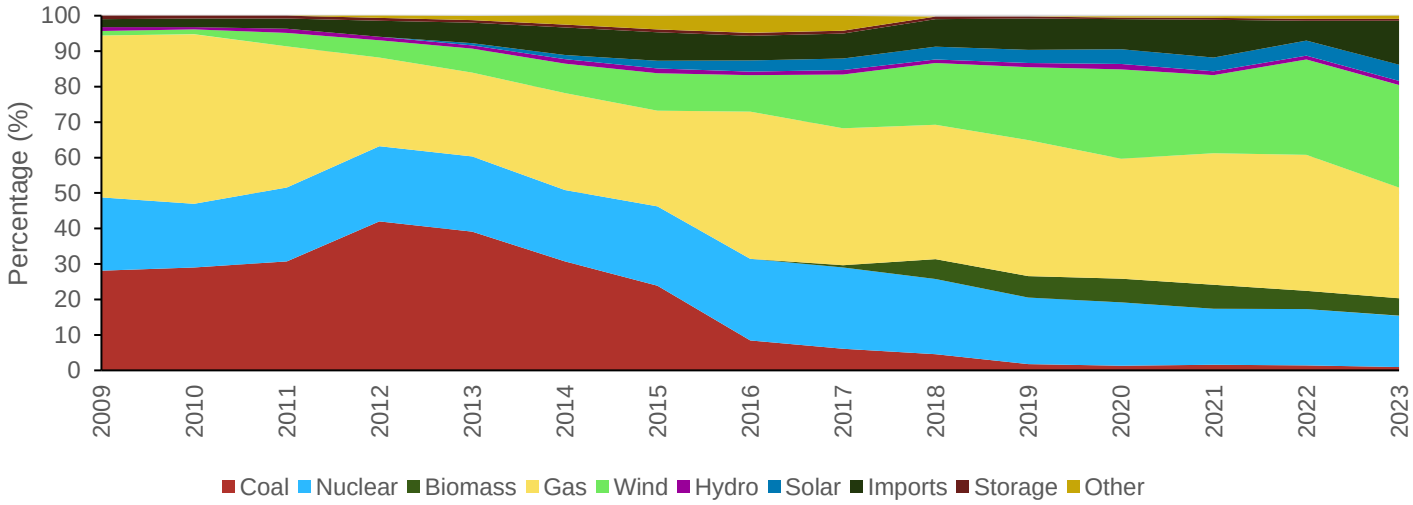
On the 30th September 2024, Ratcliffe-on-Soar stopped generating, marking an end to 142 years of coal fired generation in Great Britain.

The world's first coal fired power station was opened at Holborn Viaduct in London in 1882. Over the next 100 years, coal continued to be the major source of electricity generation, reaching a peak capacity of 57.5GW in 1974[1]. Coal capacity started decreasing sharply in the 1990s due to the 'Dash for Gas' and the expansion of gas fired generation plants.

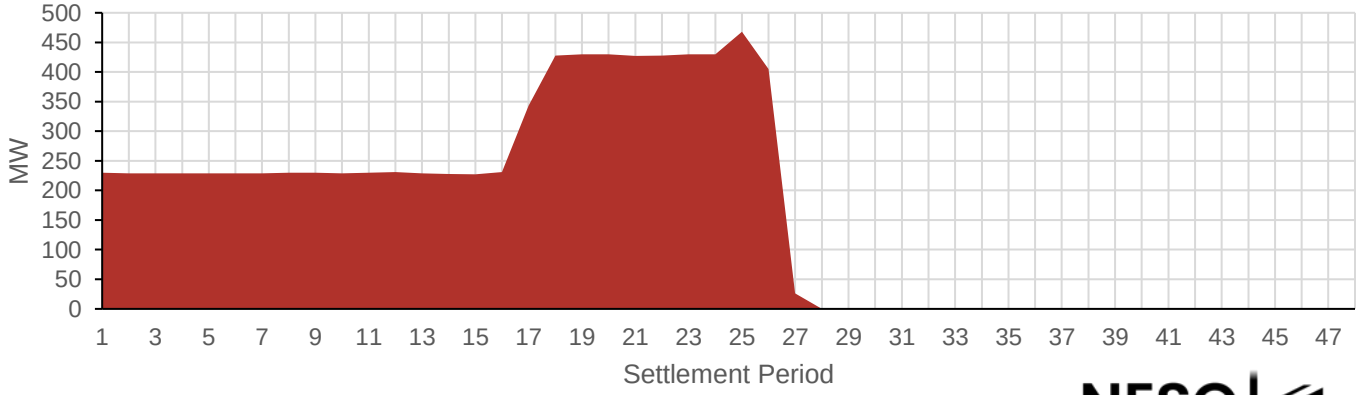
The percentage of coal in the GB energy mix has dropped from 39% in 2013 to just 1% in 2023. This has largely been down to the growth in renewables over the last 10 years, especially offshore wind, but also due to carbon pricing and the implementation of stricter emission standards.

Coal has remained less than 2% of the GB energy mix since 2019, despite a brief uptick due to the energy crisis in 2021. Over its lifetime it has played a key role in providing dispatchable generation, a role that will be taken over in the future by gas fired generation.

Change in generation mix - 2009 to 2023



Goodbye Coal – 30th September 2024



[1] UK Electricity capacity and generation by fuel between 1920 and 2020, p3

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Case Studies

Key messages:

- Balancing costs in August were £291m, making it the most expensive month of the summer 2024 period.
- High costs were caused by high wind outturn and reduced constraint limits in Scotland.
- The B5 boundary was the key region of network congestion resulting in high levels of wind curtailment above this boundary.

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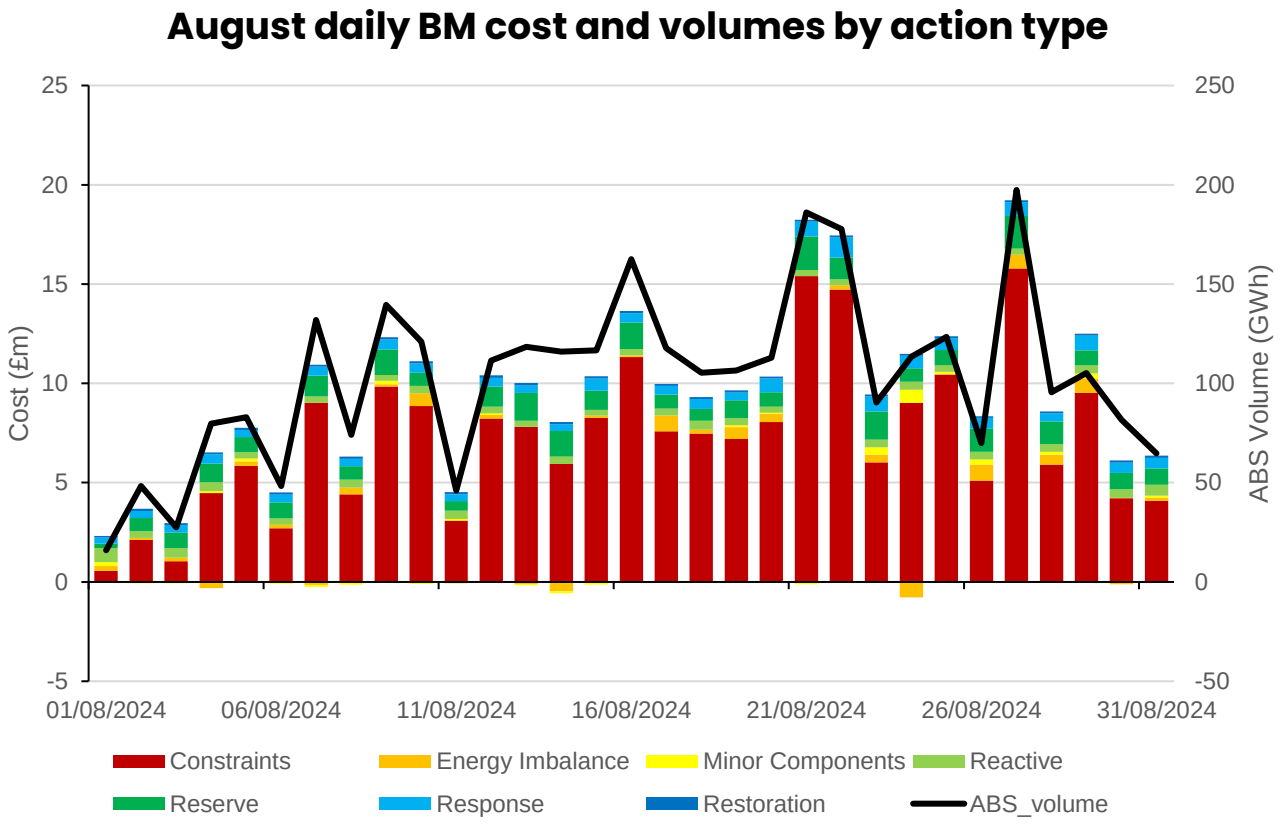
August – high cost month

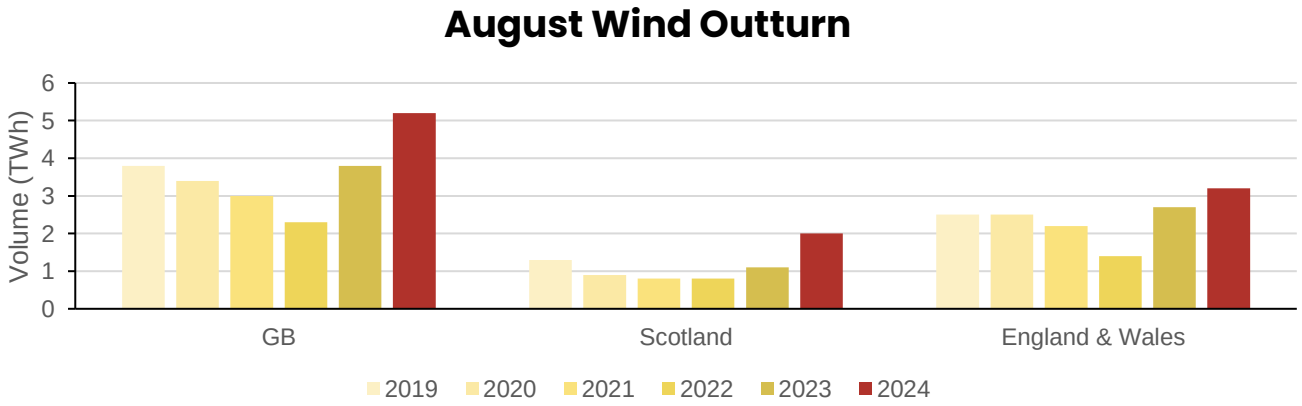
August was the most expensive month for balancing costs due to a combination of high wind and reduced constraint limits in Scotland

Balancing costs in August were £291m, making it the most expensive month of the summer 2024 period. This was due to the effects of high wind which was amplified by reduced constraint limits in Scotland.

Wind generation was up 37% compared to August 2023, with wind in Scotland alone up 82%. Notably, the remnants of Hurricane Ernesto and Storm Lilian around the 22 August led to difficult operating conditions in the second half of the month.

Constraint actions (shown in red) consequently made up 77% of the total BM cost in August.





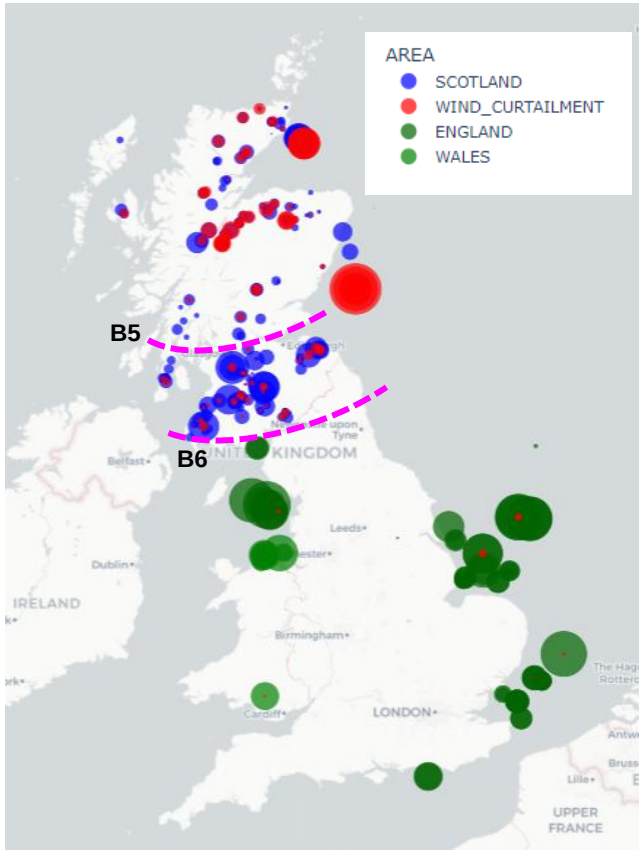
August – high cost month

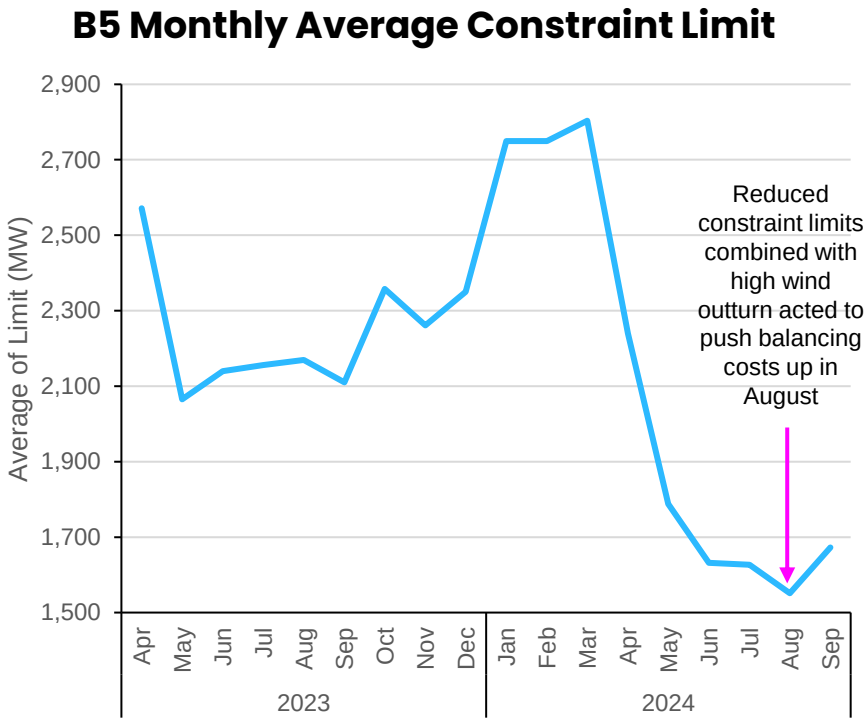
The transfer capacity at the B5 boundary reduced to ~41% in August due to outages scheduled over the summer period.

This coincided with abnormally high wind outturn volumes in Scotland, resulting in increased wind curtailment above this boundary which drove up costs across the month.

This drove constraint costs to their highest August value over the last 5-years.

Distribution of wind generation and curtailment by region in August, the size of the bubble indicates the volume





In August, outages lowered constraint limits in Northern Scotland. Outages are usually scheduled over summer due to their reduced impact on balancing costs. However, unusually high wind outturn in August (including storm conditions) exacerbated the impact from outages and resulted in higher than expected costs.

B5 was a key constraint boundary contributing to balancing costs during the summer period. The chart above (left) shows wind curtailment was significantly higher behind this constraint in August, whereas curtailment between B5 and B6 was notably lower.

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If you have any questions or queries relating to Balancing Costs, please reach out to box.Balancing.Costs@nationalenergyso.com

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