

ESO RII02 Business Plan 1 (2021-23)

February 2023

Incentives Report

23 March 2023



Contents

| | |
|---|-----------|
| Introduction | 1 |
| Role 1 Control Centre operations | 4 |
| Role 2 Market development and transactions..... | 24 |
| Role 3 System insight, planning and network development..... | 27 |

Introduction

The ESO's [RIIO-2 Business Plan](#), submitted to Ofgem in December 2019, sets out our proposed activities, deliverables, and investments for 2021-26 to enable the transition to a flexible, net zero carbon energy system.

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 1" period, which runs from 1 April 2021 to 31 March 2023.

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 [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. 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](#).

Every six months, we produce a more detailed report covering all of the criteria used to assess our performance.

Please see our [website](#) for more information.

Summary of Notable Events

In February we have successfully delivered the following notable events and publications:

- We've saved consumers £80 million between April 22 - January 23 as part of the Constraints Management Pathfinder's Anglo-Scottish Intertrip scheme. By allowing renewable units already connected to the scheme to start service delivery early, we have avoided extra costs for consumers and 139,924 tonnes of potential CO₂.
- The Balancing Programme hosted their latest industry engagement event in London. It provided an update on progress against our industry co-created Balancing Programme Roadmap. We received some great feedback following the event with attendees rating the event 8.1 out of 10.
- We published Baringa's independent assessment of investment policy options and market design packages. We commissioned Baringa's analysis as part of the fourth phase of our Net Zero Market Reform (NZMR) programme and to support the debate around market reform driven by the Government's Review of Electricity Market Arrangements (REMA). We will now be forming our conclusions on holistic market design, which will pull together various analyses including Baringa's assessment, to be published in Summer 2023.
- On 31 January, we published the 2022 Electricity Ten Year Statement (ETYS), which shows our view of GB's National Electricity Transmission System (NETS) over the next ten to twenty years.
- We announced reforms into how to connect into the transmission grid. Our new five-point plan will speed up the current connections queue. To begin initiating this plan, from 1 March we're implementing a new two-step process for applications in England and Wales. This will reduce uncertainty for developers in the longer term as we apply our new modelling and storage assumptions. In Scotland, these changes will be applied without the need to implement a new two-step process.
- The ESO Innovation team alongside Ofgem, ENA, Innovate UK, all the GB electricity and gas networks came together for an inaugural event to develop and accelerate the solutions we need to deliver Net Zero.
- On 1 February, we hosted a customer webinar on the development of the EMR Portal. It was well attended by over 100 industry customers and stakeholders. The majority of the customers supported our preferred option of delivery of the new portal for 2024.
- ESO delivered the T-1 and T-4 auctions for the Capacity Market for the Delivery Year 2023/24 and 2026/27. This will help strengthen the security of supply in the UK as well as contributing towards our net zero ambition.

Table 1: Summary of Metrics and RREs

This table summarises our Metrics and Regularly Reported Evidence (RRE) performance for February 2023.

| Metric/Regularly Reported Evidence | | Performance | Status |
|------------------------------------|--|--|--------|
| Metric 1A | Balancing Costs | £280m vs benchmark of £148m | ● |
| Metric 1B | Demand Forecasting | Forecasting error of 2.1% vs benchmark of 2.1% | ● |
| Metric 1C | Wind Generation Forecasting | Forecasting error of 6.0% vs benchmark of 5.4% | ● |
| Metric 1D | Short Notice Changes to Planned Outages | 3.9 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 | 93.6% of actions taken in merit order | N/A |
| RRE 1G | Carbon intensity of ESO actions | 6.2gCO 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% | N/A |

Below expectations ●

Meeting expectations ●

Exceeding expectations ●

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

Gareth Davies

ESO Regulation Senior Manager

Role 1 Control Centre operations

Metric 1A Balancing cost management

February 2023 Performance

This metric measures our balancing costs based on a benchmark that has been calculated using the previous three years' costs and outturn wind generation. It assumes that the historical relationship between wind generation and constraint costs continues, recognising that there is a strong correlation between the two factors. Secondly, it assumes that non-constraint costs remain at a calculated historical baseline level. A more detailed explanation follows:

At the beginning of the year the non-adjusted balancing cost benchmark is calculated using the methodology outlined below. The final benchmark for each month is based on actual outturn wind, but an indicative view is provided in advance based on historic outturn wind.

- i. Using a plot of the historic monthly constraints costs (£m) against historic monthly outturn wind (TWh) from the 36 months immediately preceding the assessment year, a best fit straight-line continuous relationship is set to determine the monthly 'calculated benchmark constraints costs'.
- ii. Using a plot of historic monthly total balancing costs (£m) against historic monthly constraint costs from the 36 months immediately preceding the assessment year, a best fit straight-line continuous relationship is set, with the intercept value of that straight line used to determine the monthly 'calculated benchmark non-constraints costs'.
- iii. An equation for the straight-line relationship between outturn wind and total balancing costs is then formed using the outputs of point (i.) and point (ii.).
- iv. The historic 3-year average outturn wind for each calendar month is used as the input to the equation in point (iii). The output is 12 ex-ante, monthly non-adjusted balancing cost benchmark values. The sum of these monthly values is the initial 'non-adjusted annual balancing cost benchmark'. The purpose of this initial benchmark is illustrative as it will be adjusted each month throughout the year.

$$\text{Total Balancing Costs}^1 (\text{£m}) = (\text{Outturn Wind (TWh)} \times 25.254 (\text{£m/TWh})) + 15.972 (\text{£m}) + 50.4 (\text{£m})$$

A monthly ex-post adjustment of the balancing cost benchmark is made to account for the actual monthly outturn wind. This is done by following the process described in point (iv.) above but using the actual monthly outturn wind instead of the historic 3-year average outturn wind of the relevant calendar month. The annual balancing cost benchmark is then updated by replacing the historic value for the relevant month with this actual value.

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](#).

¹ This is the benchmark formula for 2022-23. The benchmark for 2021-22 was calculated as: (Outturn Wind (TWh) x 12.16 (£m/TWh)) + 19.75 (£m) + 41.32 (£m)

Figure 1: Monthly balancing cost outturn versus benchmark – two-year view

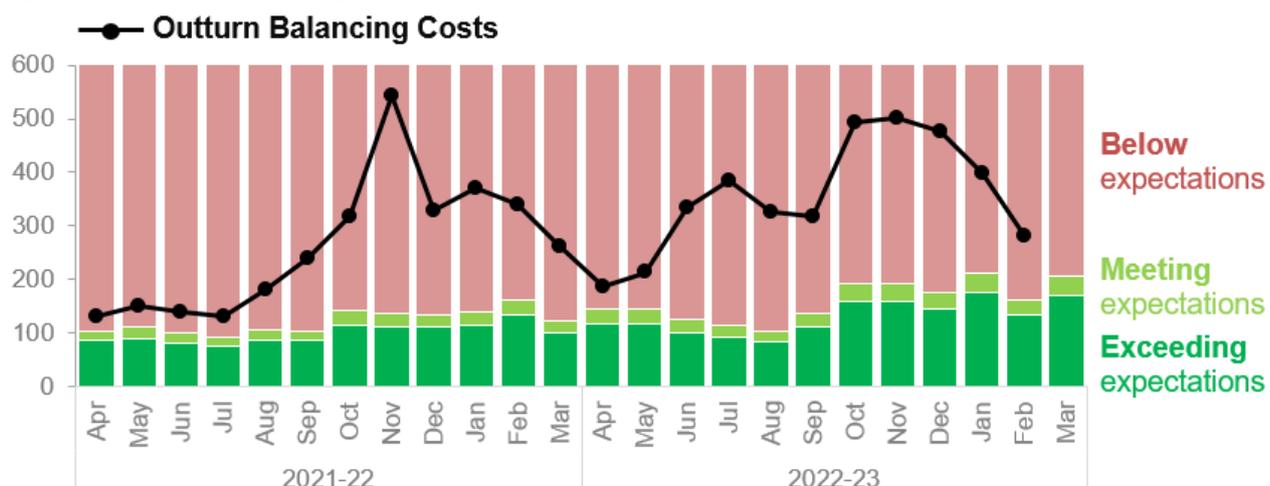


Table 2: Monthly balancing cost benchmark and outturn

| All costs in £m | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | YTD |
|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----|-------------|
| Benchmark: non-constraint costs (A) | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | | 554 |
| Indicative benchmark: constraint costs (B) | 97 | 89 | 90 | 81 | 101 | 107 | 146 | 133 | 151 | 156 | 182 | | 1333 |
| Indicative benchmark: total costs (C=A+B) | 147 | 139 | 140 | 132 | 152 | 158 | 196 | 183 | 201 | 206 | 233 | | 1887 |
| Outturn wind (TWh) | 3.8 | 3.8 | 3.1 | 2.8 | 2.3 | 3.5 | 5.6 | 5.6 | 5.0 | 6.3 | 4.5 | | 46.2 |
| Ex-post benchmark: constraint costs (D) | 80 | 80 | 62 | 52 | 42 | 73 | 125 | 125 | 110 | 143 | 98 | | 991 |
| Ex-post benchmark (A+D) | 130 | 130 | 113 | 130 | 93 | 123 | 176 | 176 | 161 | 194 | 148 | | 1546 |
| Outturn balancing costs² | 188 | 213 | 335 | 385 | 327 | 318 | 493 | 502 | 477 | 398 | 280 | | 3916 |
| Status | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | ● |

Rounding: monthly figures are rounded to the nearest whole number, with the exception of outturn wind which is rounded to one decimal place.

Performance benchmarks

- **Exceeding expectations:** 10% lower than the balancing cost benchmark
- **Meeting expectations:** within $\pm 10\%$ of the balancing cost benchmark
- **Below expectations:** 10% higher than the balancing cost benchmark

² Please note that previous months' outturn balancing costs are updated every month with reconciled values

Supporting information

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.

February performance

The Balancing costs for February 2023 were £280m, which is a decrease of around £118m from January 2023.

A new cost category, Winter Contingency, has been added to the non-constraint costs from October 2022. In response to the disruption of gas supplies to Europe, the Secretary of State approached the ESO to secure additional non-gas capacity over winter 2022/23. The ESO has contracted five generation units across three coal fired power stations to stay available across this winter to provide extra generation should it be needed to ensure electricity security of supply. These contracts began in October 2022 and are the main driver of the significant increase in non-constraint costs since September 2022.

Although the non-constraint volume of actions was higher than the previous month and slightly higher from the same period last year, the underlying non-constraints costs (excluding Winter Contingency) significantly decreased but remain slightly higher than last year.

Constraint costs decreased this month and remain lower than last year.

The total volume of actions and the total cost was lower this month compared to the corresponding period last year.

Breakdown of costs vs previous month

Balancing Costs variance (£m): February 2023 vs January 2023

| | (a) | (b) | (b) - (a) | decrease ◀ increase |
|------------------------------|--------------|--------------|----------------|---------------------|
| | Jan-23 | Feb-23 | Variance | Variance chart |
| Non-Constraint Costs | | | | |
| Energy Imbalance | -11.9 | -11.8 | 0.1 | |
| Operating Reserve | 88.4 | 53.7 | (34.7) | █ |
| STOR | 13.0 | 6.2 | (6.8) | █ |
| Negative Reserve | 0.6 | -0.1 | (0.6) | |
| Fast Reserve | 18.5 | 13.7 | (4.8) | █ |
| Response | 19.6 | 15.7 | (3.9) | █ |
| Other Reserve | 2.2 | 1.5 | (0.7) | |
| Reactive | 32.6 | 30.1 | (2.6) | █ |
| Restoration | 9.0 | 2.4 | (6.6) | █ |
| Winter Contingency | 62.9 | 37.3 | (25.6) | █ |
| Minor Components | 20.8 | 20.9 | 0.1 | |
| Constraint Costs | | | | |
| Constraints - E&W | 35.4 | 16.6 | (18.8) | █ |
| Constraints - Cheviot | 2.3 | 4.2 | 1.9 | █ |
| Constraints - Scotland | 13.7 | 17.8 | 4.1 | █ |
| Constraints - Ancillary | 2.0 | 3.7 | 1.7 | █ |
| ROCOF | 16.5 | 9.1 | (7.5) | █ |
| Constraints Sterilised HR | 69.3 | 59.5 | (9.8) | █ |
| Totals | | | | |
| Non-Constraint Costs - TOTAL | 255.7 | 169.6 | (86.1) | █ |
| Constraint Costs - TOTAL | 139.2 | 110.9 | (28.4) | █ |
| Total Balancing Costs | 394.9 | 280.4 | (114.5) | █ |

As shown in the total rows from the table above, the non-constraint costs decreased by £86m this month. Constraint spends also decreased by £28m. Constraints in England & Wales, Constraints Sterilised Headroom (HR) and ROCOF were the main drivers behind this decline. All the other constraint categories showed little variance from the previous month. Within the Non-Constraint costs all categories experienced a decrease in cost or showed little variance from the previous month.

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

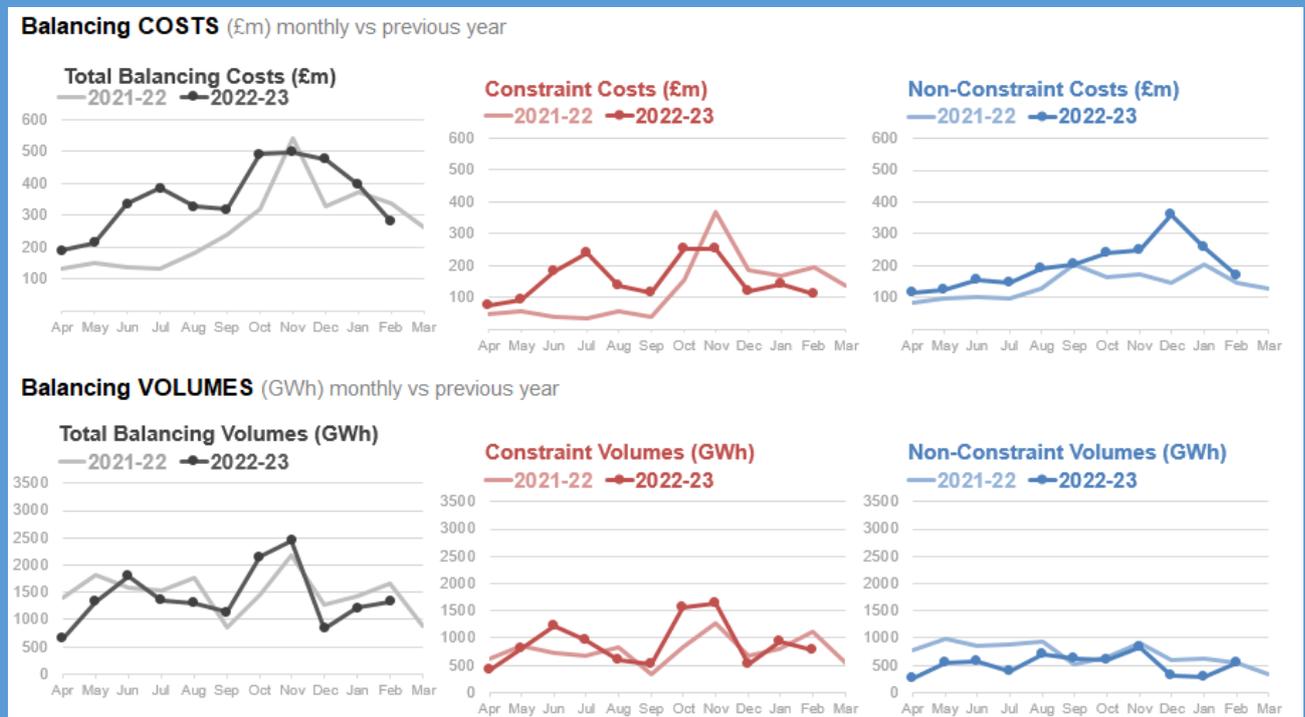
- **Constraint-E&W: £19m decrease**, due to lower volume of actions.
- **ROCOF: £7.5m decrease**. Decrease driven by the inertia requirements being met by synchronised generation, whether self-dispatched or instructed for voltage or another requirement.
- **Constraints Sterilised HR: £9.8m decrease**. The cost reduction is in line with the reduction of constraint actions because less headroom had to be replaced elsewhere outside the constraint through BM actions.

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

- **Operating Reserve: £35m decrease**. Healthier margins required less intervention to maintain reserve requirements.
- **Winter Contingency: £26m decrease**. Three less days in this month than the previous one and a decrease in the daily spend from £2m to £0.8m after the first half of the month.

Constraint vs non-constraint costs and volumes

Restoration: Please note that the 2020-21 incentivised balancing cost figures did not include costs for restoration, but from April 2021 these are included. To enable a direct comparison, in the graphs below these restoration costs are included for both 2020-21 and 2021-22.



Please note that a portion of the **Minor Components** spend contributing to non-constraint cost and volume is 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 £84m lower than in February 2022 due to:

- Lower wholesale prices compared with last year.
- Lower volume of actions.

Compared with last month:

Constraint costs were £28m lower than in January 2023 due to:

- An overall reduction in the wholesale prices in February.
- Lower volume of actions.

Non-constraint costs

Compared with the same month of the previous year:

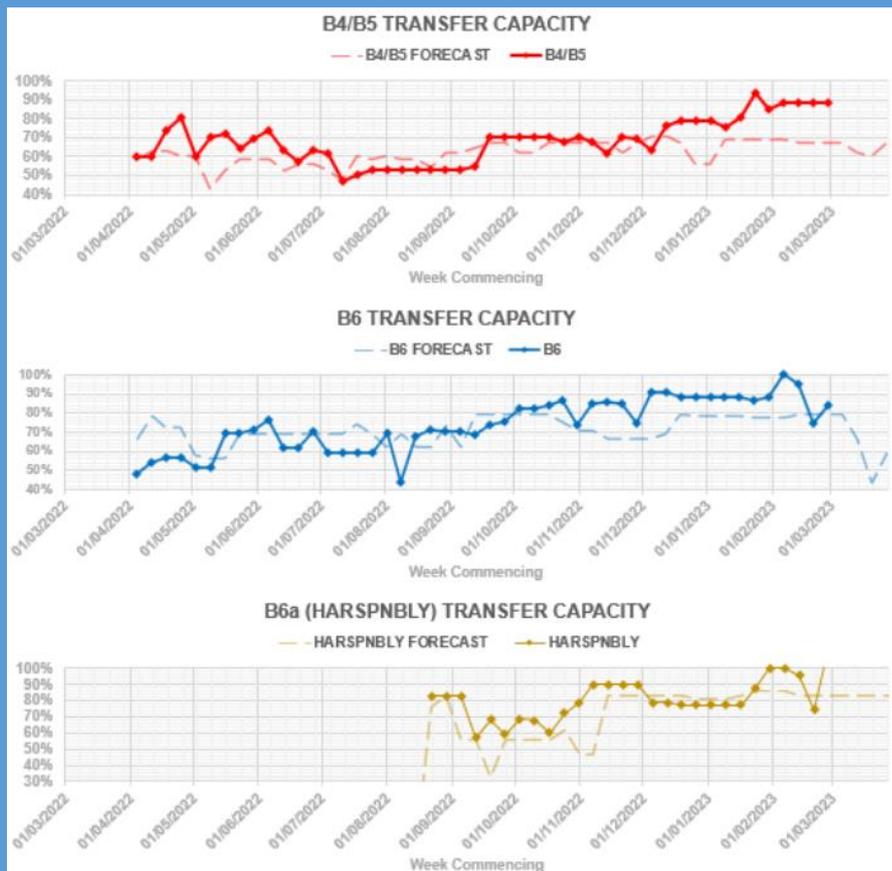
Non-constraint costs were £26m higher than in February 2022 mainly due to winter contingency contracts.

Compared with last month:

Non-constraint costs were £86m lower than in January 2023 due to:

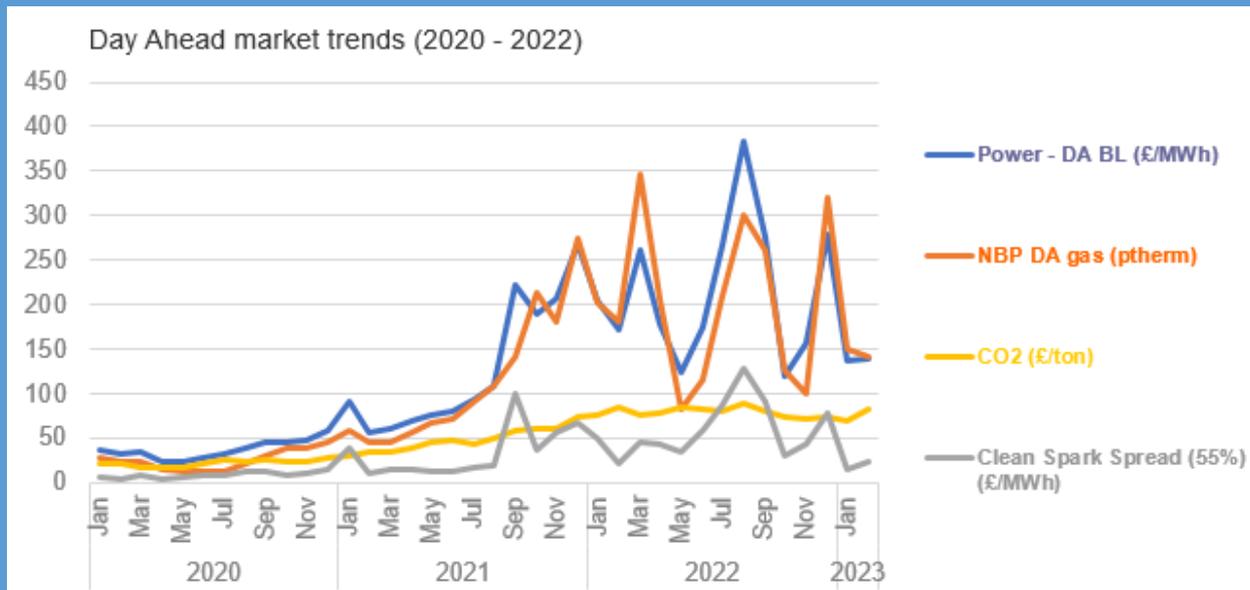
- Lower average wholesale prices.
- Lower daily spend for the winter contingency contracts.

Network availability 2022-33



Please note that transfer capacity is discussed in more detail at each week's Operational Transparency Forum. Details of how to sign up, and recordings of previous meetings are available [here](#).

Changes in energy balancing costs



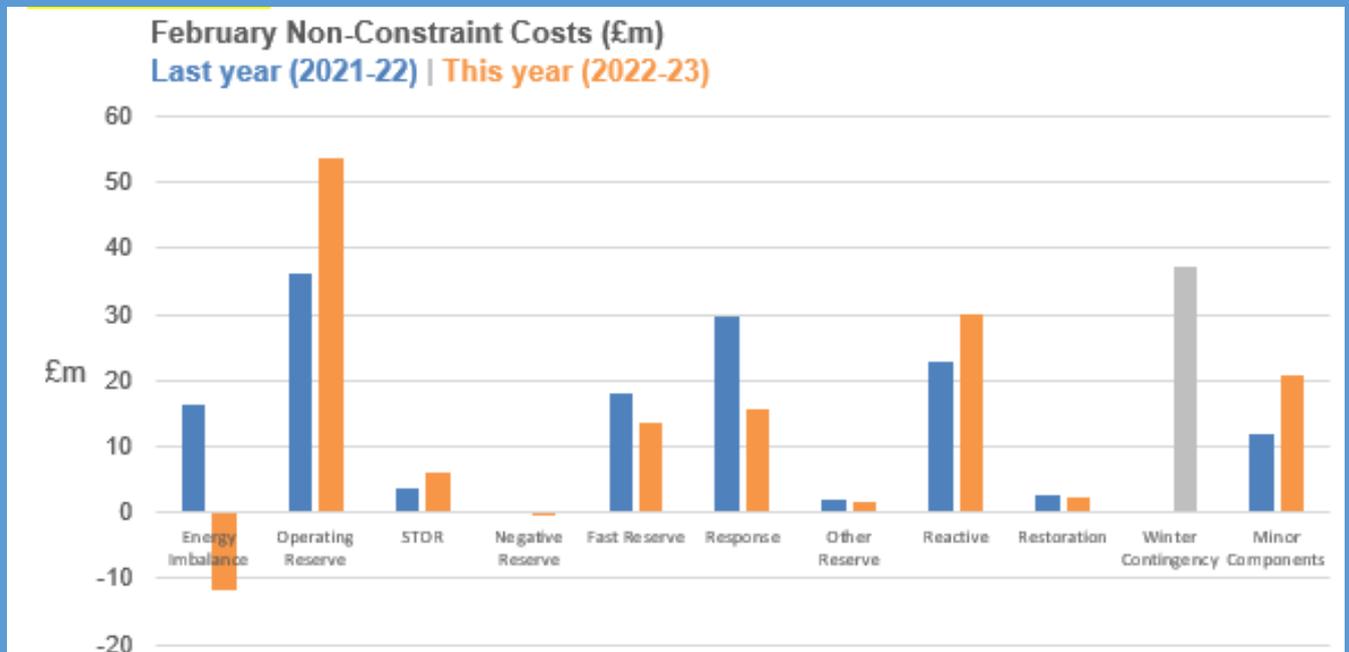
DA BL: Day Ahead Baseload

NBP DA: National Balancing Point Day Ahead

Power day ahead prices and day ahead Gas prices showed little variance from last month and remain lower compared to previous year.

Clean Spark Spread and Carbon prices increased this month compared the previous month and remain at the same level compared to the previous year.

Cost trends vs seasonal norms

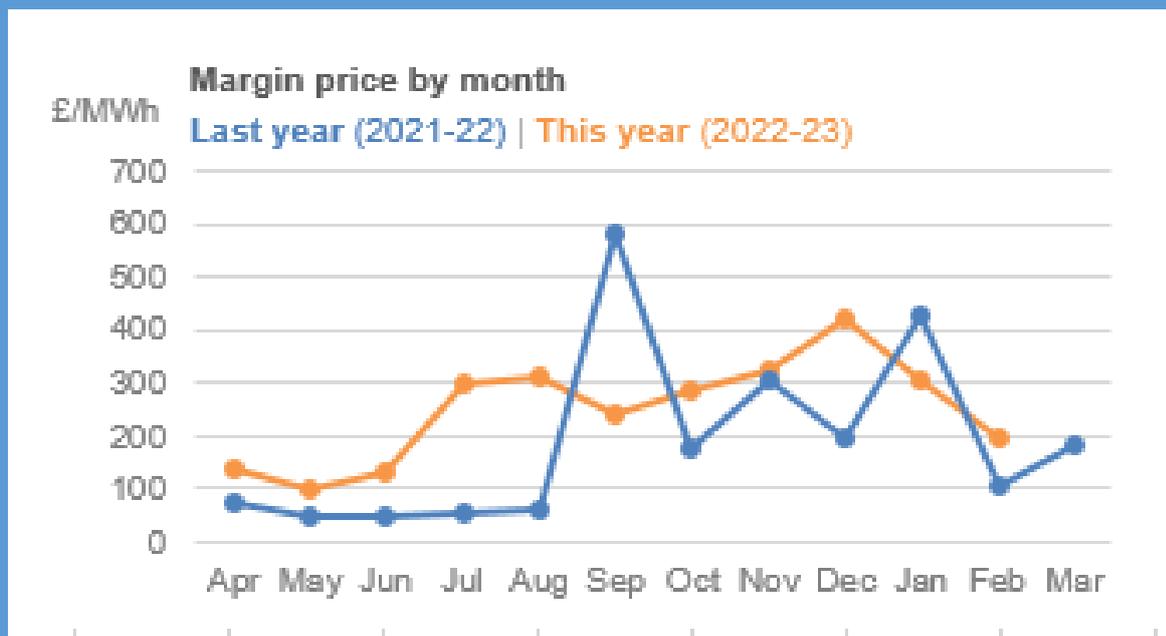


Comparing the non-constraint costs of February 2023 with those of February 2022, Operating Reserve, STOR, Reactive and Minor Components showed an increase, all the other categories showed a decrease in cost or a small deviation from the previous month.

We do not cover the variation in Minor Components here as it is driven by the data issue referenced earlier. Winter Contingency costs were introduced this year.

- **Operating Reserve £18m** increase due to high BM prices being submitted by units which were required to maintain reserve levels.
- **STOR** increased by £2.4m, as cleared costs of procuring the service have increased.
- **Reactive** costs are £7.4m higher. Volumes from the relevant ancillary services are not available at the time of writing this report.
- **Winter Contingency:** £37m higher. There were no Winter contingency contracts in effect during 2021/22. The current contracts started from October 2022. See introduction to this section for more detail.
- **Minor components:** £9m increase. We have identified most of the cost in this category should have been allocated to the Operating reserve category. It will be corrected once the data issue is resolved.

Drivers for unexpected cost increases/decreases



Margin prices (the amount paid for a single MWh) have decreased since December but are higher than the same month last year.

Daily costs trends

As discussed above, February balancing costs were £115m lower than the previous month. Less constraint volume of actions, less cost for the winter contingency contracts and less spent on the Operating Reserve. However, we counted five days that recorded a spend of more than £15m.

On Sunday 19 February when out-turned costs were around £18m, the major cost component was the Constraints due to high wind speed resulting in more BM actions required to curtail generation in order to manage thermal constraints.

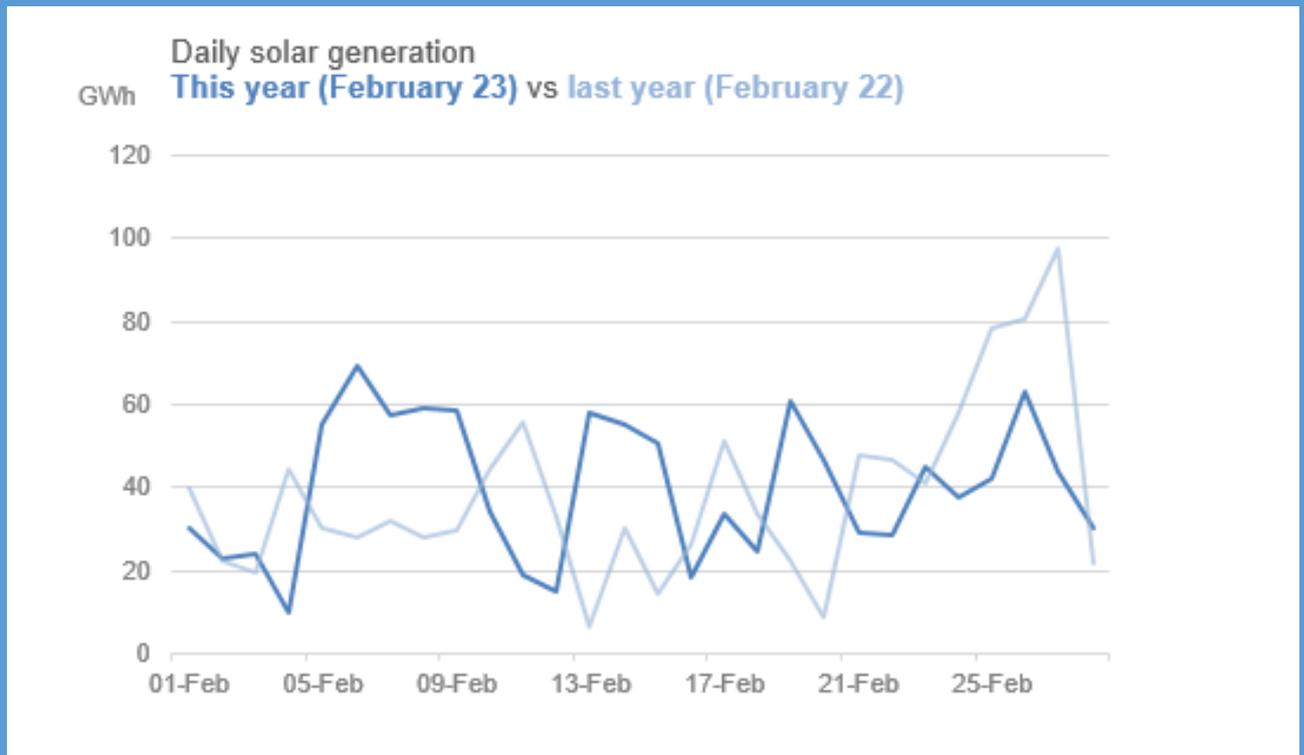
There was a similar picture for the other expensive days, namely 01, 02, 08 & 20 February, with thermal constraints being the main drivers behind costs.

The average daily cost for the month was £10m, a £2.7m decrease from the previous month.

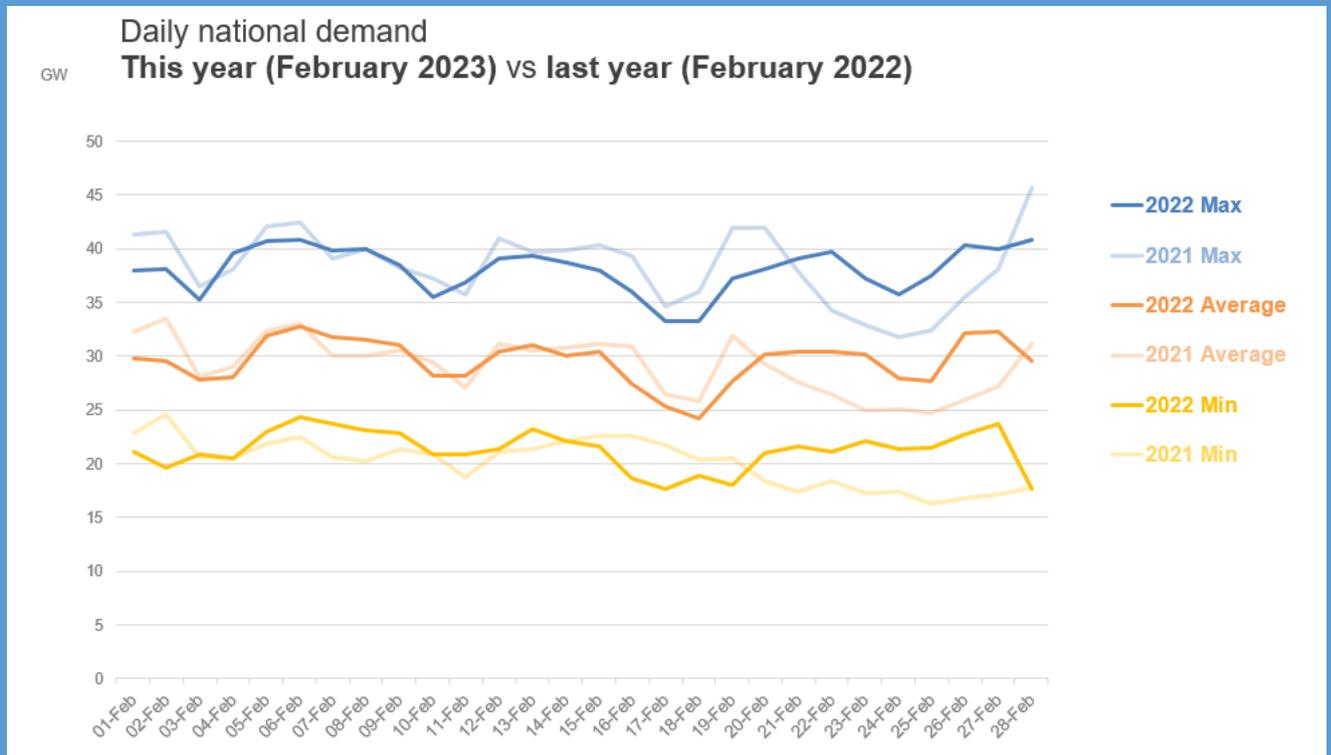
The minimum cost of £3.7m observed on 28th February

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 actions

Solar generation - February 2023 vs February 2022



Outturn Demand – February 2023 vs February 2022



Metric 1B Demand forecasting accuracy

February 2023 Performance

This metric measures the average absolute percentage error (APE) between day-ahead forecast demand and outturn demand for each half hour period. The benchmarks are drawn from analysis of historical forecasting errors for the five years preceding the performance year.

If the Optional Downward Flexibility Management (ODFM) service is used, it will be accounted for in the data used to calculate performance. The ESO will publish the volume of instructed ODFM.

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

Performance will be assessed against the annual benchmark of 2.1%, but monthly benchmarks are also provided as a guide. The ESO will report against these each month to provide transparency of its performance during the year.

Figure 2: Monthly APE (Absolute Percentage Error) vs Indicative Benchmark – two-year view

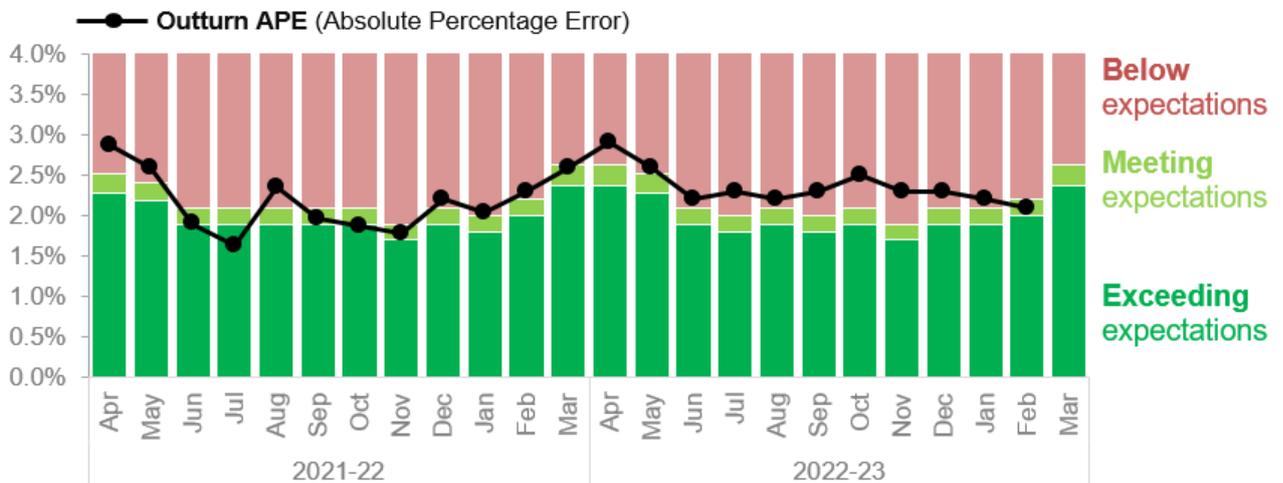


Table 3: Monthly APE (Absolute Percentage Error) vs Indicative Benchmark (2022-23)

| | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Full Year |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|
| Indicative benchmark (%) | 2.5 | 2.4 | 2.0 | 1.9 | 2.0 | 1.9 | 2.0 | 1.8 | 2.0 | 2.0 | 2.1 | 2.5 | 2.1 |
| APE (%) | 2.9 | 2.6 | 2.2 | 2.3 | 2.2 | 2.3 | 2.5 | 2.3 | 2.3 | 2.2 | 2.1 | | |
| Status | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |

Performance benchmarks

- **Exceeding expectations:** >5% lower than 95% of average value for previous 5 years
- **Meeting expectations:** $\pm 5\%$ 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

For February 2023, the mean absolute percentage error (MAPE) of our day ahead demand forecast was 2.1% compared to the indicative performance target of 2.1%, and therefore meeting expectations.

February was a dry, mild month – joint 5th mildest on record according to the Met Office. The weather was dominated by high pressure systems over the UK which helped to repel advancing fronts and generally kept wind levels lower and more stable. Having calmer, less variable weather compared to previous years aids forecast accuracy.

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 (1344) |
|--------------------|---------------|--------------------------------------|
| 1000 MW | 260 | 19% |
| 1500 MW | 95 | 7% |
| 2000 MW | 35 | 3% |
| 2500 MW | 18 | 1% |
| 3000 MW | 11 | 1% |

The days with largest MAPE were February 7, 13 and 16. Both Feb 7 and 13 were affected by large solar errors, and Feb 16 was affected by the uncertainty of a low-pressure system passing near Scotland and the associated wind errors.

DFS tests were run on February 13, 16, 21. These events add additional uncertainty versus regular days, and against the 5 years benchmark period before DFS was introduced.

Work is under way implementing the recently increased amount of weather data we receive and feed into our forecast models. Model improvements are currently being developed, though this will take time to collect enough data to robustly measure the impact of these forecast improvements (at least one full quarter), and accuracy improvements won't be seen immediately.

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

Triads

Triads are the three half-hour settlement periods of highest demand on the GB electricity transmission system between November and February (inclusive) each year. They are separated by at least ten clear days to avoid all three triads potentially falling in consecutive hours on the same day, for example during a particularly cold spell of weather. The ESO uses the triads to determine TNUoS demand charges for customers with half-hourly meters. The triads are designed to encourage demand customers to avoid taking energy from the system during peak times if possible. See our [website](#) for more detail on triads.

In February we saw 3 days affected by triad avoidance behaviour, totalling approximately 9,200 MW over 17 settlement periods.

These have the effect of increasing uncertainty when forecasting peak demands.

Metric 1C Wind forecasting accuracy

February 2023 Performance

This metric measures the average absolute percentage error (APE) between day-ahead forecast and outturn wind generation for each half hour period as a percentage of capacity for BM wind units only. 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 $\pm 5\%$ of that value is required to meet expectations.

Figure 3: BMU Wind Generation Forecast APE vs Indicative Benchmark – two-year view

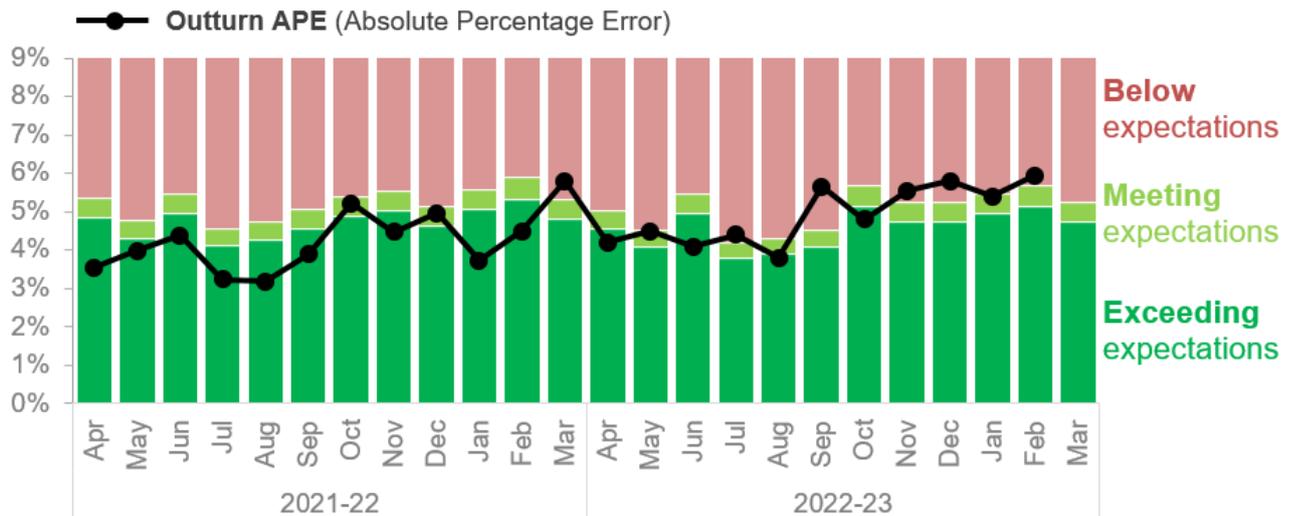


Table 4: BMU Wind Generation Forecast APE vs Indicative Benchmarks (2022-23)

| | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Full Year |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------|
| BMU Wind Generation Forecast Benchmark (%) | 4.8 | 4.3 | 5.2 | 4.0 | 4.1 | 4.3 | 5.4 | 5.0 | 5.0 | 5.2 | 5.4 | 5.0 | 4.8 |
| APE (%) | 4.2 | 4.5 | 4.1 | 4.4 | 3.8 | 5.7 | 4.8 | 5.5 | 5.8 | 5.4 | 6.0 | | |
| Status | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |

Performance benchmarks

- **Exceeding expectations:** <5% lower than 95% of average value for previous 5 years
- **Meeting expectations:** $\pm 5\%$ 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

February is the month where Spring tries to arrive but where Winter normally has a last freeze before the thaw. February 2023 was dominated by long periods where high pressure atmospheric conditions brought mild temperatures and suppressed the wind. February 2023 was the driest in 30 years in England according to the Met Office. When considering the whole of the UK less than half the seasonal average rainfall fell in February.

Notable weather events in February were as follows. On the 17th wind was brought to Northern areas as low pressure moved across Northern Scotland in the form of Storm Otto. For the rest of February there were no notable weather scenarios. Significant lightning only occurred on the 1st Feb on the West side of Scotland and that didn't coincide with significant forecast error. Lightning is a good indication of atmospheric instability which can be an indication of wind power forecast error.

Wind farms with CFD contractual arrangements switch off for commercial reasons while prices are negative for 6 hours or more. In February there were no occasions when the electricity price went negative. The electricity price used for this analysis is the Intermittent Market Reference Price. Market Price Data for August can be downloaded from here. <https://www.emrsettlement.co.uk/settlement-data/settlement-data-roles/>.

For the month of February the wind power forecast accuracy achieved was 5.95% with a target of 5.39%. On this occasion the monthly target was missed. Overall larger errors occur because the atmosphere does not always move in time with the forecasts.

Metric 1D Short Notice Changes to Planned Outages

February 2023 Performance

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

Figure 4: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages – two-year view

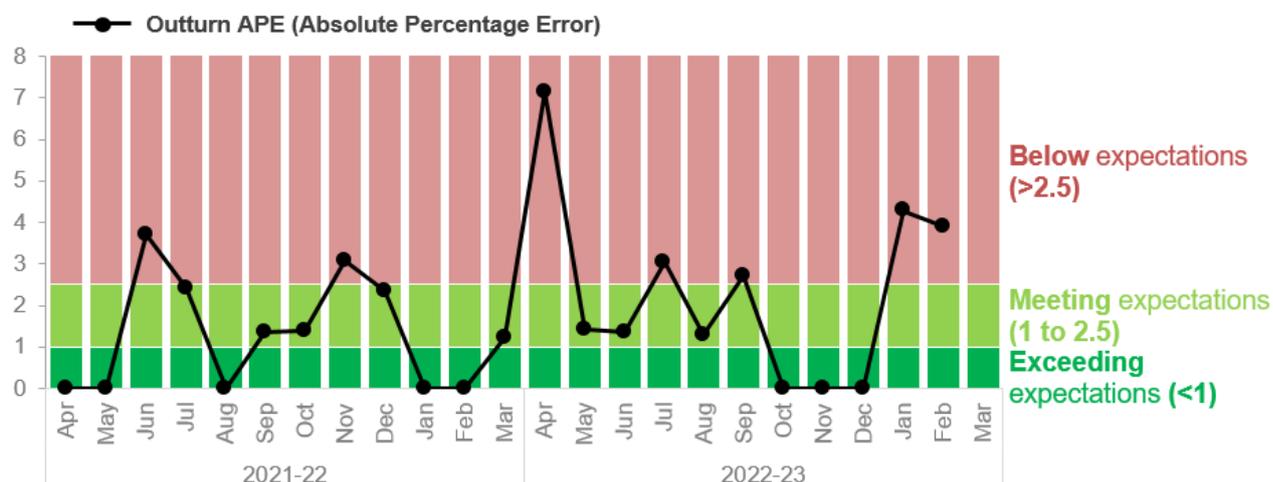


Table 5: Number of outages delayed by > 1 hour, or cancelled, per 1000 outages

| | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | YTD |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Number of outages | 700 | 709 | 730 | 660 | 766 | 739 | 684 | 635 | 441 | 467 | 512 | | 7043 |
| Outages delayed/cancelled | 5 | 1 | 1 | 2 | 1 | 2 | 0 | 0 | 0 | 2 | 2 | | 16 |
| Number of outages delayed or cancelled per 1000 outages | 7.1 | 1.4 | 1.4 | 3.0 | 1.3 | 2.7 | 0 | 0 | 0 | 4.3 | 3.9 | | 2.3 |
| 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 February, the ESO has successfully released 512 outages and there have been two delays or cancellations that occurred due to an ESO process failure. The number of stoppages or delays per 1000 outages is 3.91, which is outside of the 'Meets Expectations' target of less than 2.5 delays or cancellations per 1000 outages. However, the cumulative number of stoppages or delays per 1000 outages still remains within 'Meets Expectation's target at 2.27. The events can be summarized below:

The first delay occurred on outage where it was identified overnight by the control room that for a particular fault it would result in overloading a Super Grid Transformer (SGT) under a specific generation

pattern that could not secure the Distribution Network Operator (DNO) demand. This unique generation pattern was not studied within the planning department and therefore the fault did not flag up. The ESO control room proposed re-configuring the substation to mitigate the unacceptable overloading on the SGT following that fault. This new configuration was required to be reviewed by the DNO and agreed before the outage could be released. An operational learning note is being written to identify corrective measures to prevent a re-occurrence.

The second delay was due to a substation running arrangement proposed by the planning team during a busbar protection depletion that did not identify a particular fault would result in the DNO demand not being secured. As a consequence of the busbar protection depletion there could be a fault which would result in losing two sections of busbars simultaneously. There was the additional complexity on this substation due to an DNO interconnector with another site that required a late change to the plan which required further fault analysis to be conducted, and additional clarity required to determine if the switching could commence during the day, or overnight due to the demand levels. This was not identified within planning timescales and was raised by the control room during the overnight shift. The new substation configuration to secure the demand was sent to the DNO planning team to agree before the outage could commence. An operational learning note has been written highlighting corrective measures for modelling the trips in the offline modelling software and guidance on fault level management at these sites.

RRE 1E Transparency of operational decision making

February 2023 Performance

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.

The Dispatch Transparency dataset, first published at the end of March 2021, has already sparked many conversations amongst market participants. It is anticipated that as we continue to publish this dataset, we will be able to provide additional insight into the actions taken in the Balancing Mechanism and help build trust as we become more transparent with our decision making.

Figure 5: Percentage of balancing actions taken in merit order in the BM – two-year view

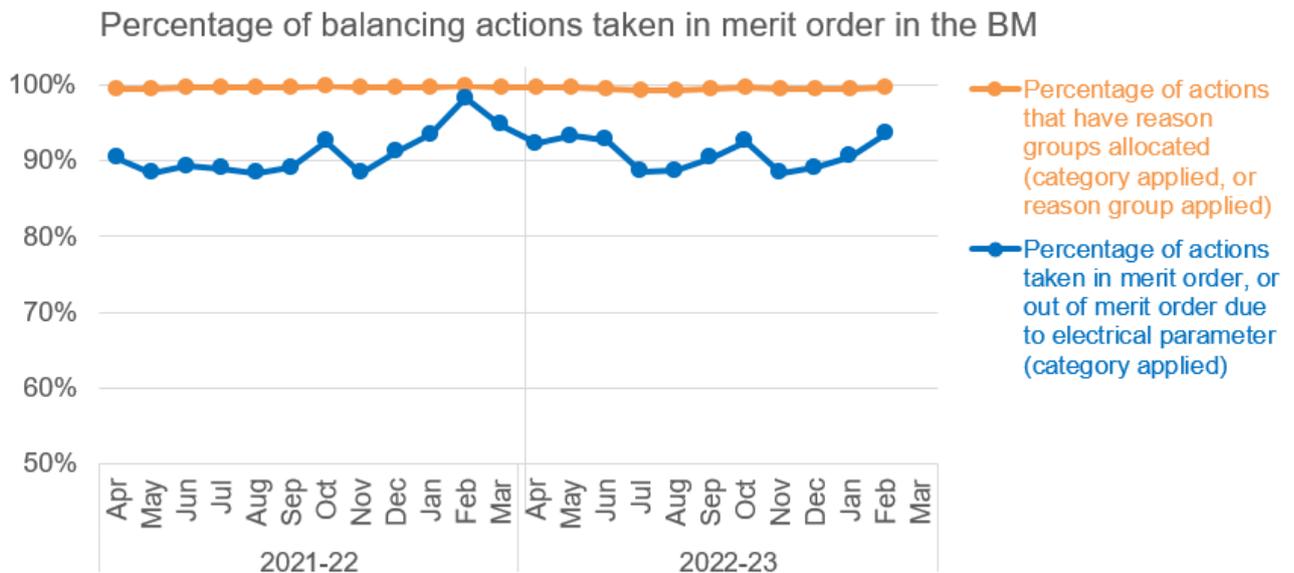


Table 6: Percentage of balancing actions taken outside of merit order in the BM

| | 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) | 92.3% | 93.3% | 92.8% | 88.6% | 88.7% | 90.4% | 92.6% | 88.4% | 89.1% | 90.6% | 93.6% | |
| Percentage of actions that have reason groups allocated (category applied, or reason group applied) | 99.7% | 99.7% | 99.6% | 99.4% | 99.4% | 99.6% | 99.7% | 99.6% | 99.6% | 99.6% | 99.7% | |
| Percentage of actions with no category applied or reason group identified | 0.3% | 0.3% | 0.4% | 0.6% | 0.6% | 0.4% | 0.3% | 0.4% | 0.4% | 0.4% | 0.3% | |

Supporting information

This month 93.6% 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 Feb 2023, we sent 51,218 BOAs (Bid Offer Acceptances) and of these, only 138 remain with no category or reason group identified, which is 0.3% of the total.

Data issue: As mentioned in our October report, we have identified an issue with the data used to support this metric. The impact of this issue is minor and is very unlikely to affect the reported figures.

- Over the 19-month period from April 2021 to October 2022, 11 days were not captured by the dataset.
- We have identified the cause in the data which is provided by an ESO legacy tool and we have implemented countermeasures to ensure any future missing days are flagged promptly and included into the dataset.
- We are unable to recreate the previous missing days due to the time elapsed.

RRE 1G Carbon intensity of ESO actions

February 2023 Performance

This 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](#).

Figure 6: Average monthly gCO₂/kWh of actions taken by the ESO - two-year view

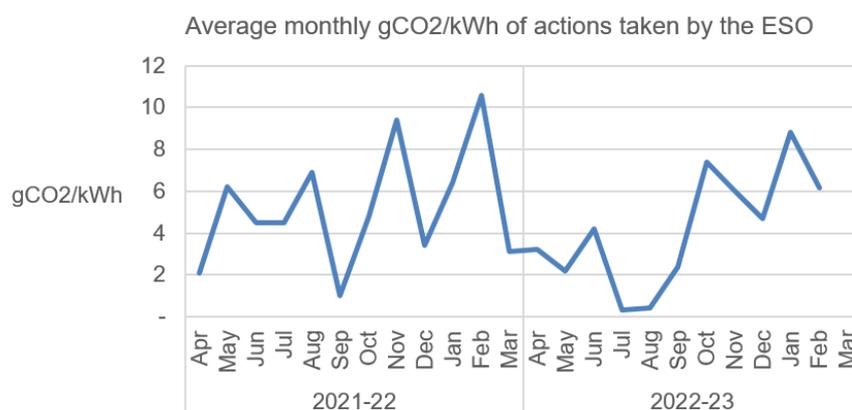


Table 7: Average monthly gCO₂/kWh of actions taken by the ESO

| | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Carbon intensity (gCO₂/kWh) | 3.2 | 2.2 | 4.2 | 0.3 | 0.4 | 2.4 | 7.4 | 6.0 | 4.7 | 8.8 | 6.2 | |

Supporting information

In February, the average carbon intensity of balancing actions was 6.18 gCO₂/kWh. This was a decrease from January but is relatively normal for this time of year as temperatures drop and the demand rises. In addition, wind levels have meant that we have had to constrain off wind generation due to thermal export constraints and replace the missing energy with carbon generation. This increases the carbon intensity of our actions.

For Q1, Q2 and Q3, the average carbon intensity was 3.2 gCO₂/kWh, 1.0 gCO₂/kWh and 6.1 gCO₂/kWh respectively. Q2 saw a reduction in the carbon intensity as we were taking significantly fewer operational actions compared with previous months. In addition, carbon generation has been supporting the increased exports from GB and they also provide the needed network ancillary services. This reduces ESO interventions and means that if we do take operational actions pulling back carbon generation, the market carbon figures for this RRE will also reduce significantly.

In February, the largest decrease in carbon intensity due to ESO's actions was at 23:00 on 15th February with a minimum intensity of ESO actions at -24.7 gCO₂/kWh. The biggest reduction of this financial year remains -41.2 gCO₂/kWh on 29th January.

RRE 1I Security of Supply

February 2023 Performance

This Regularly Reported Evidence (RRE) shows when the frequency of the electricity transmission system deviates more than $\pm 0.3\text{Hz}$ 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 $\pm 0.3\text{Hz}$ 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 |
| $49.2 \leq f < 49.5$ | up to 60 seconds | 2 times per year |
| $48.8 < f < 49.2$ | Any | 1-in-22 years |
| $47.75 < f \leq 48.8$ | 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.

Table 8: Frequency and voltage excursions (2022-23)

| | 2022-23 | | | | | | | | | | | |
|--|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Instances where frequency was 0.3 – 0.5 Hz away from 50Hz for over 60 seconds | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Voltage Excursions defined as per Transmission Performance Report ³ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

Supporting information

There were no reportable voltage or frequency excursions in February.

³ <https://www.nationalgrideso.com/research-publications/transmission-performance-reports>

RRE 1J CNI Outages

February 2023 Performance

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.

Table 9: Unplanned CNI System Outages (Number and length of each outage) – two-year view

| Unplanned | 2021-22 | 2022-23 | | | | | | | | | | | |
|--|---------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | TOTAL | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
| Balancing Mechanism (BM) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Integrated Energy Management System (IEMS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

Table 10: Planned CNI System Outages (Number and length of each outage) – two-year view

| Planned | 2021-22 | 2022-23 | | | | | | | | | | | |
|--|------------------------|---------|-----|-----|-------------------------|-----|-----|-----|-------------------------|-----|-----|-----|-----|
| | TOTAL | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
| Balancing Mechanism (BM) | 3 ⁴ outages | 0 | 0 | 0 | 1 outage 186 minutes | 0 | 0 | 0 | 1 outage 165 minutes | 0 | 0 | 0 | |
| Integrated Energy Management System (IEMS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |

Supporting information

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

⁴ July 2021: 1 outage, 216 minutes.
November 2021, 1 outage, 215 minutes.
March 2022, 1 outage, 196 minutes.

Notable events during February 2023

Balancing Programme - Quarterly Industry Update & Feedback

Following on from our Strategic Balancing review we have continued to engage and collaborate with our stakeholders, on a quarterly basis. For our new balancing systems, we are engaging with stakeholders on how it will transform the way the control room operate, seeking their feedback on the proposed platforms. Our engagement has resulted in four stakeholder working groups being created at the request of our stakeholders to ensure we are working together to address the key challenges.

The feedback received from attendees at the events has been fantastic, praising the openness and highlighting this as a new standard for how the ESO should engage. The industry is no longer a group we keep informed of progress we have made, but a group that actively create and shape how the Balancing Programme delivers. They are helping prioritise what we deliver, providing valuable insight into the how changes will affect them and ultimately championing our roadmap. The shift in dynamic has been staggering, giving the Balancing Programme the best possible platform to achieve success.

- 110 industry stakeholders, representing 73 companies have been involved.

At our last Quarterly event on 9th February.

- Stakeholders rated the overall event 8.1/10
- Our breakout sessions ranged from 3.27 to 4.32 out of 5.

Feedback included:

- “The openness and honesty to which you revealed the challenges facing the control room is very refreshing”
- “Engaging and interactive, open and honest”
- “Delivery of content was focussed and clear, and positively engaged participants.”
- “Very informative, collaborative, open and honest. Great to involve industry and let me participate also!”
- “Great transparency / very good collaboration / enjoyed seeing control room in action.”
- “Admirable openness.”

Role 2 Market development and transactions

RRE 2E Accuracy of Forecasts for Charge Setting – BSUoS

February 2023 Performance

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.

Figure 7: Monthly BSUoS forecasting performance (Absolute Percentage Error) – two-year view

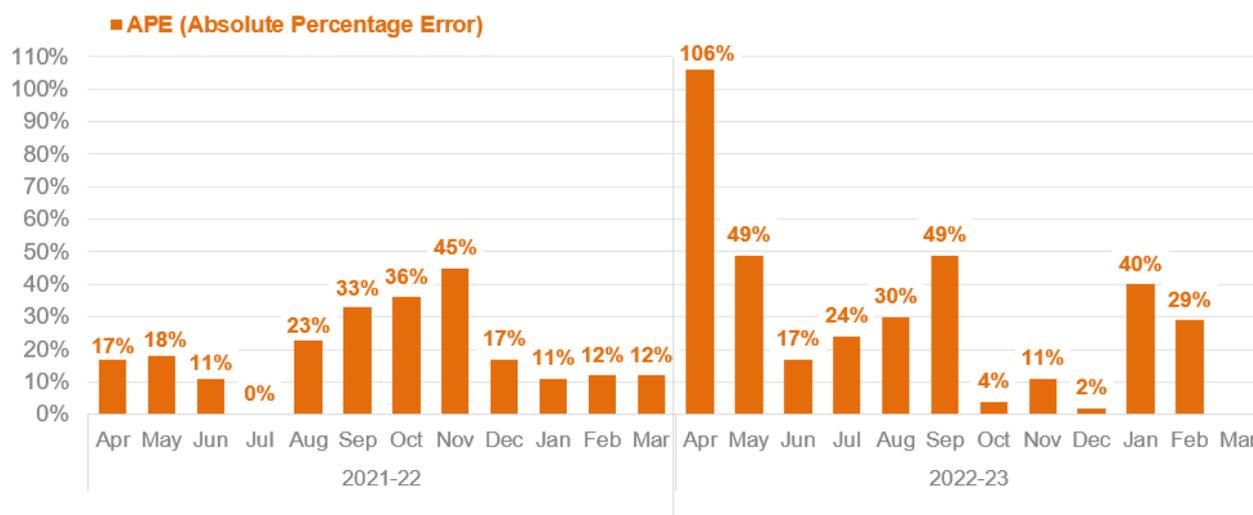


Table 11: Month ahead forecast vs. outturn BSUoS (£/MWh) Performance⁵ - one-year view

| | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
|--|------|-----|-----|------|------|------|------|------|------|------|-----|-----|
| Actual | 5.3 | 6.0 | 9.4 | 10.3 | 9.2 | 8.5 | 12.5 | 11.7 | 10.5 | 8.9 | 7.5 | |
| Month-ahead forecast | 11.0 | 9.0 | 7.7 | 7.8 | 11.9 | 12.7 | 12.1 | 13.0 | 10.3 | 12.4 | 9.7 | |
| APE (Absolute Percentage Error) ⁶ | 106% | 49% | 17% | 24% | 30% | 49% | 4% | 11% | 2% | 40% | 29% | |

Supporting information

The BSUoS charge (£/MWh) depends on the total BSUoS cost and the total volume. The BSUoS cost forecast 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 we expect the actual BSUoS charge to be lower than the forecast provided the actual volume is at or above the estimate (and vice versa).

⁶ 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.

February performance

Absolute Percentage Error (APE) decreased from 40% in January 2023 to 29% in February 2023. The main driver of the variance was the outturn costs being significantly lower than expected.

Costs:

February outturn costs were at the 12th percentile of the forecast produced at the beginning of January.

This is firstly due to the wholesale electricity prices being 34% lower in outturn (£136/MWh) than the forward market prices available at the beginning of January (£182/MWh).

Secondly, due to renewable proportion of demand being lower in outturn (15%) than the forecast at the beginning of January (34%).

Forecast for February made at the start of January = £307 million (Not including winter contingency costs).

Outturn costs for February: £280 million (£243m plus winter contingency cost £37m)

Volumes:

Estimated BSUoS Volume (made at the start of January): 41.2 TWh.

February actual BSUoS volume: 41.9 TWh (1.7% higher than the estimate)

Notable events during February 2023

Net Zero Market Reform (NZMR) Update: Assessment of Investment Policy and Market Design Packages

We published a study on the possible packages for net zero markets on the 27th February.

As part of the current fourth phase of our Net Zero Market Reform (NZMR) programme, and to support the debate around market reform driven by DESNZ's Review of Electricity Market Arrangements (REMA), ESO commissioned Baringa to assess policy options and policy / market design packages. The report assesses all investment policy options for mass low carbon power, capacity adequacy and flexibility, and then constructs and assesses 6 different market design and policy packages covering all wholesale market designs (national, zonal and nodal).

The study began in August and included stakeholder feedback on the options at workshops which were held in November of last year. Baringa is a business and technology consultancy, and they are working with the NZMR team to provide an independent assessment of market reform options and packages.

Baringa's qualitative assessment adds to the body of work previously conducted under ESO's NZMR programme. In coming months, we will complete our own assessment of the investment policy options and packages, building on Baringa's evidence and analysis, taking account of stakeholders' feedback and input.

Capacity Market Auctions

In our role as the Electricity Market Reform Delivery Body (EMR DB), we successfully delivered the T-1 and T-4 auctions for the Capacity Market for the Delivery Year 2023/24 and 2026/27 respectively. The outcome from these auctions will help strengthen the security of supply in the UK as well as contributing towards our net zero ambition.

EMR New Portal Customer Webinar

The EMR Portal is one of the key deliverables for the EMR DB. We have delivered some key features which have been tested with the customers and received positive feedback. However due to internal and external factors, we experienced some delays and as such have undertaken an intensive re-plan exercise. On 1 February, we hosted a customer webinar on the development of the EMR Portal. It was well attended by over 100 industry customers and stakeholders. Majority of the customers (~70%) supported our preferred option of delivery of the new portal for 2024. Taking the customer and stakeholders feedback onboard, we will look to confirm the re-plan of the project in Q1 FY24.

Role 3 System insight, planning and network development

Please note there are no metrics for Role 3

Notable events during February 2023

ESO Electricity Ten Year Statement (ETYS)

On 31 January, we published the 2022 Electricity Ten Year Statement (ETYS), which shows our view of GB's National Electricity Transmission System (NETS) over the next ten to twenty years. This is an annual document which helps us to understand the future requirements of the system and where investment and development is needed to help us achieve our zero-carbon ambition.

As we transition to a zero-carbon ambition operation of the NETS is becoming increasingly complex and we need to expand our view of system needs across the year to capture the full range of system needs. This year, in addition to our regular report, we have added a new chapter which provides an update on our progress in integrating a wider range of system needs into the ETYS. This includes some examples of how year-round thermal needs are communicated using results from POUYA, our probabilistic year-round thermal analysis tool, as well as an update on our progress developing an enduring process for assessing voltage needs and its integration into the network planning cycle.

Visit our [website](#) to find out more or click the button below to download the full report.
[PowerPoint Presentation \(nationalgrideso.com\)>](#)

ESO Virtual Energy System Conference 2023

ESO's Virtual Energy System (VirtualES) is a social-technical programme and a shared asset that is being built and operated by members of the Great Britain's energy industry. Our ambition is to build a digital representation of GB's whole energy system through digital twin technology, and we want to work with all energy players and technology providers to build the Virtual Energy System collaboratively.

We hosted the VirtualES Conference at the Institute of Engineering and Technology in London on February 10th, 2023. Industry, Government and regulation representatives came together to explore how digitalised solutions, big data and advanced analytics are helping to support network reliability and meet energy demands whilst bridging the gap to Net Zero.

Matthew Roderick of n3rgy Data was the conference host and we've heard from him and expert panellists and engaged with the 120 in person attendees (most stayed for the whole event), while over 200 people watched the live stream on the ESO YouTube channel – link to recording [here](#). Speakers included BEIS, Ofgem, Cabinet Office, Laura Sandys, ESO's Shubhi Rajnish, CNZ, Energy System Catapult +10 more.

ESO's Head of Innovation and Strategy Anna Carolina Tortora set the tone for the day, focusing on the need for collaboration to unite the industry behind a cleaner energy future: *"The value of the Virtual Energy System is industry collaboration. We will all succeed when energy industry participants come together to share data in pursuit of a digitalised, decarbonised future energy system."*

The first two panels of the day brought into discussion how we can accelerate the digitalisation process by delivering the key building blocks required to hit Net Zero goals, while highlighting the government and regulation's recognition of progress and the need to accelerate practical steps forward. The panel also drove home the value of constant innovation, of being open to exploring new methods and solutions to move ever closer to safe data sharing and to achieving society's energy goals.

The third panel consisted of current and future industry projects presentations with an industry Q&A session at the end. While the VirtualES programme is being built on use cases, we wanted to explore how various projects apply fresh approaches to technology, processes, partnerships and people and supercharge delivery capabilities. One of the important learnings of the session was the fact that the success of the projects lies largely in data security, therefore they must be accompanied by a clear set of rules of engagement. This was highlighted by Amy Manefield during her presentation on The National Underground Asset Register, which will improve the efficiency and safety of underground networks by creating a secure, auditable, trusted and sustainable map of underground assets across England, Wales and Northern Ireland.

The Virtual Energy System Conference 2023 was very well received, with excellent internal and external feedback:

- ESO's Head of Innovation and Strategy Anna Carolina Tortora mentioned: *"Brilliant conference, flawless in its running."*
- In the words of our VIP interviewee, Laura Sandys (Chair of the Government's Energy Digitalisation and Data Taskforces) about the VirtualES Conference, *"It was great to hear about CrowdFlex, with leading roles from National GridESO, OhmeEV and Octopus Energy unlocking demand side participation. And delivering value to customers and the system. #virtualenergysystem."* – link to post [here](#).
- Simon Evans (Global Digital Energy Leader at Arup), who gave the industry keynote speech at the conference, posted on LinkedIn: *"Excellent event! Great to discuss and unpack the role and importance of digitalisation in the energy sector, and how the Virtual Energy System is contributing to that future!"* – full post [here](#).

Connections Five-point Plan & Two-Step Offer process

In February, we announced reforms into how to connect into the transmission grid. Our new [five-point plan](#) will speed up the current connections queue.

To support the delivery of this plan, from **1 March** we're implementing a new [two-step process](#) for applications in England and Wales. The steps being taken as part of the 5 point plan look to reduce uncertainty where possible for developers in the longer term as we apply our new modelling and storage assumptions. In Scotland, these changes will be applied without the need to implement a new two-step process.

Two Step Offer Process

- New process required to enable more generation onto the grid quicker and ensure a strategic review and prioritisation of Transmission Reinforcement Works (TRW) review
 - There are currently 250GW of projects looking to connect to the NETS compared to 80GW currently connected, as we have seen an 84% increase in applications in this FY
 - Ensure the physical electricity system can quickly adapt to meet new demands as a key priority.
- The Two Step offer process will allow the TRW review to be undertaken in England and Wales as due to the volume of applications doing this using the current process is not feasible.

- The First Step offer will provide a customer an offer in standard terms, stating the requested Connection site the Capacity requested and a Completion date
- The Step Two offer will contain a fully populated suite of appendices including required works to facilitate the connection, confirmation of connection location and Completion date based on the outcome of the TRW review to inform the assumptions used for the study of the connection
- Scottish TO's will not be using the Two Step process and instead will do the TRW review for their regions whilst using the existing process

Queue Management

- ESO has raised a code modification, CMP376, under the Connection and Use of System Code (CUSC), to formally introduce QM arrangements. This modification is subject to approval.
- If implemented, QM will introduce contractual milestones that customers must meet to retain their place in the connection queue, which will benefit everyone.
- QM will mean that projects which are ready to connect can do so ahead of those customer projects that may have applied earlier but are not ready or able to progress – currently the ESO are unable to prioritise the queue based on readiness to connect.
- Workgroup Report will be presented to the CUSC Panel on 31 March 2023 and presented for Panel Vote on 26 May 2023 and the Final Modification Report will be sent to Ofgem on 7 June 2023.
- Implementation will take place 10 days after Ofgem's decision.

TEC Amnesty

- The Transmission Entry Capacity (TEC) register orders the queue for connections to the national electricity transmission network and includes all projects that seek a connection offer.
- Expressions of interest provides opportunity to leave the register at no cost or at a reduced fee following assessments for projects that are unlikely to reach delivery - Developers will have between 1 October to 30 April 2023 to apply to leave the connections register.
- This will facilitate a faster connection for new projects and is one of a number of actions the ESO, in partnership with Transmission Owners (TO's), is undertaking to support the delivery of a net zero electricity network by 2035 and 50GW of Offshore Wind by 2030.
- Reducing the number of projects on the TEC Register will also provide the ESO with a clearer view of future capacity requirements for the network and will speed up the connections process for projects needed to reach 2030 and 2035 Government targets.
- This approach is supported by Ofgem and the TO's in Scotland, England and Wales.

Background Modelling Assumptions

- The generation background is oversubscribed as contains a substantial volume of project which are speculative in nature.
- An assessment against such a background indicates the need for a large number of reinforcement works to be undertaken in order to connect projects onto the network, thereby resulting in late connection dates.
- An assessment of connection rates at transmission level indicates that only about 30-40% of projects will make it to fruition.
- We have developed new CPA principles to better reflect the actual attrition rates, which will be adopted as part of the Transmission Reinforcement Works review being conducted with the Transmission Owners.
- The expectation is that the revised CPA principles will enable earlier connections for certain contracted parties.
- These assumptions will soon be published and will be under constant review to ensure that new risks introduced are appropriately managed.

Treatment of Storage and non-firm connections

- It is recognised that energy storage can play an important role in enabling an increased penetration of renewable energy projects onto the network and in facilitating the transition to net zero.

- The approach for modelling storage during connection assessments may not always align with how the customers intend on operating their assets for most of the time, therefore often resulting in a conservative approach being adopted as part of the connections process.
- We have engaged with selected storage developers to get better insights on their intended operating profiles and understood that, in some cases, storage may not be contributing to periods of constraints on the network.
- We have updated the way we model storage in line with the feedback received and will soon be offering a different type of connection to enable storage projects to connect sooner.
- This will be on the basis of an interim non-firm connection which will require the storage projects to turn off without financial compensation should they be exacerbating constraints on the network either during intact or depleted network conditions.
- We will also look at how options for interim non firm connection can be accommodated for all other technologies.
- The restrictions on the ability to export will be removed following the delivery of reinforcements if these are deemed to be necessary.
- We are currently working on various activities required with the TOs to enable this type of offer to be provided whilst also sharing best practices with the Distribution Network Owners (DNOs)

Constraints Management Pathfinder: delivering consumer savings

Thanks to our Constraints Management Pathfinder, we've saved consumers an estimated £80million, that would have otherwise been spent on constraint payments.

With the full service set to go live in October 2023, we've already generated savings for consumers by allowing six units to begin operation early - these will alleviate network constraints on the B6 England/Scotland network boundary.

The successful units, the majority of which are windfarms along with a battery storage facility, will be connected to constraint management equipment. This will maximise renewable generation on the system, and reduce constraint costs across the B6 English/Scottish border.

The contracts are part of the ESO's Constraints Management Pathfinder project and will give our control room more flexibility by allowing renewable generation to remain on the system, rather than being pre-emptively curtailed. Instead of paying constraint costs to turn off generation when there is the risk of a fault, this service allows clean renewable generation to continue exporting energy for longer. This results in reduced constraint costs which would ultimately be paid for by consumers. It also lowers the overall carbon intensity of the electricity produced.

Julian Leslie, Head of Networks said:

“The constraint management pathfinder is fundamental towards solving a heavily constrained area of the grid, and we have taken the initiative to drive forward innovative solutions to manage constraints on the system, whilst maximising renewable generation to ensure 100% zero carbon operation.

This builds on our wide-ranging 5-point plan which will demonstrate how we resolve constraints on the network for years to come, and reduce balancing costs, ultimately saving consumers millions of pounds.”

As well as cutting costs, this will also help to boost our green energy generation. From April 2022 to January 2023, these six units have enabled almost 32GWh of extra green energy to be generated that would otherwise have been curtailed and replaced by gas-fuelled generation. This equates to 139,924 tonnes of carbon savings, which is the same as 84,802 return flights between London and New York or 12.5 million burgers! The service is therefore already significantly aiding the ESO's ambition of transforming the network to become zero carbon by 2025.

Energy Innovation Basecamp

On Tuesday 28th Feb, the ESO Innovation team alongside Ofgem, ENA, Innovate UK, all the GB electricity and gas networks came together for an inaugural event to develop and accelerate the solutions we need to deliver Net Zero.

At the event, we collaborated with leaders from the energy industry and innovators from the UK and beyond laying out the challenges ahead and shaping 'problem statements' that will direct the future of the programme. The ESO Innovation Team and ESO subject matter experts from across the business presented on 6 challenges from the following themes: 'Data and Digitalisation'; 'Flexibility and Market Evolution'; 'Net Zero and the Energy System Transition'.

Following the event, suppliers from across industry and academia will use insights from the day to develop solutions, these will be submitted for review and presented at a follow-up event in summer to energy sector decision-makers. The best will be selected for accelerated funding and delivery through our Network Innovation Allowance (NIA) and the Strategic Innovation Fund (SIF).

Event info and challenge areas: <https://smarter.energynetworks.org/energy-innovation-basecamp/>

The programme is a collaboration between Ofgem, ENA, Innovation UK alongside the UKs energy network operators.