NESO
National Energy System Operator

power responsive

Annual Report 2024

A roundup of developments in demand side flexibility markets in GB

Contents

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Foreword

We are pleased to publish the Power Responsive Annual Report, reflecting on policy, regulatory, and market developments throughout 2024 as well as trends in demand side flexibility. The report also offers a forward-looking view of key future developments to help stakeholders navigate industry changes and support demand side participation in flexibility markets.

Over the past year, the National Energy System Operator (NESO) has undergone significant changes, transitioning into a public corporation owned by the government. This transformation is part of an integrated zero-carbon strategy for managing electricity and gas networks, positioning NESO as GB's independent system operator and planner. Our objective is to ensure everyone has access to secure and sustainable energy supplies, focusing on delivering value for consumers and driving positive change across the global community.

Clean Power 2030 (CP30), established by the Department of Energy Security and Net Zero (DESNZ), outlines the pathway to achieving clean power by 2030. The Clean Power 2030 Action Plan, published by DESNZ in December 2024, underscores the importance of demand side flexibility, projecting its growth from 2.5GW in 2023 to between 10.4GW and 11.7GW by 2030. To reach the goal of 95% low-carbon generation, advancements in digital technology, product and service standards, and customer engagement are necessary. The plan emphasises a balanced mix of generation types, substantial energy storage, and public engagement to address challenges such as grid connections, supply chains, and funding.

2024 saw reforms aimed at enhancing the efficiency and effectiveness of the energy market. New services introduced by NESO, like Balancing Reserve and Quick Reserve, along with regulatory changes including code modifications, have made energy markets more accessible for flexible assets. These reforms, along with the evolving Demand Flexibility Service, have created additional options for flexibility providers. They also underscore the need for collaboration between industry, government, and stakeholders to advance towards a low-carbon future.

Power Responsive continues to thrive and has set the direction for NESO's collaboration with stakeholders, enabling increased participation and driving growth in demand side flexibility through industry engagement and working groups. It addresses barriers for flexible assets and promotes awareness of flexibility opportunities, helping to grow flexibility and in turn support the balance of the electricity system.

Though challenges remain, with the community's participation, we believe we can progress towards our net zero ambitions. Collaboration is key to our success, and I thank everyone who has contributed to our workstreams. Progress isn't possible without you.

1.0 Executive Summary

Report Headlines

1 New strategic policy direction

Through the Clean Power 2030 Action Plan, the UK Government have reinforced the need for flexibility and paved the way for more demand flexibility across a range of asset sizes. Other regulatory changes, such as the admission of up to 300MW of aggregated assets into the Balancing Mechanism in February 2024 and the P415 Balancing and Settlement Code (BSC) change introduced in late 2024, also opened the energy markets to significantly more flexible assets.

2 Prices and volumes of frequency response services remained stable

Throughout most of 2024 prices and volumes of frequency response services remained stable. Negative pricing, which was introduced with the launch of the Enduring Auction Capability in late 2023, became more apparent in 2024 in some services.

3 New services launched and the Demand Flexibility Service evolved

New services such as Balancing Reserve and Quick Reserve were successfully introduced and created more opportunities for flexibility providers.

The Demand Flexibility Service developed away from a winter service and now operates year-round. Events so far indicate it is providing good value against alternative actions.

4 Flexibility procured through Distribution System Operators remains undersubscribed

Flexibility procured through Distribution System Operators remains undersubscribed, but volumes of tendered and contracted flexibility increased compared to 2023.

5 Capacity Market T-1 clearing prices dropped significantly

Prices and volumes of reserve capacity contracted through the Capacity Market were stable in the 2023 T-4 auction (held in early 2024), but the average clearing price in the 2023 T-1 auction reduced significantly compared to the previous auction. Volumes of battery storage and DSR contracted in the T-1 auction increased compared to the previous year, but battery storage reduced slightly in the T-4 auction compared to the previous year.

2.0 About Power Responsive

What is Power Responsive?

Power Responsive is a stakeholder-led programme, facilitated by the National Energy System Operator (NESO), to stimulate increased participation in the different forms of demand side flexibility (DSF). It brings industry and energy users together to work in a co-ordinated way.

The role of Power Responsive is to:

1. Remove barriers to entry for flexible assets, particularly demand side flexibility, in NESO and DSO Markets.

2. Raise awareness of flexibility opportunities.

3. Act as a voice for demand side flexibility within NESO and wider industry.

This fast-growing opportunity is all about using energy more intelligently. It provides flexibility that enables NESO to balance Britain's electricity system cost-effectively, while our energy landscape changes rapidly. If your business has the flexibility to increase, decrease, or shift its electricity usage, then the power is in your hands to take full advantage.

2025 Focus Areas

Power Responsive will continue to champion increased DSF participation in markets in 2025 by focusing on these strategic areas:

1. Stimulating market participation from small scale and residential DSF through market reforms such as the enduring derogation for small-scale assets and independent review of operational metering standards for the Balancing Mechanism (BM) while continuing to support the development of all of our ancillary services.
2. Working closely with industry stakeholders and government to ensure appropriate regulation is maintained for small scale flexibility by supporting the development of PAS standards and metering requirements.
3. Investigating new ways to help unlock Industrial and Commercial (I&C) flexibility and bring new providers into NESO markets through the creation of new incentives, educational resources and industry engagement Understanding and reviewing the Local Constraints Market (LCM) to support future decisions around managing constraints ahead of gate closure.

- Growing consumer confidence in participation in flexibility through the support and development of Codes of Conduct and Compliance

schemes, such as Flex Assure and HOMEFlex, via our regional Flex Summits, in collaboration with Flex Assure and local DNO's

Stakeholder Commitments

Power Responsive maintains its commitment to provide value to our stakeholders through continuous engagement. We carried out the following in 2024:

1. Hosting and attending industry events to promote discussion around DSF, determine barriers to market entry and raise awareness of current and future stakeholder opportunities.
2. Convening the Power Responsive Challenge Group comprised of representatives from across the industry to ensure the programme's strategy continues to be aligned with stakeholders' priorities.
3. Promoting industry participation in innovation projects and trials that will support the development of the DSF sector.
4. Facilitating industry working groups that tackle significant barriers to market entry for DSF.
5. Supporting and providing oversight of the Flex Assure and Home Flex code of conduct schemes that set common standards for aggregators and establish minimum standards of practice.

Meet the Power Responsive Team

Callum Wright

Power Responsive Manager
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Callum has 15 years of experience in the industry, with expertise in gas and power trading, certificate trading, portfolio optimisation, and forecasting demand and generation. His focus includes domestic energy supply, renewable energy, asset management, energy market insight, risk management, and analysis. Callum joined National Grid ESO, now NESO in 2022 to work on Power Responsive, contributing to the development of electricity markets and their operations as Great Britain decarbonises. He is currently dedicated to removing barriers to entry, improving access to real-time electricity markets, and advancing Demand Side Flexibility.

Calum McCarroll

Power Responsive Lead
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Calum has over 7 years' experience in the electricity industry starting out in network management for the National Grid Transmission business before moving to the Electricity System Operator to develop the customer and stakeholder strategy for National Grid Group. More recently, Calum has worked on agreement management for the UK Capacity Market and spent the past 4 years in Power Responsive specialising in Demand Side Flexibility, market development and stakeholder engagement.

Vanessa Jones

Power Responsive Officer
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Vanessa has had a long and distinguished career in Aviation and Health sectors, specialising in customer liaison, service delivery and stakeholder management. As an avid proponent of sustainability and the goal of decarbonisation, Vanessa joined NESO to support the drive to net zero as Power Responsive Officer and plays a key role in bringing our stakeholder engagement strategy to life through sponsorships, events and supporting the delivery of Power Responsive market development workstreams.

James Kerr

Power Responsive Engagement Lead
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James is the Power Responsive Engagement Lead at NESO. He worked in a variety of roles at National Grid and ESO including Connections to the grid, RIIO-2 strategy, and developing the ESO's first Consumer Strategy which included being part of the team that delivered the Demand Flexibility Service (DFS). James was seconded to the Citizens Advice's Energy Policy team where he championed consumers across the energy industry, working across all networks and with a wide variety of stakeholders.

Bolu Adeyemo

Power Responsive Officer
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Bolu brings extensive experience from the Nigerian oil and gas industry to the utilities sector. With a background in oil and gas, Bolu understands the importance of transitioning to cleaner energy sources and is dedicated to supporting decarbonisation efforts within the industry. Committed to sustainability and achieving net-zero emissions, Bolu joined NESO's Power Responsive team. With a key focus on supporting market development workstreams, focusing on customer relationships, service delivery, and stakeholder engagement.

Contact **power.responsive@nationalenergyso.com**

3.0 State of the Industry

Policy, Regulatory and Market Development

Government

The section below summarises the key policy developments related to demand side flexibility (DSF) that occurred in 2024 and were primarily driven by the Government.

The Department of Energy Security and Net Zero (DESNZ) has now been in existence since February 2023. In July 2024, there was a change in Government, with a focus on energy policy evolution as a central theme and the ambition to make Britain a clean energy superpower listed by the Government as one of their Milestones for Mission-Led Government.

In the first half of 2024, the main topic of conversation was the second consultation on the review of the electricity market arrangements (REMA). REMA policy development is expected to be concluded in mid-2025, with implementation work following thereafter.

A large part of the Government's programme that is relevant to flexibility comes from the Clean Power 2030 initiative, which was set up in the July following the election through a "Mission Control" centre. The details of what has been announced relevant to flexibility is covered separately later in this report.

Although already legally separated, the formal change from National Grid ESO to NESO (National Energy System Operator) was announced in October 2024, merging the electricity system operator functions with the existing gas system operator and planner functions. The Government took ownership of NESO, and at the same time changed the ownership of Elexon (previously owned byNational Grid ESO), so that it would be owned via a "federated model" of ownership by the 13 largest Balancing and Settlement Code parties. This has ensured that Elexon's ownership will be by industry, rather than by government.

Other notable developments in 2024 include:

- The publishing of the Digital Spine Feasibility Study, which examines ways of improving the way that energy system data is shared to enable a decarbonised energy sector. The 'spine' would take the form of a data sharing infrastructure with a set of responsibilities, processes and technical functions to enable secure data exchange for organisations in the energy sector.

- Confirmation of the intention to create a cap and floor scheme to unlock investment for Long Duration Electricity Storage (LDES). The Government hope that this could result in the development of Britain's first significant long duration energy storage capacity in nearly 40 years. Ofgem will be the regulator and delivery body for this cap and floor scheme.
- A consultation on new standards for Energy Smart Appliances (ESA) as part of the Smart Secure Electricity Systems (SSES) Programme, focussed on interoperability, cybersecurity, data privacy and grid stability.

After the General Election in July, GB Energy was founded by the new Government. GB Energy is a government-owned renewable energy company that is operationally independent from DESNZ.

Looking ahead, a Low Carbon Flexibility Roadmap is being worked on and will be published in 2025, detailing new actions to deliver clean power flexibility by 2030 and net zero by 2050. Additionally, we can expect publication of the results of DESNZ's call for evidence regarding consumer engagement for consumer-led flexibility. When published, the results will inform the Government's approach to engaging consumers to participate in demand side flexibility in GB.

Ofgem

The section below summarises the key regulatory developments related to DSF that occurred in 2024 and were primarily driven by the energy regulator Ofgem.

Ofgem has had less direct impact on flexibility markets throughout 2024 when compared to 2023, but there are still several well-coordinated ongoing parallel workstreams to develop and facilitate a smart and flexible energy system. Notably, various NESO services have been approved, including the enduring Demand Flexibility Service (DFS) and the new Slow and Quick Reserve services.

In July Ofgem announced Elexon as the market facilitator of flexibility resources and also launched a consultation on a common Flexibility Market Asset Registration (FMAR) to aid market entry for flexibility service providers. Elexon's role as market facilitator is to act as a single expert entity to drive coordination between local DSO and national NESO flexibility markets. The Association of Decentralised Energy (ADE) raised BSC Modification P481 which formally extends Elexon's role and in December Ofgem opened a consultation on the detailed policy framework for the role.

The FMAR consultation closed in September 2024, with a decision in March 2025 confirming that Elexon as market facilitator would be responsible for the design, development/procurement, and deployment of the aligned asset registration processes and common digital infrastructure. A related Ofgem consultation on whether NESO, Ofgem, or an independent body will coordinate the development of a Data Sharing Infrastructure (DSI) was opened in parallel with Ofgem subsequently making a decision to appoint the NESO as the Interim DSI Coordinator in April 2025.

In November, the third iteration of the demand flexibility service (DFS) was approved. For the winter of 2024-25 reserve margins were expected to be significantly higher than for the two previous winters, and so the need for the DFS as a security of supply tool was not as clear as for the previous two years. Nevertheless, the positive engagement of consumers with the DFS was regarded as something worth continuing to reduce barriers to market entry, although the use of tests and availability payments to supplement participant revenues was explicitly discouraged, meaning that revenue per event is likely to be significantly lower than in previous years.

Other notable developments in 2024 include:

- The first DSO Incentive Report was published in September, examining DSO Stakeholder Satisfaction Survey scores, DSO Performance Panel scores, detailed performance panel feedback, and the overall financial reward or penalty assigned to each distribution network company for the DSO incentive.

- In November, the next electricity distribution price control (ED3) framework consultation was launched. ED3 will start in April 2028. This ED3 price control period will be a critical one, largely overlapping with the Government's planned timeline for rapid transformation of the energy system.
- New balancing terms and conditions for Dynamic Response services were approved by Ofgem and published in October. A notable change was the maximum sell size being increased to 100MW for all dynamic response products.
- Local constraint market (LCM) rule modifications were approved to better enable aggregator participation. The new rules provide a route to better understand demand turn-up / generation turn-down markets and their impact on alleviating system constraints, as well as further allowing the market to achieve the overall aims of reducing generation curtailment and costly grid upgrades.

National Energy System Operator (NESO)

The section below summarises the key market developments related to demand side flexibility (DSF) that occurred in 2024 and were primarily driven by NESO.

The UK's 2023 Energy Act set the legislative framework for an independent system planner and operator to help accelerate Great Britain's energy transition, leading to the establishment of the National Energy System Operator (NESO) in October 2024. NESO is built on previous experience as the Electricity System Operator (ESO), formally owned by National Grid. It is intended that NESO will take a whole system approach, with oversight of natural gas, electricity and other forms of energy. It is envisaged that NESO will engage participants in all parts of the energy ecosystem to deliver the plans, markets and operations of the energy system of today and the future.

NESO's enduring Demand Flexibility Service (DFS) went live at the end of November 2024. Over the last two years, DFS has seen over 2.6 million households and businesses participating, saving over 7,000MWh of electricity. Going forward, the DFS will allow households and businesses to participate throughout the year instead of being limited to just the winter months. The service permits revenue stacking with other markets such as the Capacity Market and regional services provided by DNOs.

The Local Constraint Market (LCM) is an interim measure developed by NESO to manage the electricity grid at the B6 boundary as constraints increase. It was designed to access flexibility from new providers and offer competition to the BM. Since its inception in 2023, the LCM has struggled to realise efficient constraint savings, largely due to the challenge of competing with the BM counterfactual. A market inefficiency that limited the economic incentive for customers engaging in the service via third-party providers was identified and, in October 2024, NESO implemented an innovative interim solution that should increase the price competitiveness for participants bidding into the market to try and encourage greater engagement and savings for customers, improving the LCM service until its contracted expiry in January 2026.

Other Developments

Domestic flexibility industry

The growth of large electric loads at the domestic level, such as heat pumps and electric vehicles, combined with increased "smart" functionality has focussed the attention of flexibility providers, particularly as manual load-shifting through the demand flexibility service (DFS) is thought to be less engaged this winter. P415 enables flexibility providers to aggregate flexibility from domestic consumers into the wholesale market, opening up a key large-scale trading opportunity in GB.

NESO and DSO markets are considered "explicit" flexibility markets and can complement "implicit" flexibility markets like the wholesale market which can be used to offer consumers flexible Time Of Use Tariffs (TOUT). This is a relatively small but growing area due to increased electrification of heat and transport, but will be further facilitated by market-wide technological reforms in the coming years, such as Market-wide Half Hourly Settlement, which should also increase participation in this form of flexibility.

Clean Power 2030 Action Plan

NESO was commissioned by DESNZ to provide advice on the pathways and challenges to achieving the Government's ambition for "clean power" by 2030. NESO issued this advice in the Clean Power 2030 (NESO CP30) report in November 2024. This report was followed by the Clean Power 2030 Action Plan, which was published by DESNZ in December 2024.

Two scenarios are defined in the action plan: the 'Further Flex and Renewables Scenario' and the 'New Dispatch Scenario'. Both scenarios have large quantities of wind, solar, gas, and energy storage, with significant supporting quantities of interconnectors, consumer-led flexibility, biomass & nuclear. The main difference between the pathways is the extent of new low-carbon dispatchable generation in place of more offshore wind and storage.

High-level lessons from the report include:

- The Clean Power 2030 Action Plan will require a broad mix of generation types: No single generation type can fulfil all requirements. This provides significant robustness to external factors.
- Decarbonising the electricity gets progressively more difficult as 100% is approached: The Clean Power 2030 Action Plan has 95% of GB generation from low-carbon sources, with the remainder supplied by unabated gas – which requires keeping the gas fleet at approximately the current size. Whilst this is a pragmatic initial position, it is likely that further cost / benefit analysis could refine

(up or down) the percentage of residual unabated gas generation to be targeted.

The mix of generation types outlined in the Clean Power 2030 Action Plan is displayed in the table below (data from DESNZ Clean Power 2030 Action Plan, page 32).

TECHNOLOGY	CURRENT INSTALLED CAPACITY (GW)	NESO 'FURTHER FLEX AND RENEWABLES' SCENARIO (GW)	NESO 'NEW DISPATCH' SCENARIO (GW)	DESNZ 'CLEAN POWER CAPACITY RANGE' (GW)
Variable				
Offshore wind	14.8	51	43	43 - 50
Onshore wind	14.2	27	27	27 - 29
Solar	16.6	47	47	45 - 47
Firm				
Nuclear	5.9	4	4	3 - 4
Dispatchable				
Low Carbon Dispatchable Power	4.3	4	7	2 - 7
Unabated gas	35.6	35	35	35
Flexible				
LDES	2.9	8	5	4 - 6
Batteries	4.5	27	23	23 - 27
Interconnectors	9.8	12	12	12 - 14
Consumer-led flexibility	2.5	12	10	10 - 12

There are many challenges to realising the above vision by 2030, particularly:

- Public support for the large quantities of new infrastructure to be built.
- Planning permission.
- Grid connections.
- Supply chains.

- Skills & staff.
- Funding.

Some of these factors can be influenced by the Government, whilst others cannot. Several stakeholders have suggested 2035 is a more realistic timescale than 2030, but the Clean Power 2030 Action Plan report lays out what would be needed if the Government aim of "clean power" by 2030 is to be reached.

Demand side flexibility

Of particular relevance to this Power Responsive report is the significant quantity of demand side flexibility and energy storage that is anticipated in both pathways in the Clean Power 2030 Action Plan. Excepting gas Carbon Capture and Storage (CCS) / Hydrogen (which had no generation/demand in 2023), of all the technologies, battery storage shows the biggest increase – increasing by a factor of about 5 between 2023 and 2030. Based on the current grid queue and state of the BESS industry this target may not be particularly difficult to achieve. The demand side flexibility and long-duration energy storage targets; however, will require new developments and will be more challenging to meet, though much of this flexibility will come from retail and wholesale markets outside of the scope of NESO and DSO services, as discussed below.

The Flexibility Innovation Programme, mentioned in the 2023 Power Responsive report, is now closed.

The Clean Power 2030 Action Plan has demand side flex (excluding batteries, LDES, interconnectors & storage heaters) increasing from 2.5GW in 2023 to 10.4-11.7GW depending on the pathway. This is an extremely significant increase and represents a big opportunity for flexibility providers. It will require substantial development of the progress and innovation seen in recent years, including on digitalisation, product & service standards, customer engagement and more. Much of this flexibility will fall outside the remit of NESO and the DSOs.

CP30 requires Consumer Lead Flexibility from a range of sources, the majority of which will materialise via the wholesale market and retail propositions. The implementation of MWHHS and reform of retail markets will be essential in enabling the growth of CLF in the years ahead.

In parallel, NESO as residual balancer of the system is committed to opening up our markets to CLF and have made great progress in recent months with DFS, LCM and opening up the BM via the relaxed operational metering initiative. We expect to see further significant progress over the coming months with proposed BR reforms, SR consultation, DFS reforms, static response reform plus BM progress (P444, P483, ops metering etc). This represents material progress in opening up access to the prioritised NESO markets as identified in the Routes to Market Review process. We are also increasing progress with DNO (stacking principals, stacking progress,

coordination) and working with Market Facilitator to set up the MF and workplan to enable better market alignment and coordination.

The performance of different types of flexibility, and the interactions with expectations of consumer behaviour, is likely to be a focus over the next period if flexibility is to be delivered over longer time periods. It is worth noting that OFGEM and DESNZ have shifted away from defining flexibility with the term "demand" in it, and instead have shifted to "consumer-led" flexibility (CLF), which may become an increasingly more common term to describe DSF in the future.

Long duration energy storage (LDES)

It has been widely acknowledged for some time that LDES will be an important part of the future low-carbon energy system. GB currently has around 3 GW of LDES, primarily pumped hydro, built over 40 years ago. The Clean Power 2030 Action Plan anticipates 4.0-7.9 GW of LDES by 2030, depending on the pathway. The UK Government are deploying a number of policy incentives to drive both technological development and support currently non-viable projects financially, with the intention that these initiatives will support the industry to meet the Clean Power 2030 Action Plan target.

As mentioned in the 2023 Power Responsive report, the Longer Duration Energy Storage (LoDES) Demonstration programme continues to push technology developments. The programme is focused on developing first-of-a-kind demonstration systems and prototypes. It is structured into two streams to support technologies at different TRL stages and is now in Phase 2 — the build and demonstration phase, meaning that deliverables from this programme should be visible by the end of 2025 according to the latest timelines.

In January 2024 the UK Government consulted on "Designing a policy framework to enable investment in LDES", with supporting "Scenario Deployment Analysis". Following useful stakeholder feedback from that consultation, the UK Government published its proposals in October 2024.

The scheme will use a "Cap and Floor" mechanism, similar to that used for electricity interconnectors, and will be open to any technology that meets the definition of electricity storage (i.e. energy that (a) was converted from electricity, and (b) is stored for the purpose of its future reconversion into electricity – as defined in the Energy Act 2023), and designed for a minimum duration of 8 hours. The LDES cap-and-floor mechanism will have two streams based on projects' Technology Readiness Level (TRL) and capacity. It will embed the principle of additionality in that only projects that could not otherwise move forward to investment decisions should be supported. Ofgem, as the delivery body, intend to open the scheme during 2025. Details, including cap and floor intentions and minimum duration &

power capacity for each stream, have been set out in a Technical Decision Document (TDD) by Ofgem and the Government published in March 2025.

Artificial Intelligence

Large-language models and artificial intelligence (AI) have an upcoming role to play in the transformation of grid operations. NESO is planning to collaborate with universities, SMEs, networks and government bodies to expand their capabilities across the wider energy industry. Innovative tools like Dynamic Reserve Setting and Forecasting the Risk of Congestion leverage AI to empower the control room with greater insights. Dynamic Reserve Setting uses probabilistic machine learning in the control room to access more data sources and react dynamically to better inform reserve requirements, making more efficient use of resources. During its first trial, it saved the unnecessary purchase of 1 GW of excess reserve in just 2 hours. Forecasting the Risk of Congestion, which started in June 2023, is a project put in place to predict the probabilistic risk of congestion on specific branches of the power grid using machine learning as a tool to support Control Room operations.

In 2024/25, the NESO Innovation Strategy sets out longer-term innovation priorities to understand the opportunities and risks of actions that have higher risk and greater uncertainty. These encapsulate smaller innovation projects and will impact NESO, the wider energy system and consumers.

In March 2024, the UK Government allocated funding to support innovative AI projects that reduce carbon emissions across critical sectors as part of Stream 3 of the AI for Decarbonisation Innovation Program. To tackle transport decarbonisation, Flexible Power Systems Operate, an application which currently dynamically schedules EV fleet operations and charging in real-time will have its integrated EV charge optimisation enhanced with deep reinforcement learning techniques, furthering V2G energy optimisation and demand flexibility.

Combined heat and power

Heating is responsible for over a third of UK carbon emissions, hence decarbonising the heating of over 30 million homes and businesses across the UK will be crucial in achieving net zero by 2050. Combined Heat and Power (CHP) captures waste heat from the electricity generation process, saving carbon emissions by up to 30% and energy costs by 20% compared to conventional separated means. CHP schemes can encompass a range of generation technologies from fossil fuels to biomass. In 2022, a majority (89%) of total fuel used for CHP plants in the UK was composed of fossil fuel while only 7% were from biomass, according to a report by IEA Bioenergy.

DESNZ has decided to provide support for commercial CHP projects certified under CHP Quality Assurance due to their environmental benefit, technical complexity and relatively long payback period. The CHPQA program acts as a method to access all types and sizes of CHP schemes

throughout the UK such as Renewable Obligation Certificates, Renewable Heat Incentive, Climate Change Levy exemptions, etc. Additionally, CHP fuelled by eligible renewable sources such as biomass can also receive additional support from contract for difference incentives and other programs.

CHP has a potentially large role in the long-term decarbonisation of businesses and industries with high heat and electricity demand, where heat networks could play an important enabling role. Additionally, CHP can provide flexibility to the system, potentially accessing revenue from the Capacity Market and other balancing services. The Government will continue to provide support programs to encourage businesses and industry to improve their energy efficiency and transition to a low-carbon future.

Heat pumps

Focused on the development of the heat pump market to 600,000 installations per year by 2028, the Government sees heat pumps as a mainstream consumer solution. DESNZ launched the Clean Heat Market Mechanism in April 2025 which includes a rising market standard for heat pumps as a proportion of fossil fuel boiler sales. It has been designed to provide certainty in the UK heating appliance industry and encourage investment in building the heat pump market while transitioning the overall market to low-carbon technologies. This will all contribute to scaling up the deployment of heat pumps and encouraging the installation of heat pumps in residential properties. Building capacity and skills in the supply chain are equally vital enablers and the Government has put in place measures such as training schemes, apprenticeships and incentive programs to expand heat pump production. Additionally, the Warm Homes Plan will help people find ways to save money on energy bills and encourage residential heat pump installation for up to 300,000 households through grant schemes, planning reform and support for renters and low-income households.

Although gas CHP has been the industry standard, the Government is implementing additional incentives for investors to move towards low-carbon technology options. Low carbon options often suffer from high upfront capital costs and net operating costs compared to gas CHP technology. However, recent changes to the Standard Assessment Procedure and the launch of the Green Heat Network Fund transition scheme have lessened carbon emission benefits for gas CHP and encouraged the adoption of low-carbon technologies.

P415

P415 is a balancing and settlement code (BSC) modification enabling independent aggregators to access wholesale markets as “Virtual Lead Parties” (VLPs). Flexibility providers who are looking to grow their aggregated asset portfolios have been highlighting this as something of

great importance to enable aggregated small-scale, particularly demand side assets, to have access to the full range of possible revenues. This modification was implemented in November 2024, delivery is ongoing and therefore the effect of the modification is yet to be observed.

Future of the transmission network

The queue for connections to the transmission network currently holds more projects overall than are needed in the Clean Power 2030 Action Plan, with many of the projects holding dates for grid connections well into the future. Simultaneously, some technologies such as offshore wind have too few projects with grid connections prior to 2030. A project's position in the queue has traditionally been based on a "first come – first served" basis. This has two impacts on the electricity system:

1. Resource is occupied providing connections for projects that are either not needed in the Clean Power 2030 Action Plan (or even the DESNZ 2035 targets), or will deliver much later than needed (if at all).
2. Some projects that could usefully contribute to the electricity system in the near future are blocked from network access by other "zombie" projects that took a queue position earlier but delay or might not be ready until later.

NESO therefore propose to change the first come – first served approach to one that prioritises projects that are "needed" and ready.

The reform of the transmission connection queue will apply to the current queue, not just to new entrants. Hence, projects that currently hold a grid connection date might lose it if they cannot show that they are needed and ready. This will be particularly prevalent amongst BESS projects, as there are currently about 4 times as much BESS (by MW) in the connections queue as is required under the Clean Power 2030 Action Plan. This is a substantial change to the development landscape for BESS and it may take a while for the dust to settle. When it does, the changes should lead to a much more efficient process, quicker connection of relevant projects and less resource wasted on unnecessary, or slow, projects.

Balancing Reserve

Balancing Reserve was introduced in March 2024 to reduce the cost of balancing the system and provide better visibility of reserve volume to NESO. BMUs over 1 MW are eligible to participate in a daily auction to win. Balancing Reserve contracts., which require a change in generation or demand for up to 30 minutes with full delivery within 10 minutes of the request.

This service will shift the reserve to a market-based approach by procuring contracts and service clearing prices via a day-ahead auction. Payments are split into availability and utilisation payments which are based on available contractual capacity (£/MW/hr) and actual exported/ imported

power (£/MWh) respectively. Balancing Reserve is procured bi-directionally and frequency response contracts can be stacked in the opposite direction e.g. Dynamic Containment High with Positive Balancing Reserve.

Requirement volumes started at a fixed 400MW for Positive and Negative but now follow a shaped profile throughout the day. NESO's procurement strategy will change depending on the season and anticipated alternative costs.

Quick Reserve

Phase 1 of the new Quick Reserve service launched in November 2024 with the first auction taking place on 3 December 2024. This is being carried out using many of the standard tools for registration and dispatch that the latest services utilise, namely the single markets platform (SMP) and the enduring auction capability (EAC), but participation during phase 1 is limited to balancing mechanism units (BMUs). Unlike Balancing Reserve, the scope will be broadened out to non-BMUs in phase 2 in 2025.

The main technical requirements are minimum 1MW, with up to 1 minute response time for a minimum of 5 minutes response, and only 3 minutes recovery period between responses.

4.0 Market Metrics

Demand Flexibility Service

The Demand Flexibility Service (DFS) entered its third year of operation in winter 24/25 and has delivered consumer savings through its move to an in-merit service and increased delivery volumes materialise. As NESO's Winter Outlook showed a change in operational landscape from the previous year's, NESO were confident in transitioning the service away from a winter contingency enhanced action service to a merit-based margin tool. This meant the DFS can compete against other margin actions and continue to offer flexibility a route to market.

Service Description

The Demand Flexibility Service (DFS) helps households and businesses participate in the electricity market by providing incentives, through suppliers and aggregators, for reducing or shifting demand.

- **Registered providers can aggregate to bid units between 1 and 100 MW.** The aggregated units can submit bids in decimal values.
- **Stacking is permitted with both the Capacity Market, most DNO Services and other trials such as Crowdflex.**
- **All assets require half-hourly metering.** This means that domestic smart meters are ideal assets to be aggregated. Parties can utilise asset metering.
- **Service Requirements are published within day with typically 4-6 hours delivery notice.**

As part of the evolution of DFS, NESO engaged extensively with industry and were pleased to be able to advance several service parameters to support further growth following feedback from industry. A number of the key developments were:

- Stacking - This included unlocking the ability for parties to stack DFS with the Capacity Market, various Distribution Network Operator services and trials such as Crowdflex to maximise revenue opportunities for flexibility.
- Asset metering facilitation.
- Move to within day only procurement.
- API implementation for data sharing and bidding.
- Removal of guaranteed acceptance price and tests.
- Introduction of performance incentives.
- Ofgem approved derogation supporting the service being available all year round currently until April 2027.

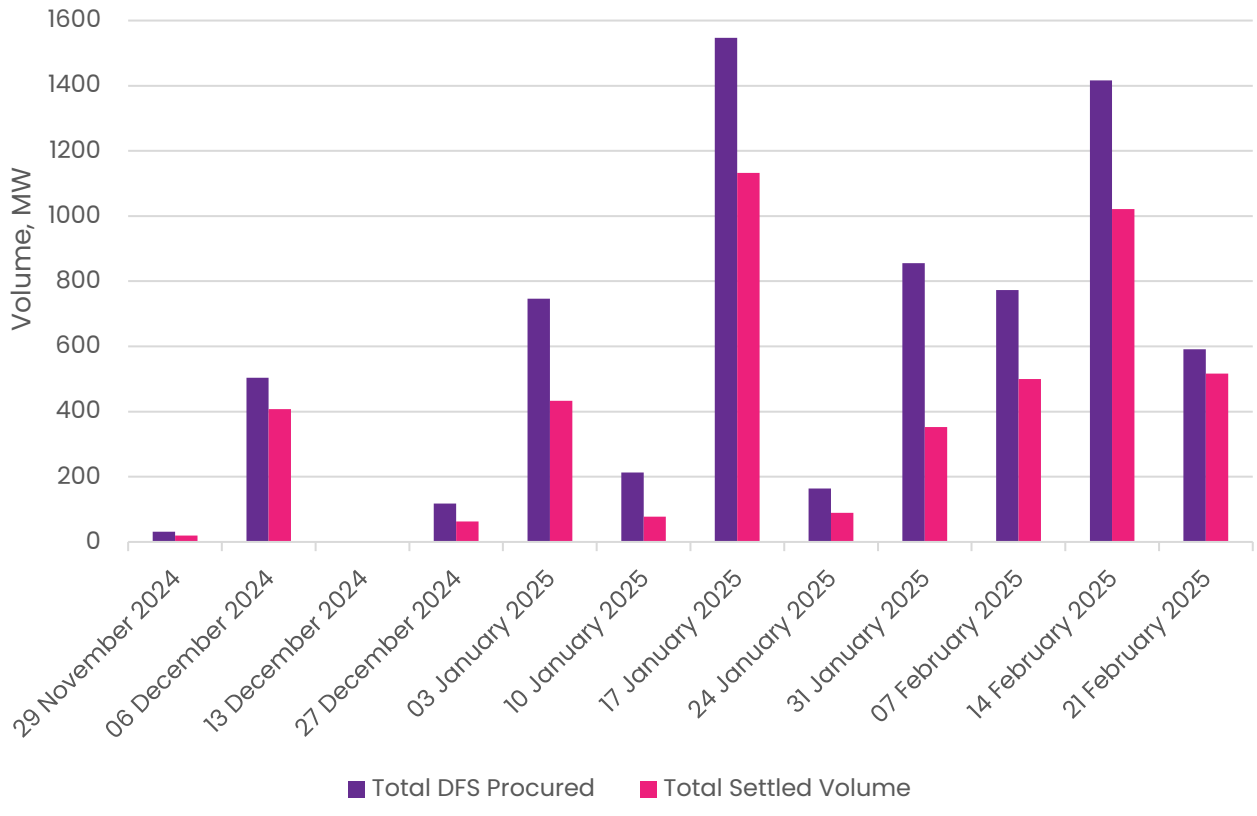
NESO shared an updated webinar in February 2025 where a commitment to explore reviewing how expanding DFS to a bidirectional product and having additional locationality features could look. NESO are now in the process of starting to shape this work and will be attending the Power Responsive Challenge workgroup to start engagement with industry around these topics.

Volumes and Prices

The evolution of DFS into a merit-based margin tool has offered 60+ Service Requirement days since the reformed changes were approved by Ofgem. Across these Service Requirements, NESO has accepted bids in excess of £1.2m across these events with a highest accepted bid price realised on 8 January 2024 for £1,290 per MWh. The peak settlement period this winter was 197MW. The evolution to a merit-based margin tool has demonstrated forecasted savings of ~£500,000 at the time of publication.

The service continues to see strong engagement externally with more than 2 million Meter Point Administration Numbers (MPANs) registered across the provider base. These include domestic consumers as well as industrial and commercial organisations.

FIGURE 1 - TOTAL DFS VOLUME PROCURED AND SETTLED, MW



Static Firm Frequency Response

Static FFR (sFFR) volumes were relatively stable throughout 2024, the clearing price on the other hand was variable. The managed phase out of Dynamic FFR (dFFR) concluded in November 2023 and is therefore not covered in this report.

Service Description

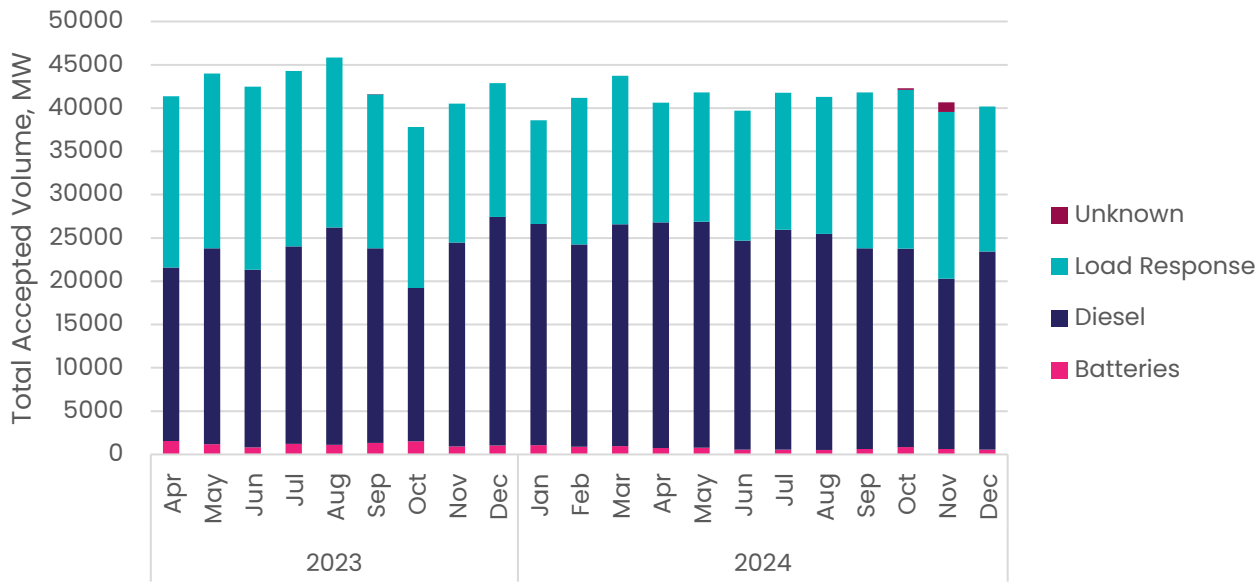
Static FFR is a post fault frequency response service, procured to help maintain frequency above the statutory minimum limit (49.5 Hz) following an infeed loss on the system. Due to service design and typically infrequent dispatching of the service, it attracts a diverse range of assets.

- **Quick and sustained response:** Static FFR requires assets to respond within 30 seconds once system frequency drops below 49.7 Hz, then sustain a response for a full 30 minutes.
- **Low frequency response service only**
- **Daily day ahead auctions:** Pay-as-clear auctions run each day for each EFA block. Payment is availability fee only (£/MW/Hr)

Volumes and Technologies

Between January and March 2024, total monthly accepted sFFR volumes grew to a peak of around 44GW in March, before reducing and largely stabilising throughout the rest of 2024 at around 41GW a month. Throughout 2024, the sFFR service was dominated by 'diesel' and 'load response', which both had a similar share, with batteries making up a very small proportion of the market that hasn't grown since 2023. Accepted volume was less variable in 2024 than it was in 2023.

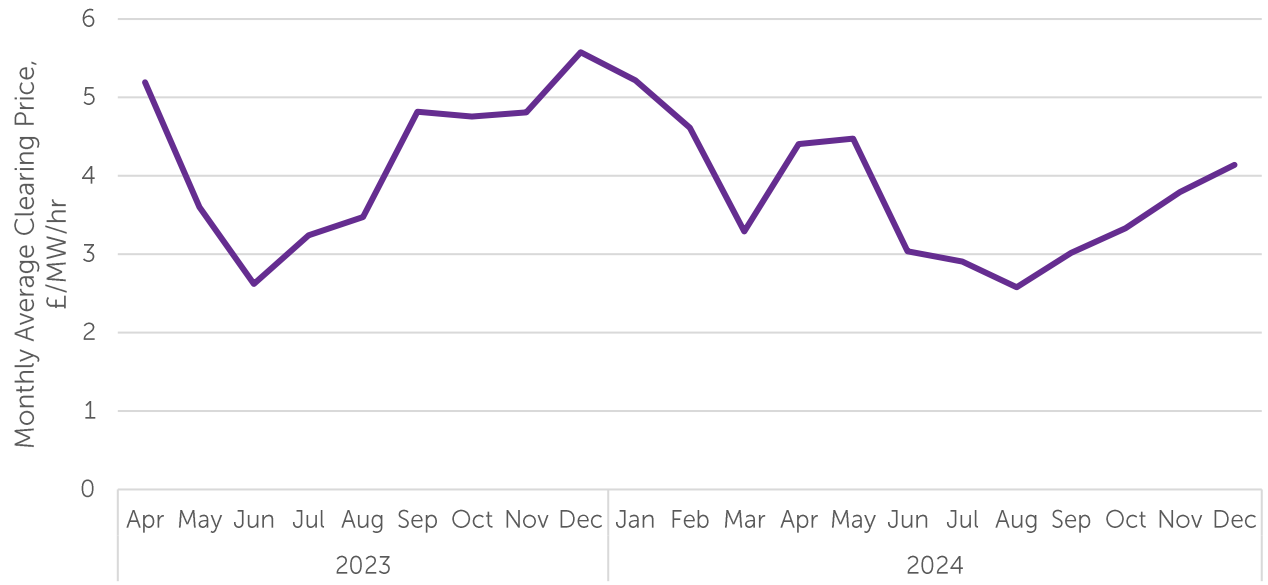
FIGURE 2 - STATIC FFR TOTAL MONTHLY ACCEPTED VOLUME, BY TECHNOLOGY, MW



Prices

In 2024, prices for sFFR varied between around £3/MW/hr and £5/MW/hr, decreasing between January and March, before rebounding in April and May. Prices fell toward the lowest average monthly price in 2024 of around £2.5/MW/hr in August before climbing gradually up to over £4/MW/hr in December.

FIGURE 3 - STATIC FFR CAPACITY, MONTHLY AVERAGE CLEARING PRICE, £/MW/HR



Quick Reserve

The Quick Reserve (QR) service launched on the EAC platform on 19 November 2024, with the first auction taking place on 3 December. It is comprised of Negative Quick Reserve (NQR) and Positive Quick Reserve (PQR). Since launching, volumes and prices of QR have been high. Due to the QR service only being live for a little over a month in 2024, it's hard to draw any firm conclusions on what the long-term volumes and clearing prices may be for the service. Due to the limited data available, the charts in this report are daily averages, rather than the weekly averages used for DC, DM, and DR.

Service Description

The Quick Reserve (QR) service is the latest of a suite of three new reserve services to be launched by NESO, started by Balancing Reserve (BR) and due to be completed by the launch of Slow Reserve (SR).

- **Regulating Reserve:** Used to correct pre-fault disturbances on the GB electricity grid (differences between generation and demand) and return the frequency clsoe to 50.0 Hz..
- **Phased launch:** Phase 1 has already gone live to balancing mechanism (BM) participants, but a second phase is being launched in 2025 to widen the participation to non-BM assets.
- **Procured in-line with dynamic frequency services:** Procurement of Regulating Reserve using the QR service will be cleared on a day-ahead basis simultaneously with other EAC dynamic response services.

Quick Reserve is split into demand turn-up (Negative Quick Reserve, NQR) and demand turn-down / output increase (Positive Quick Reserve, PQR) services.

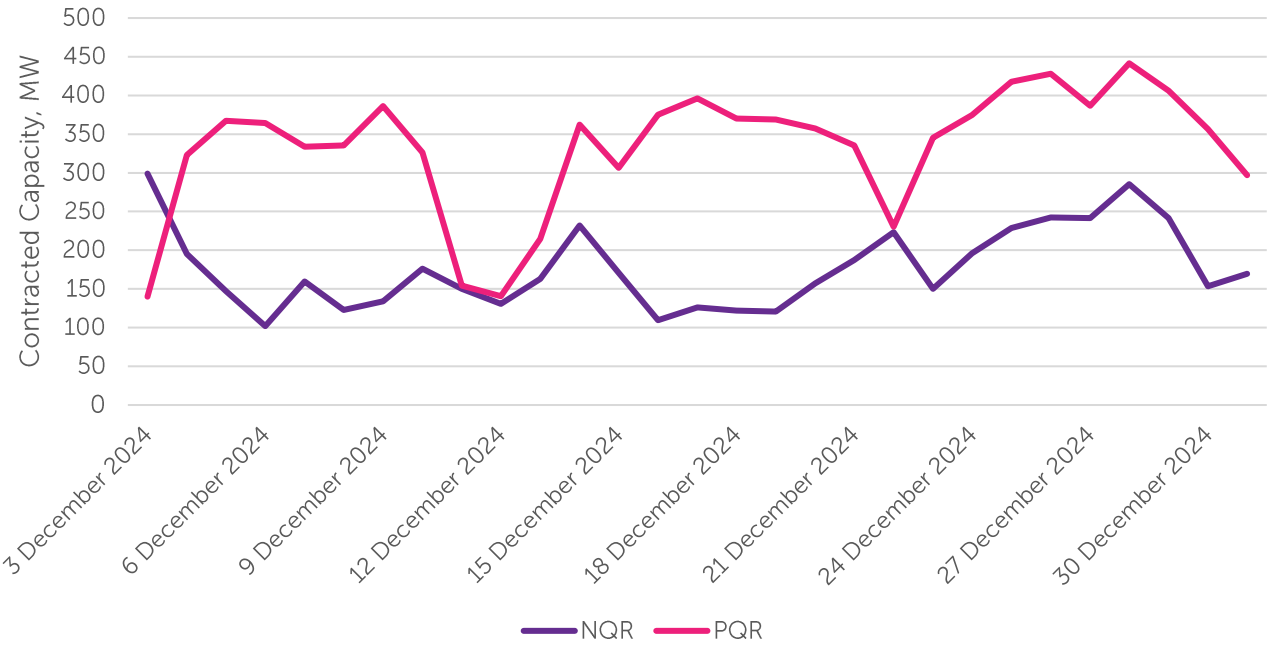
Phase 1 of Quick Reserve launched on 19 November 2024 with the first auction taking place on 3 December 2024. Procurement and dispatch is managed via the single markets platform (SMP) and the enduring auction capability (EAC), although participation during phase 1 is limited to balancing mechanism units (BMUs). Unlike Balancing Reserve, the scope will be broadened out to non-BMUs in phase 2 in 2025.

The main technical requirements are minimum of 1 MW of response, a maximum 1 minute response time and minimum of 5 minutes of sustained response, with a maximum recovery period between responses of 3 minutes

Volumes

Since launching, daily average volumes of both NQR and PQR have never fallen below 100 MW. Volumes of PQR were consistently above NQR, except on the 3rd of December.

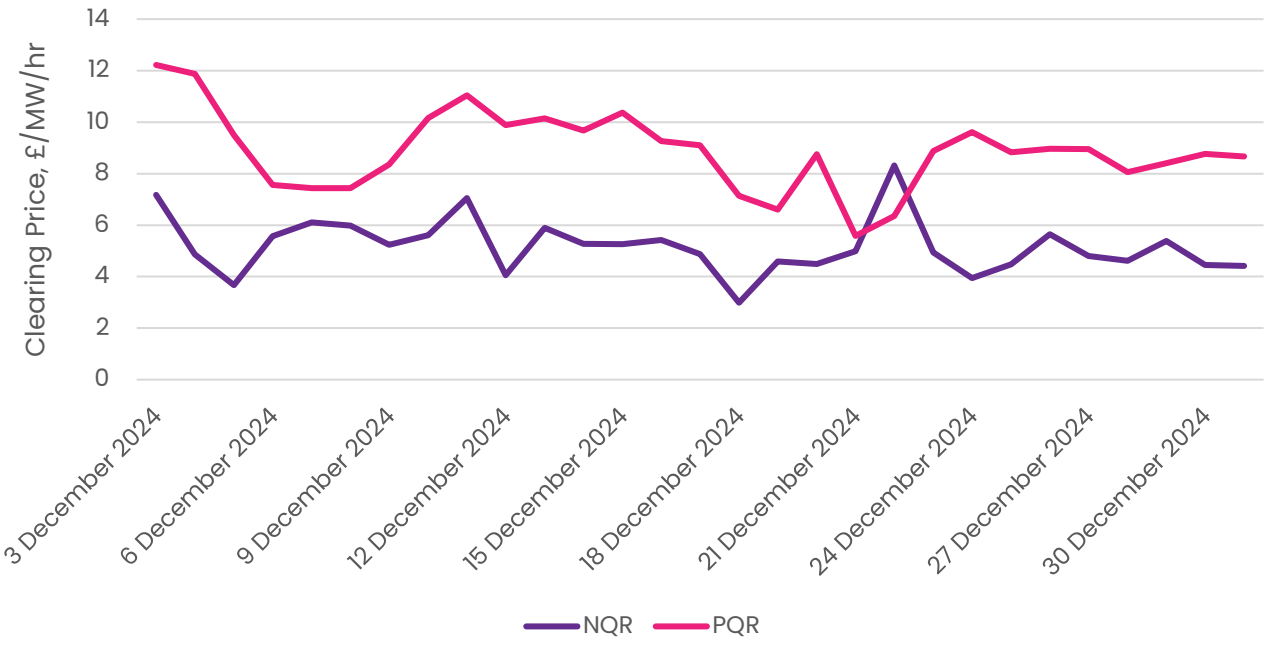
FIGURE 4 – DAILY AVERAGE CONTRACTED CAPACITY OF NQR AND PQR, MW



Prices

Prices of both services have been reasonably stable since their launch. PQR has had a higher clearing price for the vast majority of the time since the launch of the service, consistently sitting between around £6 and £10/MW/hr. NQR consistently had a price between around £4 and £6/MW/hr in 2024.

FIGURE 5 – DAILY AVERAGE AUCTION CLEARING PRICE OF NQR AND PQR, £/MW/HR



Short Term Operating Reserve

NESO continued to procure over 1GW of Short-Term Operating Reserve (STOR) comprised of mostly thermal generation each month of 2024. The share of non-thermal generation increased towards the end of 2023 and into 2024, and this share has remained stable since then. The general picture has been one of very variable clearing prices over the year and, at least for the first 3 quarters of 2024, higher average prices than in 2023. In the 2023 report it was noted that new reserve services announced by NESO may disrupt the STOR market when they go live, and although it is too early to draw firm conclusions, there does appear to be evidence of this in the volume and price data from the end of the year. The express intention of NESO is to phase out STOR with the introduction of the replacement Slow Reserve (SR) service in 2025.

Service Description

STOR is used by the system operator to manage inaccuracies in forecasting generation and demand. STOR is a post fault service and providers deliver additional electricity or increase their demand to help balance overall supply and demand.

- **Slow response, long duration:** STOR requires a slower response (within 20 minutes) and longer duration (a minimum of 2 hours) than frequency response services.
- **Capability to recover and respond again:** Participating assets must be able to respond for a second time after their initial response, with recovery within 20 hours.
- **Prequalification is mandatory:** All prospective providers must prequalify ahead of an auction by showing compliance with the Platform for Ancillary Services or by being active in the Balancing Mechanism.
- **Day-ahead tenders:** STOR procures capacity for the day-ahead through pay-as-clear auctions.
- **Larger volume requirement:** STOR units must be able to deliver at least 3 MW of generation or steady demand reduction. This can be aggregated from more than one site.
- **Stackability:** Outside of STOR contracted availability windows other services can be provided, as long as ability to deliver STOR is not affected. It is not possible to provide other services at the same time as providing STOR.

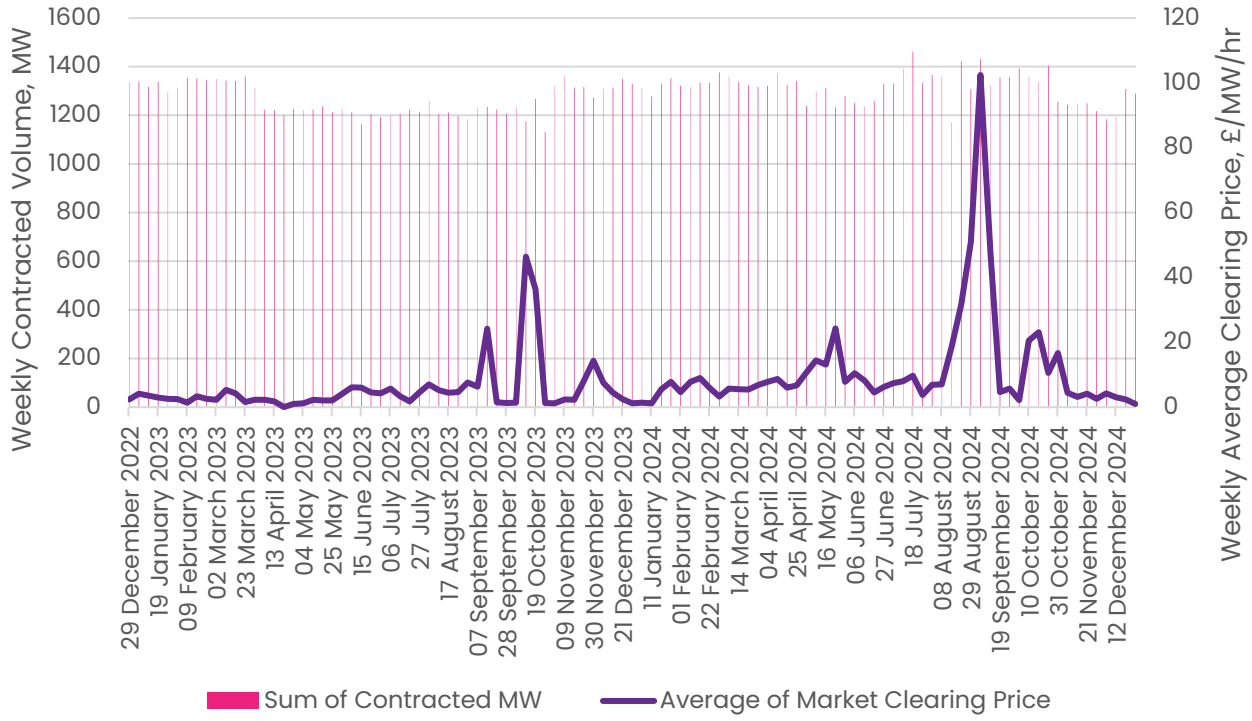
Volumes and Prices

The day-ahead STOR market continued to procure around 1300 MW of capacity per day throughout 2024, a similar level to in 2023, save for the end of the year where volumes began to fall and become more volatile. The lowest contracted average volume per day across a week in 2024 occurred in August, where average contracted volume was below 1170MW.

STOR clearing prices in 2024 trended above those seen in 2023. Prices spiked towards the end of May after increasing steadily for most weeks

from the end of February. A second significant spike in August saw the weekly average clearing price peak at £102/MW/hr. This compares to a spike of £46/MW/hr in October 2023 Towards the end of 2024 prices fell, averaging below £3/MW/hr from November onwards.

FIGURE 6 - STOR WEEKLY AVERAGE OF CONTRACTED VOLUME PER DAY AND WEEKLY AVERAGE CLEARING PRICE, MW AND £/MW/HR



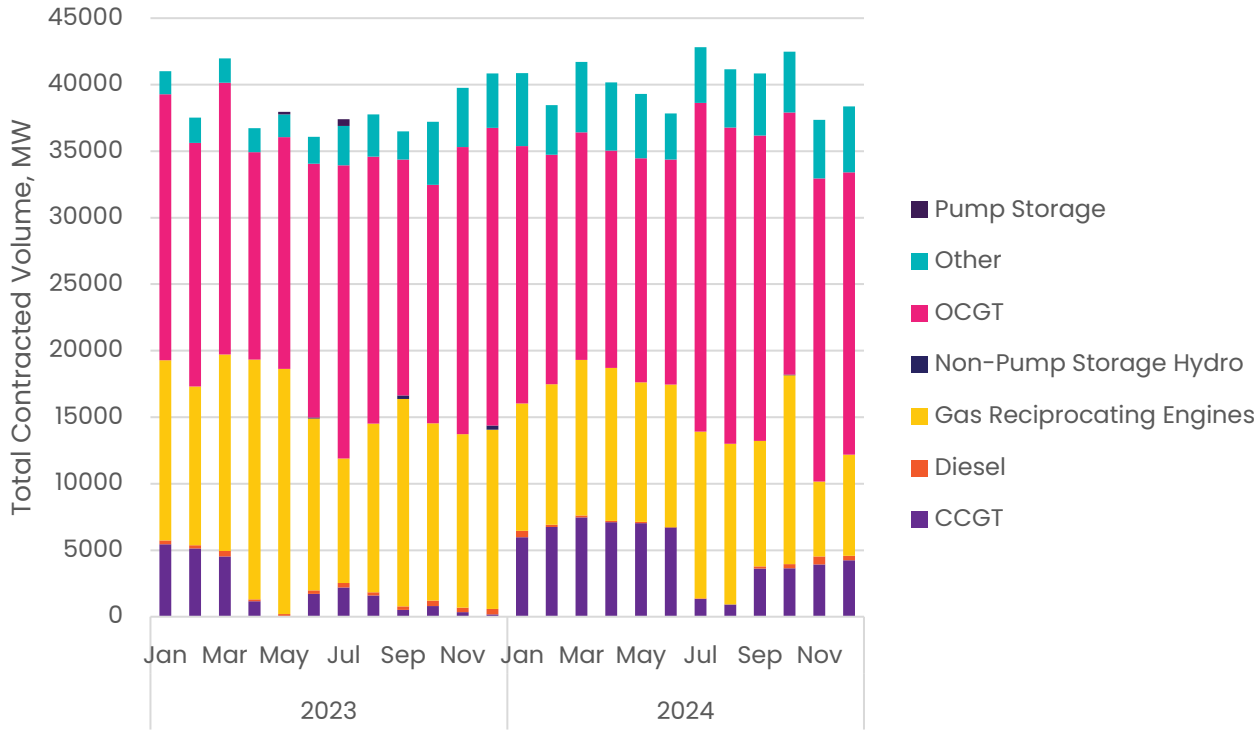
Technologies

In 2024, the STOR market continued to be dominated by thermal forms of generation. Gas Reciprocating Engines and Open Cycle Gas Turbines (OCGT) were the two most prevalent technology types, consistently contracted for around 25–30GW a month. Some of the market share of these technologies was taken by Combined Cycle Gas Turbines (CCGT), which delivered far more capacity than in 2023, especially in the first half of the year. However, CCGT volumes were volatile in the second half of the year, with a drastic drop-off in July and August, followed by a slow recovery toward December. Diesel contributed to a very small proportion of the total volume in 2024, and Non-Pumped Hydro Storage entered the market only in October, with less than 50 MW. Pumped Storage contributed no volume in 2024.

Most non-thermal DSF assets fall into the 'Other' category of STOR technologies, alongside some other non-DSF assets. In 2024, contracted volumes of this 'Other' asset type increased, and in each month of January, March, and April volumes in this category topped 5 GW, with January having a peak of almost 5.5 GW a significant increase on the previous high

of 4.75 GW seen in October 2023. In 2024, volumes in this category only dropped below 4 GW twice, in February and June.

FIGURE 7 - STOR TOTAL CONTRACTED VOLUME PER MONTH BY TECHNOLOGY TYPE, MW



The Capacity Market

The 2023 Capacity Market auctions (held in early 2024) had another relatively strong year. In the T-1, accepted capacities jumped to record levels. In the T-4, accepted capacities fell only very slightly from the previous year. Auction clearing prices for the 2023 T-1 auction fell to £35.79/kW/yr, significantly below the £60/kW/yr in the 2022 auction and far off the 2021 auction peak of £75/kW/yr. In the T-4, prices increased slightly to £65/kW/yr. Of note in the 2023 T-1 auction is the significant volume of nuclear (2.8 GW), up from the 1.4 GW accepted in the 2022 auction. The volume of batteries increased in the T-1 but fell in the T-4. Proportions of technologies acquiring contracts in the 2023 T-4 auction remained similar to those seen in the previous year. Thermal capacity has dropped slightly in both T-1 and T-4. Coal no longer makes up any of the thermal generation volume in the Capacity Market.

Service Description

The Capacity Market seeks to ensure sufficient generation capacity in GB to meet demand during peak periods. This is achieved through participants being available to generate or reduce demand during system stress events.

Under normal operation, two Capacity Market auctions are held each year. The T-1 is for delivery commencing at the start of the next delivery year, and the T-4 for delivery in four years' time. Auctions are pay-as-clear, with contracts of up to 15 years available in T-4 auctions for some new build assets.

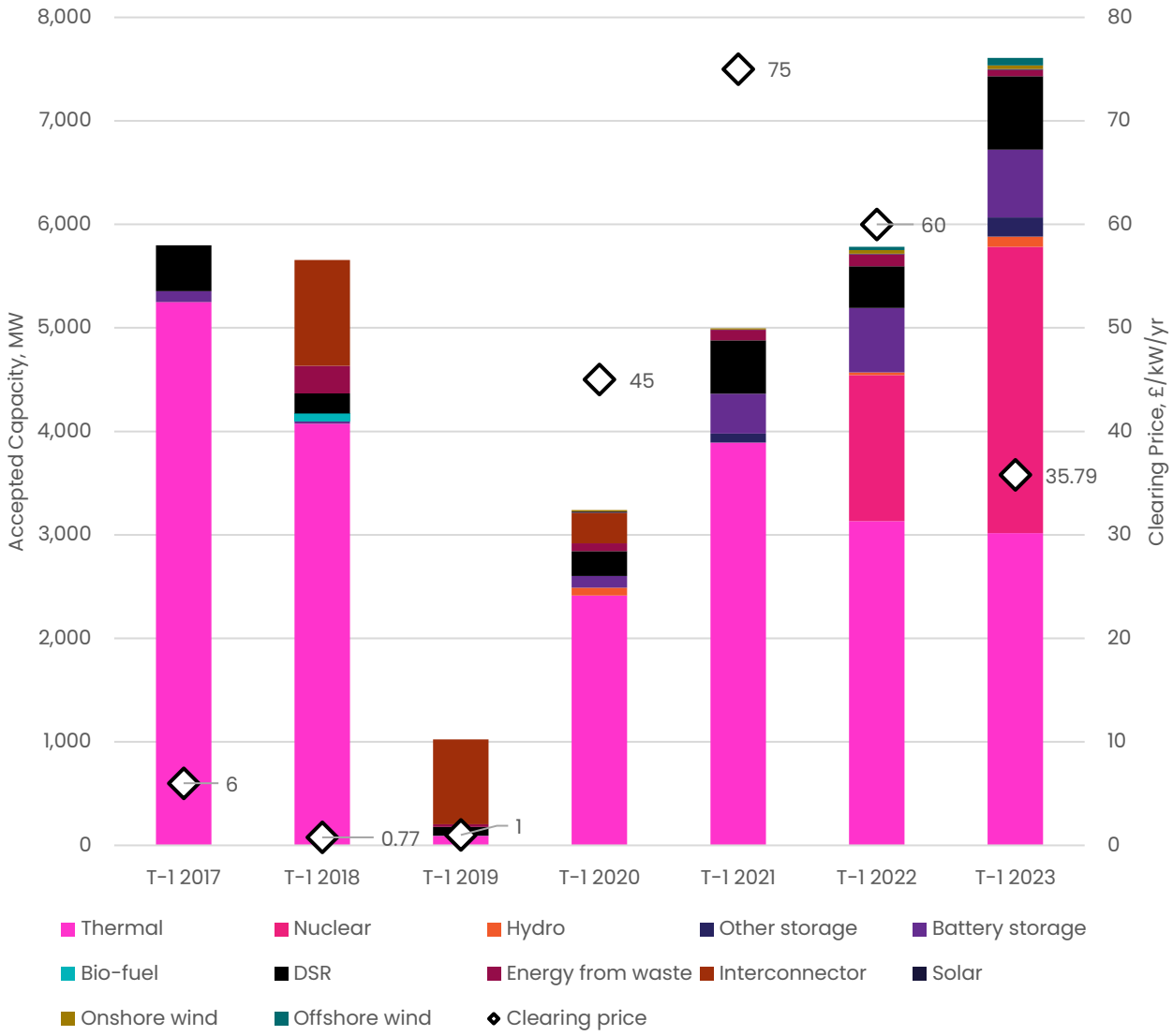
The minimum capacity limit is 1 MW, although each technology is given a de-rating assumption linked to the likelihood of it being available during system stress events. Generators receiving renewable energy subsidies are not eligible.

Any system stress events are preceded by a Capacity Market Notice, which provides a warning at least four hours in advance that there may be a generation shortfall approaching.

T-1 Auction

In the 2023 T-1 auction (held in early 2024), volumes of accepted capacity increased to 7.6 GW, up from 5.8 GW in the 2022 auction. This 2023 volume was largely comprised of new capacity with some thermal displacement. Notable increases were seen in the volume of nuclear (~2.8GW) and battery storage (up from 620 MW to 655 MW) winning contracts. The auction clearing price in the 2023 auction decreased substantially to £35.79/kW/yr, far from the highs of £60/kW/yr and £75/kW/yr in 2022 and 2021 respectively.

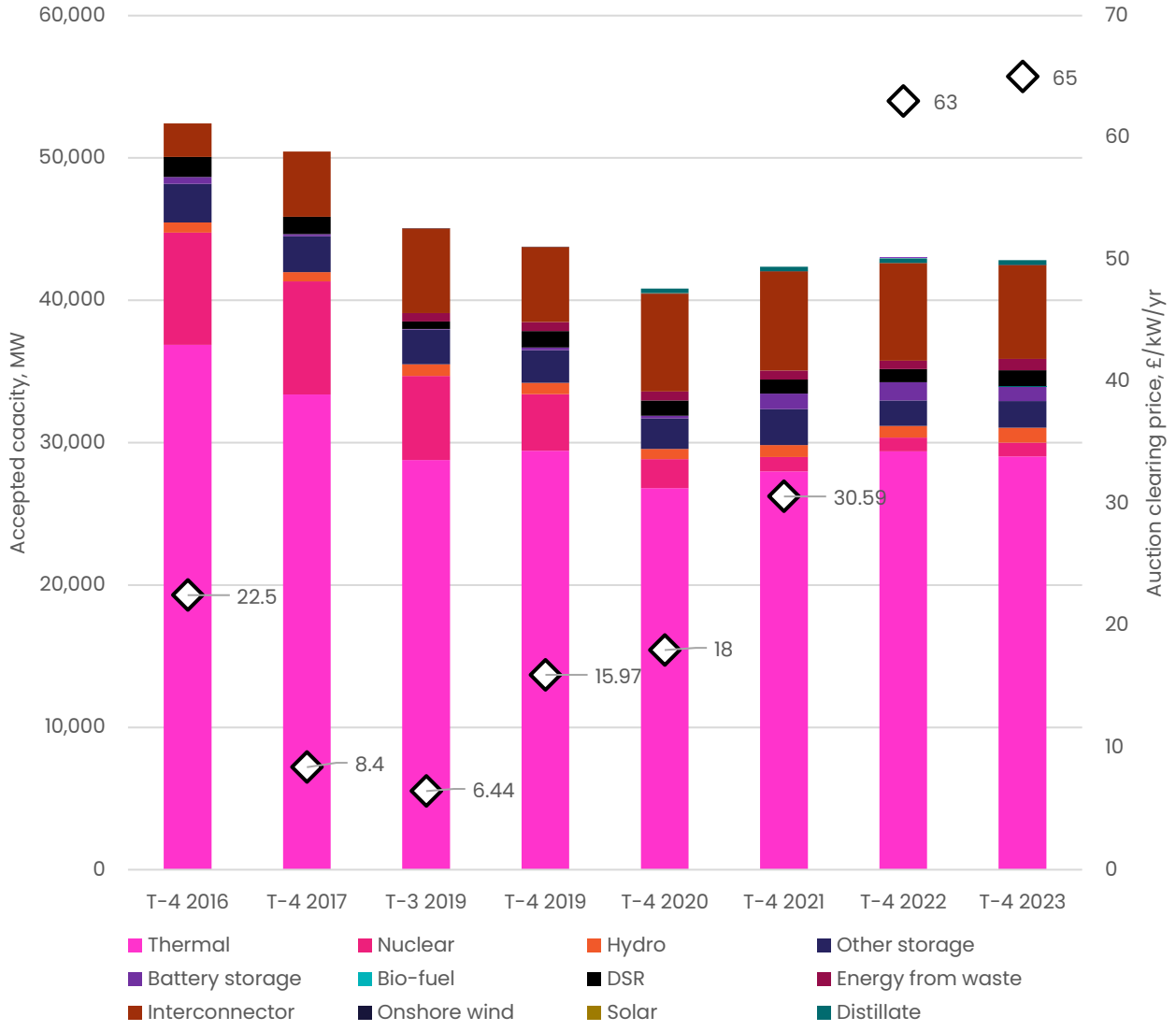
FIGURE 8 - CLEARING PRICE AND ACCEPTED CAPACITY BY TECHNOLOGY OF T-1 CAPACITY MARKET AUCTIONS, MW AND £/KW/YR



T-4 Auction

In the 2023 T-4 auction (held in early 2024), volumes of accepted capacity increased to 42.8 GW, a slight decrease from 43.0GW in the 2022 auction. The only notable change was that no offshore wind was awarded capacity in the 2023 auction. Battery volumes decreased slightly from 1.28 GW in the 2022 auction to 1.02GW in 2023. Overall, the technology make-up of the 2023 auction awarded capacity remained very similar to in 2022.

FIGURE 9 - CLEARING PRICE AND ACCEPTED CAPACITY BY TECHNOLOGY OF T-4 CAPACITY MARKET AUCTIONS, MW AND £/KW/YR



The Balancing Mechanism

The Balancing Mechanism (BM) has historically been a large yet uncertain market for flexible assets of all types. This remained true in 2024. A new derogation came into place in February 2024 to allow 300MW of aggregated assets access to the BM.

Service Description

The Balancing Mechanism (BM) is NESO's primary tool for balancing electricity supply and demand close to real time. The interface between the BM and tendered ancillary services is complex. Some services are dispatched through the BM, while others are not. Most services targeted by DSF providers sit outside the BM.

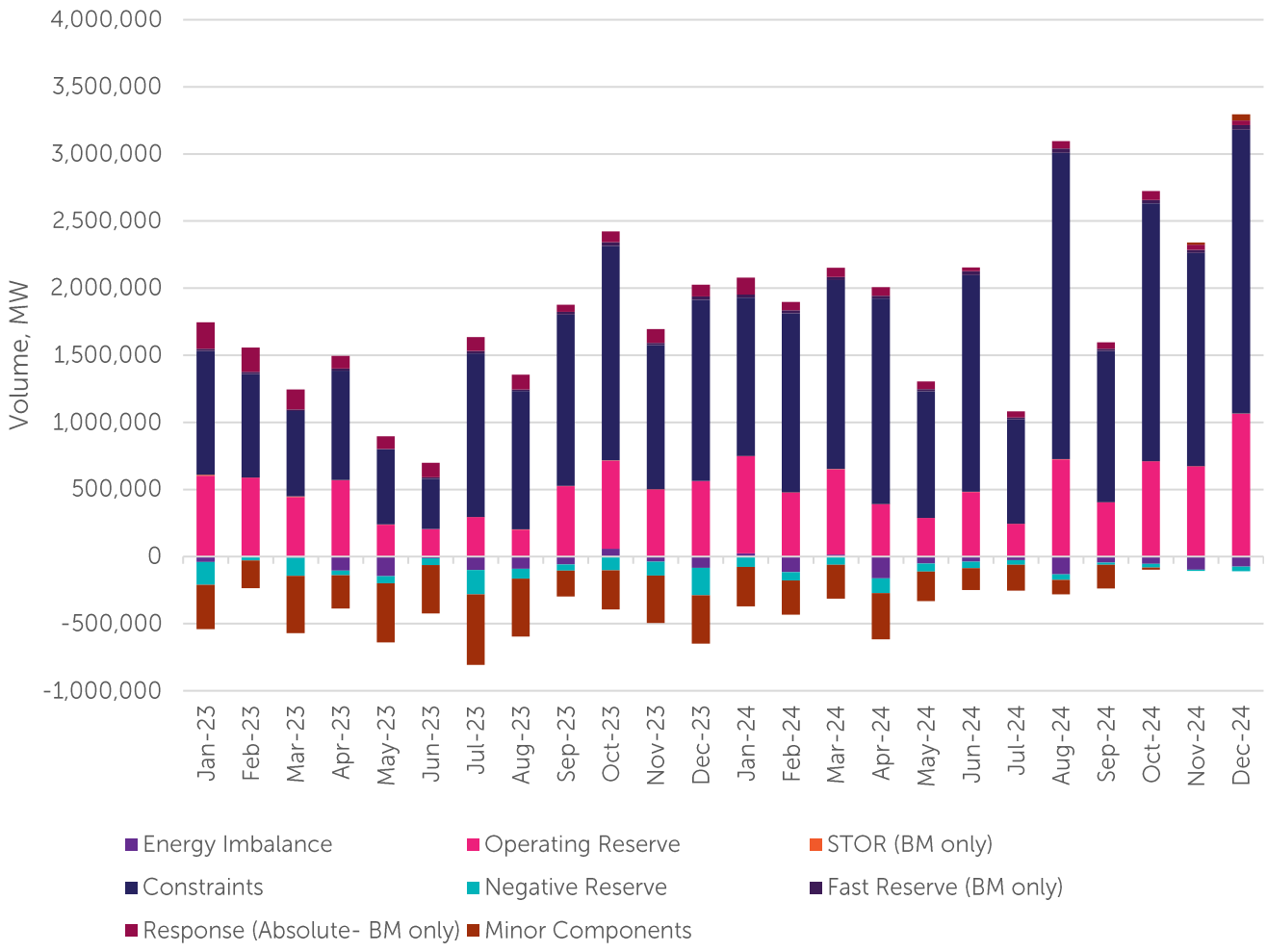
Regulatory changes have opened up access to the BM to DSF providers, including a reduction in the threshold of participation from 100 MW to 1 MW; introduction of the Virtual Lead Party (VLP) route for aggregators; and the release of an Application Programming Interface (API) improving data and access for providers. NESO have also improved dispatch systems to allow more efficient dispatch of smaller units.

Participants in the BM submit bids and offers to reduce or increase their generation or consumption within each 30-minute settlement period. NESO calls on these providers as needed, paying the bid or offer price for the volume dispatched.

Volumes

Average monthly volumes of capacity secured through the BM in 2024 are considerably higher than those in 2023 and 2022, though there is still notable volatility between months. In 2024, the greatest volumes procured were in December (around 3.3TWh) and the smallest in July (around 1.5TWh). This lowest figure is over double the lowest month of 2023, which was in June of that year (0.684TWh). As in previous years, most BM instructions are taken to manage constraints on the grid. The volume of Minor Components, used to control over-supply, decreased notably in the second half of 2024.

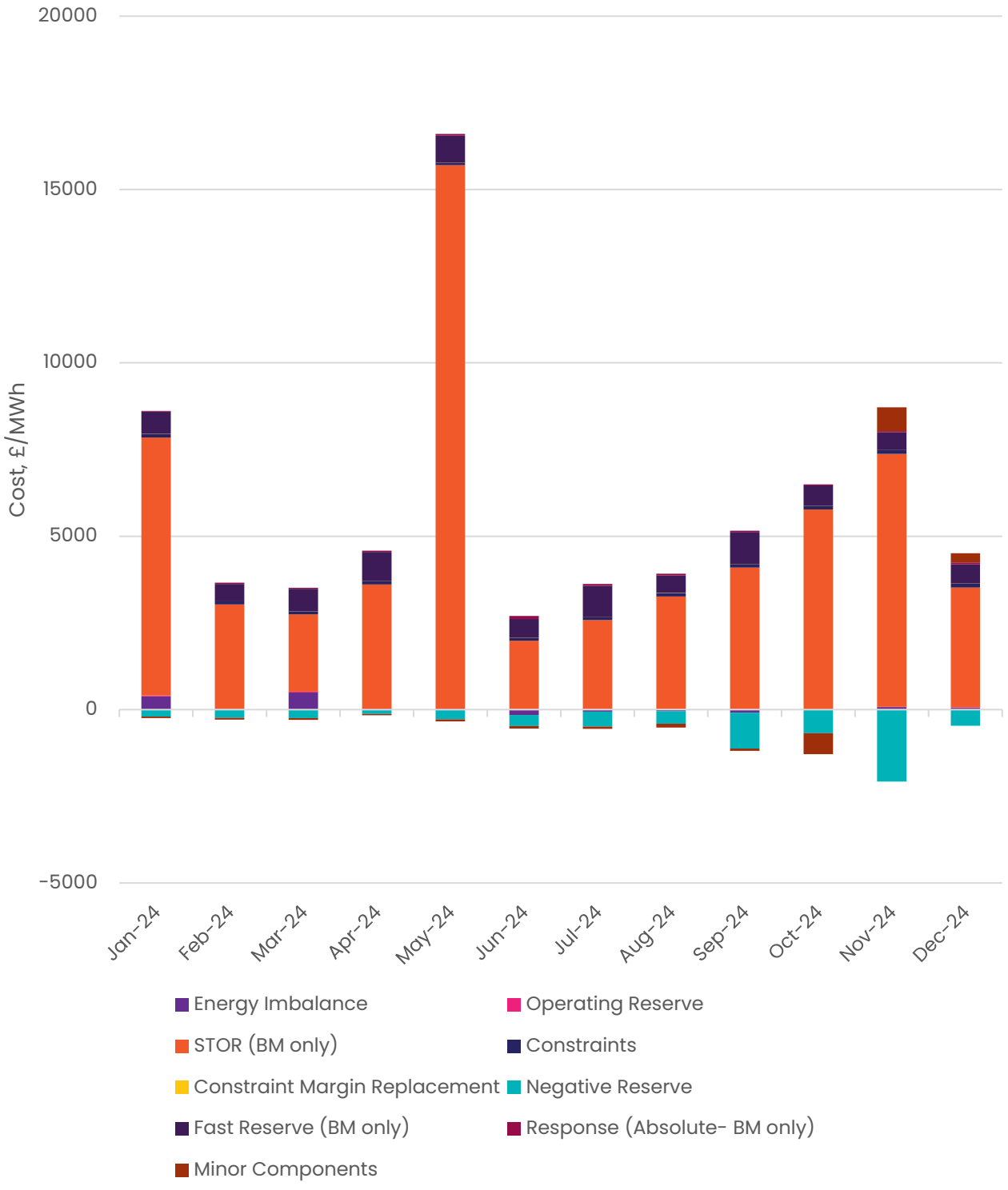
FIGURE 10 - BALANCING MECHANISM VOLUMES BY MONTH AND TYPE OF INSTRUCTION, MWH



Prices

Prices have varied greatly in 2024 depending on the BM Instruction. STOR (BM only) has by far the largest cost in £ per MWh. All other BM Instructions have much lower costs per MWh. Minor Components and Negative Reserve have negative pricing.

FIGURE 11 - BALANCING MECHANISM COST BY MONTH AND TYPE OF INSTRUCTION, £/MWH



Balancing Reserve

Balancing Reserve is a new service that was launched in March 2024 to reduce the cost of balancing the system and provide better visibility of reserve volume to NESO. BMUs over 1 MW are eligible to participate in a daily auction for Balancing Reserve contracts through the Enduring Auction Capability (EAC) platform. Since launching, weekly volumes of Positive Balancing Reserve (PBR) were remarkably consistent in magnitude throughout 2024, and consistently higher than Negative Balancing Reserve (NBR). Clearing prices for PBR approximately followed a U-shaped curve since March to the end of 2024, with NBR prices staying comparatively flat from May 2024 to the end of the year.

Service Description

The Balancing Reserve (BR) service allows NESO to procure Regulating Reserve on a firm basis through day-ahead auctions via the Enduring Auction Capability (EAC) platform.

- **Regulating Reserve:** Used to correct energy imbalances on the GB electricity grid (differences between generation and demand).
- **Uniform risk:** Requirements ensure uniform risk of loss of load events due to reserve shortfall across all settlement periods in the year.
- **Cost decrease and security benefits:** Procurement of Regulating Reserve using the BR service on a firm basis at day ahead reduces balancing costs and improves system security by guaranteeing reserve capacity for the Control Room. Reserve volume is locked in ahead of the day ahead energy market and is not available for continental markets over interconnectors.

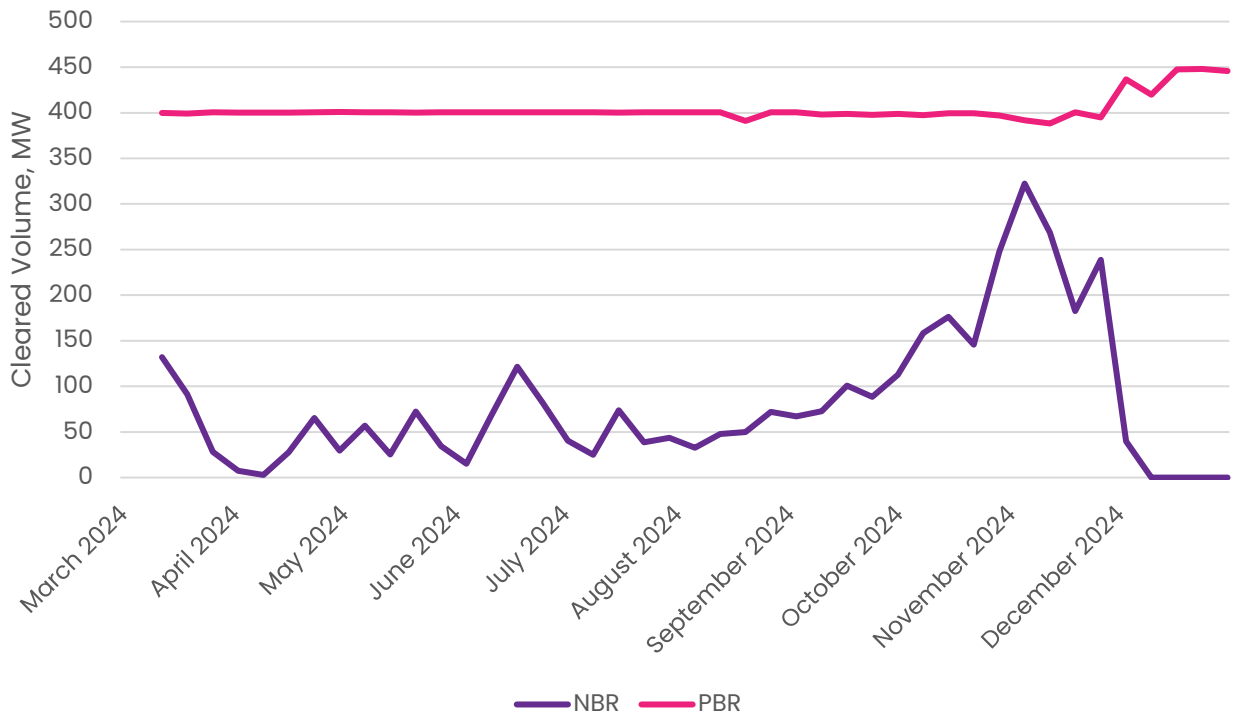
Balancing Reserve is split into demand turn-up (Negative Balancing Reserve, NBR) and demand turn-down / output increase (Positive Balancing Reserve, PBR) services.

Volumes

Cleared volumes of PBR during 2024 were around 400MW per half hour settlement period until mid-November, when a measurable increase was seen with volumes peaking in the week beginning 17 December at around 450MW. Cleared volumes of NBR on the other hand were far more variable, especially between March and August, where there was variation from 2.9MW cleared volume in the week beginning 9 April up to 122MW in the week beginning 18 June. After 5 months of volatility, from August cleared volumes started trending upwards consistently up to the week of 5 November, where cleared volumes peaked at 322MW. Following this peak, NBR volumes fell to 0MW in the week beginning 10 December, due to a

reduced requirement across the winter period. From this point, there was no cleared volume of NBR for the rest of 2024.

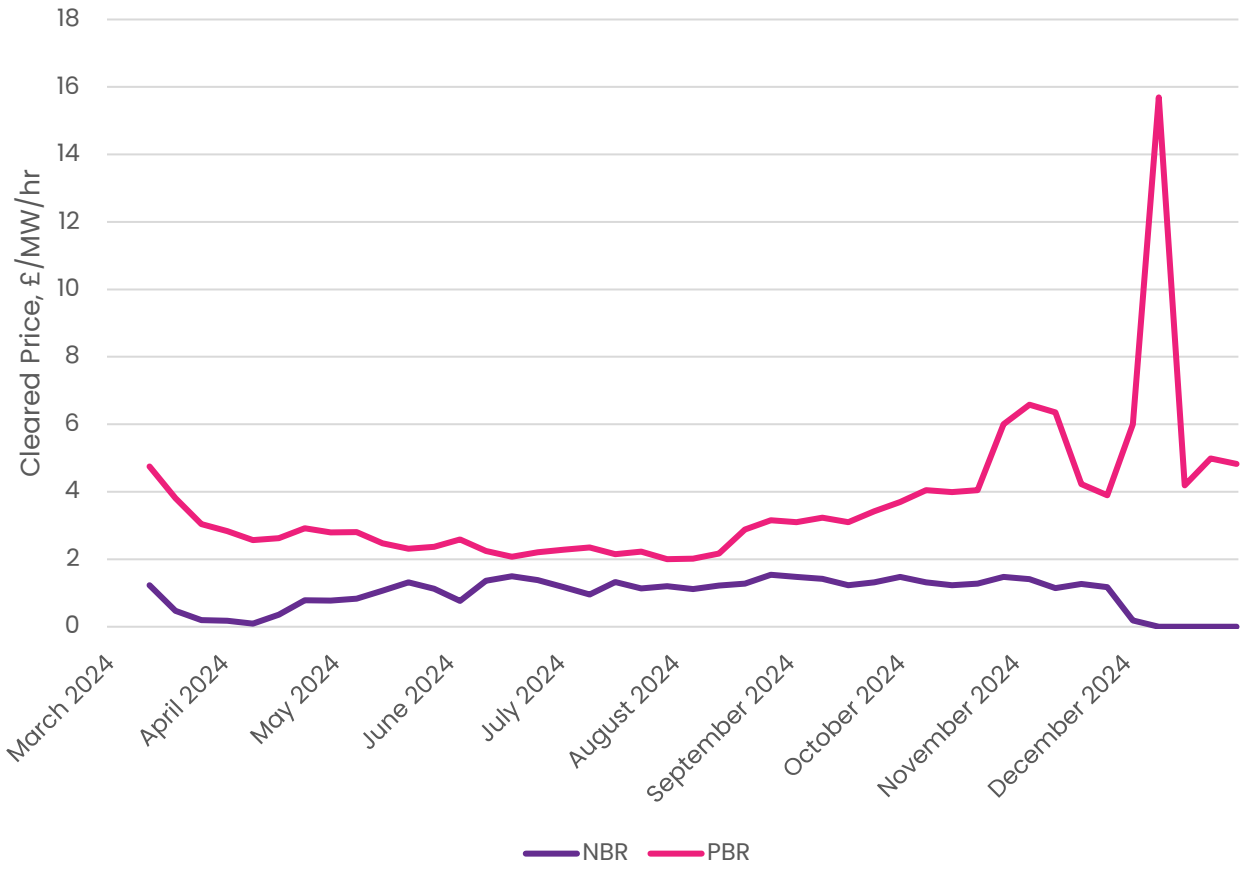
FIGURE 12 - AVERAGE CLEARED VOLUME OF NBR AND PBR PER HALF HOUR SETTLEMENT PERIOD, MW



Prices

Average cleared prices of PBR between March and October 2024 formed a shallow U-shape, starting at around £4/MW/hr in March, reaching a low of around £2/MW/hr in July/early August, then climbing to £4/MW/hr again in October. From mid-October, average prices of PBR started increasing, in the week beginning 5 November they reached £6.58/MW/hr. From mid-November, prices dropped off back to around £4/MW/hr again, before rising to a dramatic peak in the week beginning 10 December of £15.69/MW/hr, the largest average cleared price of the year by far. Average PBR weekly clearing prices dramatically dropped off again in the following week and sat between £4 and £5/MW/hr for the remainder of 2024. Weekly average cleared prices of NBR were lower than PBR for the whole of 2024, and a lot less volatile. NBR prices peaked at £1.54/MW/hr in the week beginning 27 August, and the hit a low point of £0.09/MW/hr in the week beginning 9 April. Overall, NBR average weekly clearing prices sat at around £1/MW/hr for most of 2024.

FIGURE 13 - WEEKLY AVERAGE CLEARED PRICE OF NBR AND PBR, £/MW/HR



Dynamic Containment

Dynamic Containment is a rapid frequency response service procured to protect against sudden demand or generation loss. During 2024, volumes procured have stabilised in comparison to the growth seen in the previous year. Dynamic Containment auction clearing prices have also been stable for much of the year, however both Dynamic Containment High (DCH) and Dynamic Containment Low (DCL) saw significant spikes in the autumn period. Clearing prices were significantly below those seen in 2022 and in summer 2023, with £1-£2/MW/hr common throughout much of the year.

Service description

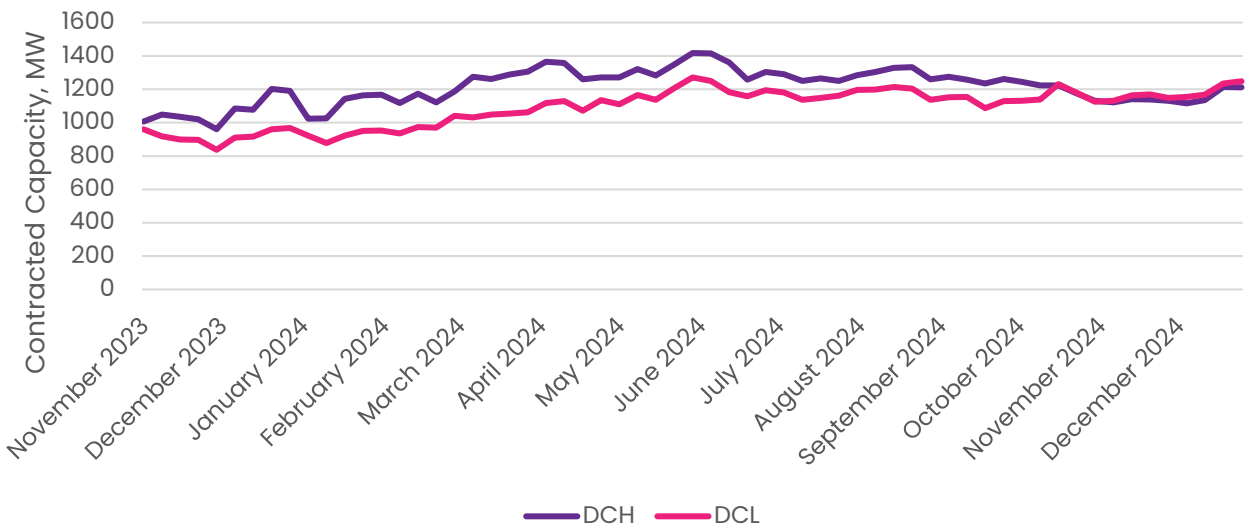
Dynamic Containment is a frequency response product designed to keep the transmission network within safe operating limits of frequency after a system fault. Key features of the service are:

- **Rapid frequency containment:** DC is rapid response service designed to maintain the nominal frequency of 50 Hz within operational limits of +0.5Hz/- 0.8Hz.
- **Quick speed of response:** The service requires full response in under one second, with output sustained for 15 minutes
- **Export and import:** DC is split into two services, one responding to high-frequency events (where there is more generation than demand) and the other to low-frequency events (when there is less generation than demand). The high-frequency service was introduced in November 2021. Both can be provided from the same asset.
- **High-resolution metering:** The service requires 20 Hz high-resolution metering capability.
- **Intra-day auctions:** Pay-as-clear auctions run each day for each Electricity Forward Agreement (EFA) block. There are six EFA blocks throughout the day, each lasting four hours in duration. Payment is based on an availability fee (£/MW/hr).

Volumes

Over the course of 2024, daily volumes of DCH and DCL remained relatively flat in comparison to the large increases seen in previous years. From December 2023, volumes for both services then gradually increased up to a peak of around 1420 MW (DCH) and 1270 MW (DCL) by June 2024. Volumes then decreased slightly and levelled off for the rest of the year, with both DCH and DCL settled at around 1200MW at the end of December 2024. DCH volumes were consistently higher than DCL volumes from November 2023 until October 2024. Since October 2024, volumes for both DCH and DCL have been around the same.

FIGURE 14 - DC WEEKLY AVERAGE CONTRACTED CAPACITY OF DCH AND DCL, MW

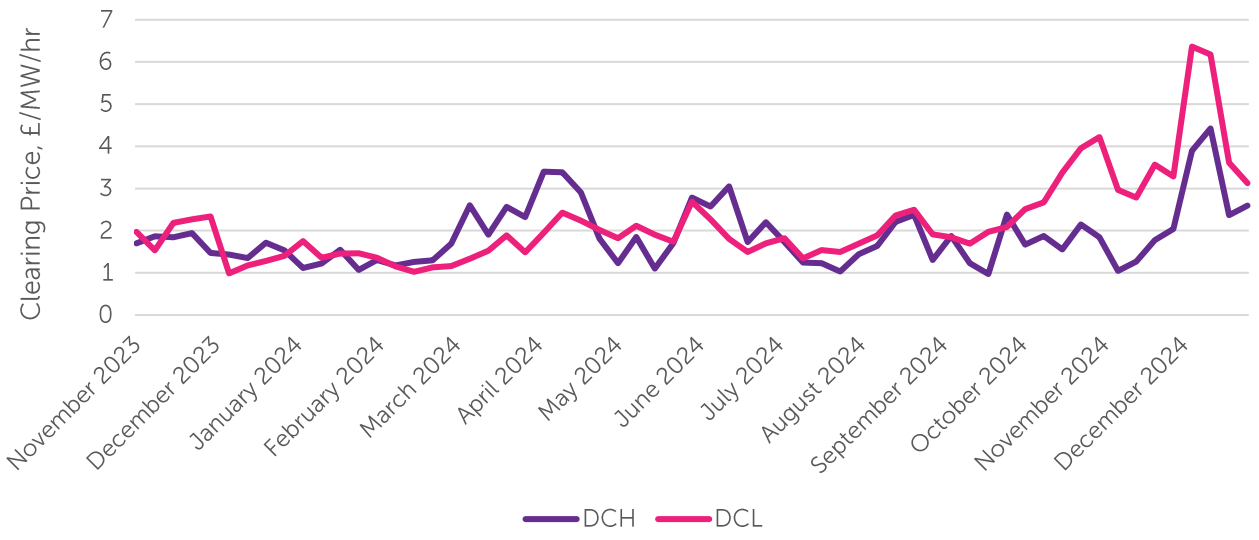


Prices

2024 saw a drop in DCH and DCL auction clearing prices compared to 2023, and a very significant drop when compared with 2022. Daily average DCH and DCL prices consistently sat around £2/MW/hr for much of the year. Average DCL prices picked up in October 2024 and peaked at around £6/MW/hr in December 2024, whilst DCL prices also peaked around the same time, at roughly £4/MW/hr.

In last year's report we noted that the introduction of the EAC appeared to have caused a reduction in clearing prices for both DCH and DCL, data gathered over a longer period now shows that this trend observed at the time has been established.

FIGURE 15 - WEEKLY AVERAGE AUCTION CLEARING PRICE OF DCH AND DCL, £/MW/HR



Dynamic Moderation

Dynamic Moderation went live in May 2022 as a service to help manage sudden large imbalances between supply and demand on the transmission system. In 2024, contracted volumes of Dynamic Moderation High (DMH) and Dynamic Moderation Low (DML) remained largely stable. Auction clearing prices for DMH reduced from 2023 and often went negative. DML prices through 2024 remained similar to 2023 and relatively stable, with a visible upwards trend from August 2024 and onwards to the end of the year.

Service Description

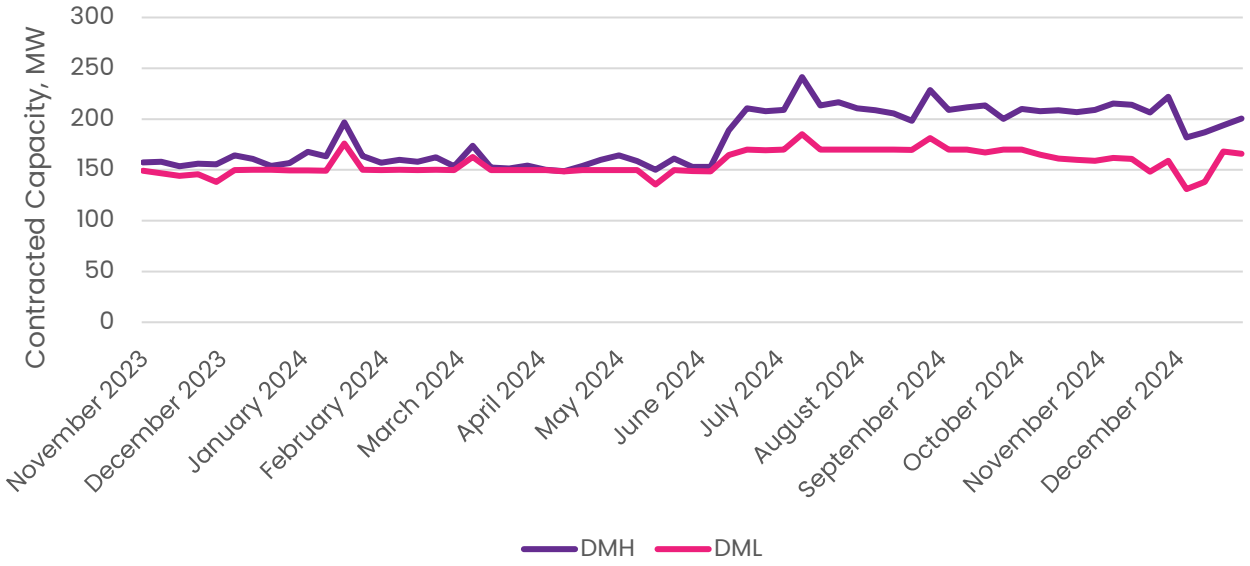
Dynamic Moderation is a pre-fault service designed to keep the frequency within the operational limits. DC, DM and DR can be stacked with the BM. The key features are:

- **Delivery range**: +/- 0.015 - 0.2 Hz with a 5% output +/- 0.1Hz (knee point) and a linear increase to 100% output at +/- 0.2 Hz
- **Speed of response:** The service requires full response in under 1 second, with output sustained for 30 minutes
- **Export and import:** DM is split into two services, one responding to high-frequency events (where there is more generation than demand) and the other to low-frequency events (when there is less generation than demand). The high-frequency service was introduced in April 2022. Both can be provided from the same asset. There is a unit cap of 100 MW per asset.
- **Performance metering:** The metering frequency for DM is 20 Hz.
- **Intra-day auctions:** Pay-as-clear auctions run each day for each EFA block. There are six EFA blocks throughout the day, each lasting four hours in duration. Payment is based on an availability fee (£/MW/hr).

Volumes

Volumes of DMH and DML were very stable from November 2023 until June 2024 with a weekly average of around 150 MW for both DMH and DML. A notable jump in DMH volumes occurred to over 200 MW per week in July 2024 and was largely sustained through to the end of the year. DML volumes increased slightly in July 2024 but then trended towards the average for the first half of the year towards the end of 2024.

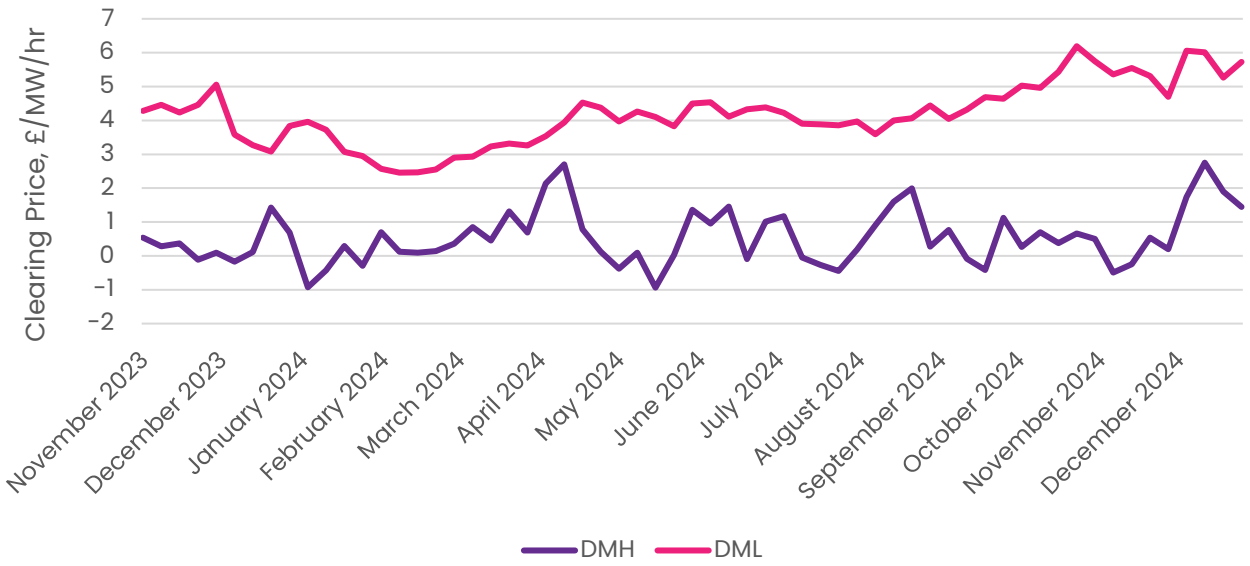
FIGURE 16 - DM WEEKLY AVERAGE CONTRACTED CAPACITY OF DMH AND DML, MW



Prices

In 2024, average auction clearing prices for DMH reduced significantly from the £4/MW/hr seen from April to November 2023. The result of the introduction of the EAC in early November 2023 has seen auction clearing prices drop significantly, they are often negative throughout 2024.DML prices were typically around £4/MW/hr for the majority of 2023, and this has continued into 2024, albeit with a slight increase up to around £6/MW/hr in the autumn of 2024.

FIGURE 17 - WEEKLY AVERAGE AUCTION CLEARING PRICE OF DMH AND DML, £/MW/HR



Dynamic Regulation

Launched in April 2022, Dynamic Regulation is a pre-fault service designed to correct small imbalances in supply and demand, effectively regulating frequency to the target 50 Hz. In 2024, contracted volumes of Dynamic Regulation High (DRH) and Dynamic Regulation Low (DRL) increased. Average auction clearing prices have been stable. Clearing prices for DRL remained well above those for DRH, with negative DRH clearing prices seen for almost the entirety of 2024.

Service Description

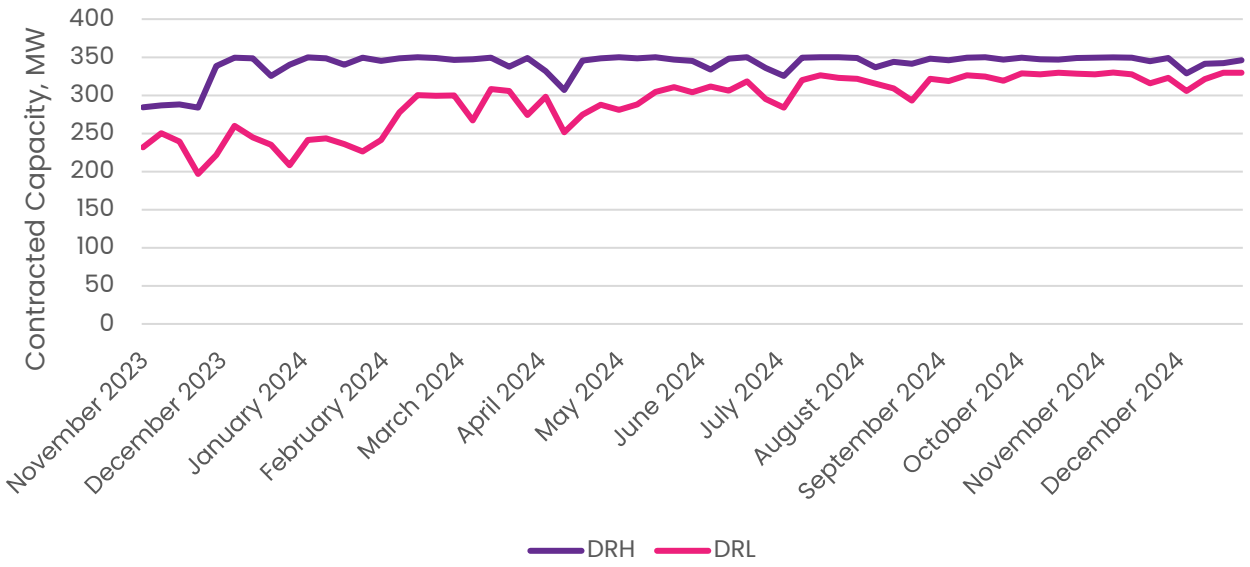
Dynamic Regulation is a pre-fault service designed to keep the frequency within the operational limits. DC, DM and DR can be stacked with the BM. The key features are:

- **Delivery range:** +/- 0.015 - 0.2 Hz with a linear range of 100% at +/- 0.2 Hz
- **Delivery range:** +/- 0.015 - 0.2Hz with a linear range of 100% at +/- 0.2Hz
- **Speed of response:** The service requires full response in under 10 seconds, with the output sustained for 60 minutes
- **Export and import:** DR is split into two services, one responding to high-frequency events and the other to low-frequency events. The high-frequency service was introduced in April 2022. Both can be provided from the same asset. There is a unit cap of 100MW per asset.
- **Performance metering:** Metering frequency for DR is 2 Hz.
- **Performance metering:** Metering frequency for DR is 2Hz.
- **Intra-day auctions:** Pay-as-clear auctions run each day for each EFA block. There are six EFA blocks throughout the day, each lasting four hours in duration. Payment is based on an availability fee (£/MW/hr).

Volumes

Volumes of DRL increased gradually throughout 2024, whilst DRH had a far more immediate jump around December 2023, before stabilising throughout 2024. Volumes of DRH and DRL reached roughly the same level towards the end of 2024 with weekly average contracted capacities of around 350MW. DRH volumes were consistently higher than those for DRL throughout 2024.

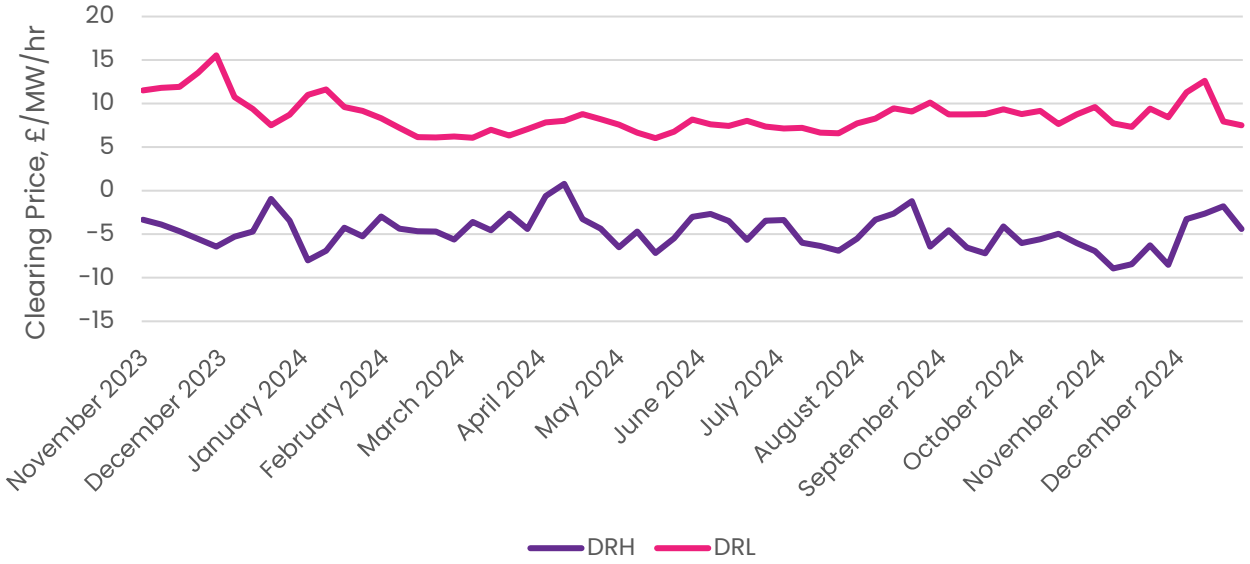
FIGURE 18 - WEEKLY AVERAGE CONTRACTED CAPACITY OF DRH AND DRL, MW



Prices

Throughout the entirety of 2024, daily average clearing prices for DRL were consistently higher than those for DRH. DRH prices have been negative for the vast majority of the time since the EAC was introduced, with a relatively stable price throughout 2024 of around -£5/MW/hr, albeit with peaks and troughs. DRL prices were the highest of all the Dynamic Response Services, consistently between £5/MW/hr and £10/MW/hr for most of the year.

FIGURE 19 - DAILY AVERAGE AUCTION CLEARING PRICE OF DRH AND DRL, £/MW/HR



Distribution System Operator Services

The total volume of flexibility services procured directly by GB Distribution Network Operators in 2024 hit a new record. Contracted volumes were proportionally similar to last year when compared to the amount tendered, which was for a record volume. DSO services are an attractive option for DSF providers located in the parts of the Distribution Network where services are available.

In 2022, the Energy Networks Association (ENA), the industry body for the electricity and gas network operators in the UK and Ireland, changed the way in which they reported on the flexibility services procured by GB Distribution Network Operators. Rather than providing figures for each calendar year, they now report according to the regulatory year running from April to March. For this reason, the figures in the charts below are for regulatory years from April to March. For the purposes of the analysis in this report, 2024 means April 2023 to March 2024.

Service Description

DSO services are procured by the six Distribution Network Operators that operate in GB. They are designed to manage particular challenges faced by the lower voltage networks and are necessarily locational – procuring services in certain areas of the grid where they are most needed. A range of different types of service come under the banner of DSO services.

- **Partially standardised services:** The Open Networks project have defined four primary service types, each with a 100kW minimum threshold. Uptake of the standard service forms is growing, but is not universal, and many competitions are for services that do not follow the standardised service definition exactly.
- **The four Open Networks service types are:**
    - **Sustain:** a scheduled constraint management service (usually requiring a 30-minute minimum duration)
    - **Secure:** a closer to real time constraint management service (usually requiring a 30-minute minimum duration)
    - **Dynamic:** a post-fault service (usually requiring a 30-minute minimum duration)
    - **Restore:** a service to help restore the network to normal operation after a fault (usually requiring a 3-hour minimum duration)
- **Location is key:** DSO services are locational, meaning only assets in a given geographic area (and therefore connected to a specific part of the network) can deliver services.
- **Differences between procedures remain:** The procurement process differs slightly between DNOs, but generally follows a process of qualification, testing and delivery, only including a competitive element in the currently rare case of an oversubscribed competition.

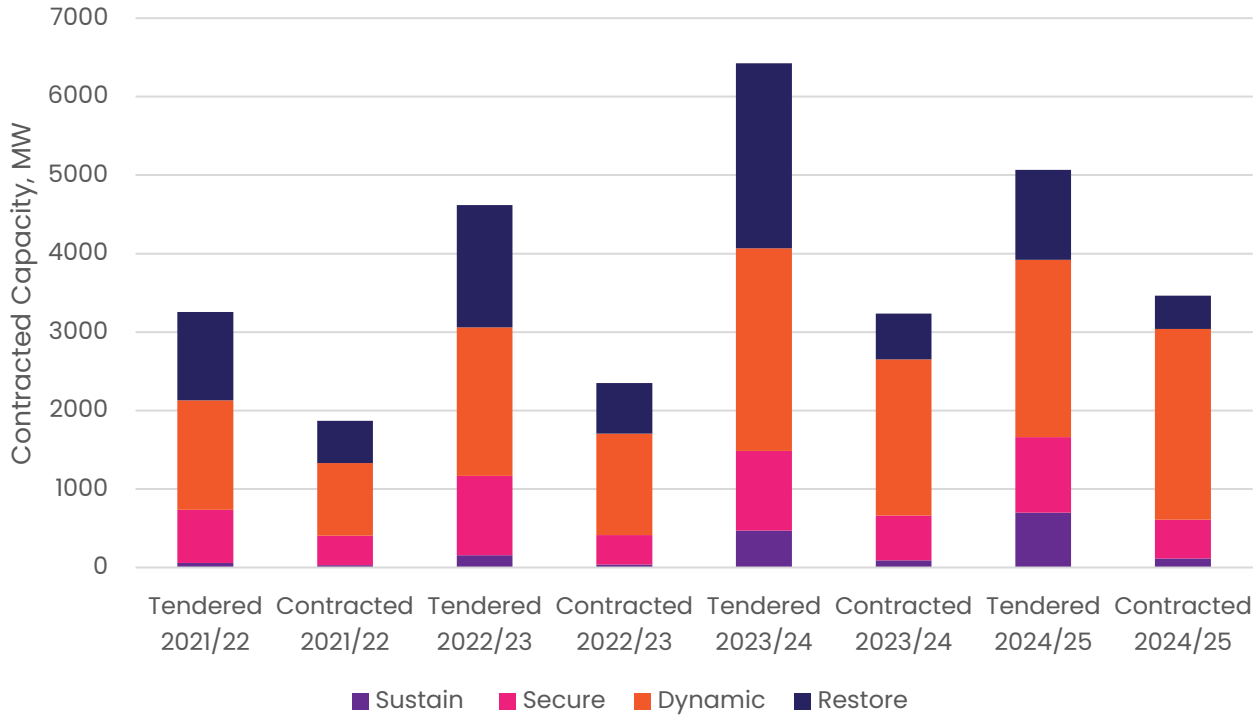
Volumes

The total volume of contracted DSO services in 2024 was 3.2 GW, significantly higher than the 2.3 GW contracted in 2023. The volume of capacity tendered increased from 4.6 GW to 6.4 GW, so proportionally the volume contracted compared to the volume tendered in 2023 and 2024 was very similar at around 50%. This highlights the fact that constraints in the service delivery of DSO services remains a significant limitation in increasing contracted delivery.

In 2024, Dynamic services (post-fault constraint management) continued to dominate the DSO market with 1190 MW of contracted capacity. 585 MW was contracted for Restore services (black-start restoration), 569 MW for Secure services (pre-fault constraint management) and 93 MW for Sustain services (scheduled constraint management).

Data for 2025 is provisional, up to June 2024 it shows that the total volume of contracted DSO services has been around 3.5GW, higher than the value contracted in 2024. Proportionally, around 70% of tendered volume has been contracted, higher than in 2024.

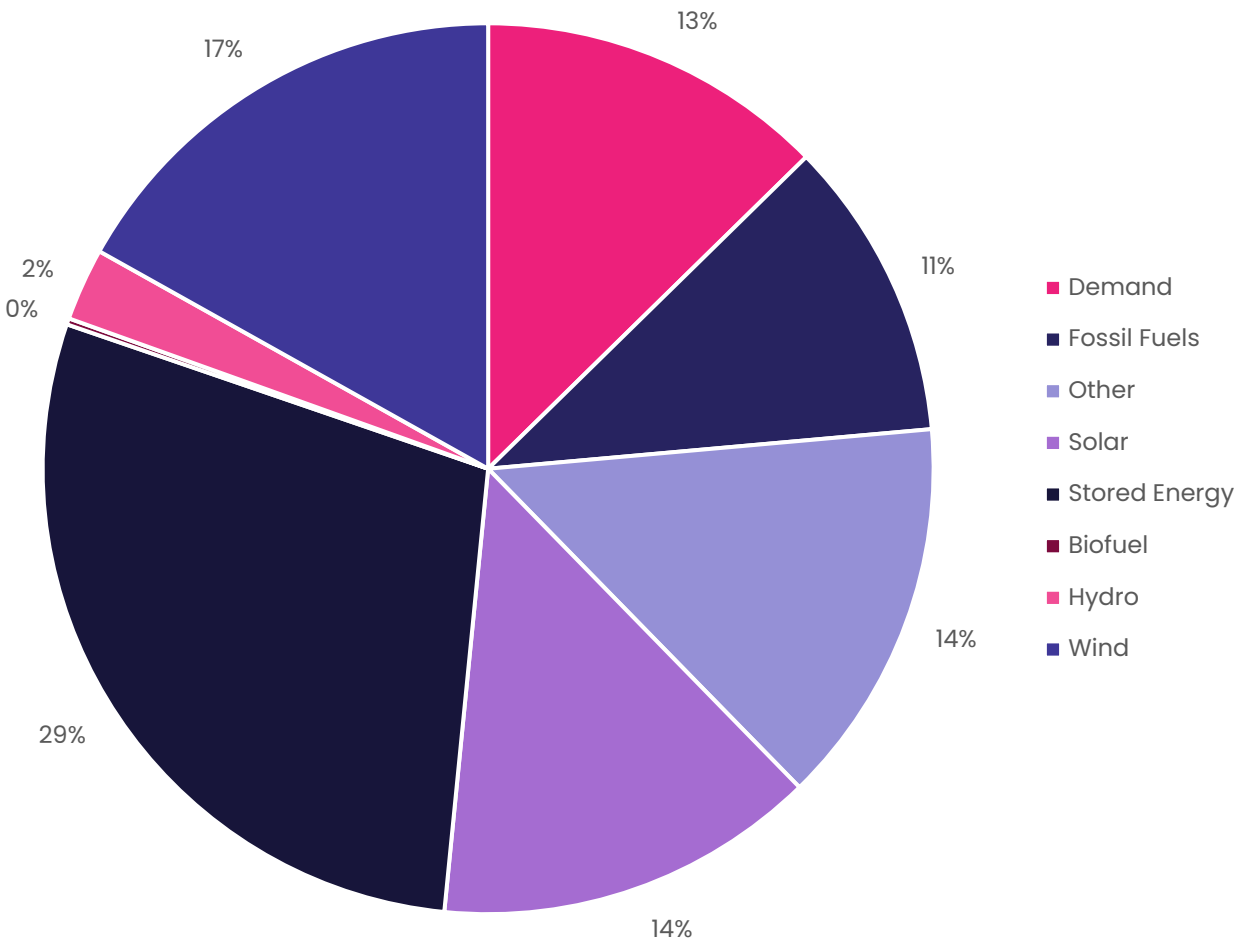
FIGURE 20 - VOLUMES OF DSO SERVICES CONTRACTED AND TENDERED BY SERVICE TYPE, 2021/22 TO 2023/24, MW



Technologies

Technology-wise, DNOs are typically agnostic when it comes to sourcing flexibility services, but there is a range of different technologies being contracted, such that different DSO services have different major technology types.

FIGURE 21 – PROPORTION OF CONTRACTED DSO SERVICES BY TECHNOLOGY TYPE 2023/24, %



5.0 Glossary

AI	Artificial Intelligence
API	Application Programming Interface
BM	Balancing Mechanism
BMU	Balancing Mechanism Unit
BR	Balancing Reserve
CCS	Carbon Capture and Storage
CCGT	Combined Cycle Gas Turbine
CHP	Combined Heat and Power
CM	Capacity Market
CP30	Clean Power 2030
DC	Dynamic Containment
DCH	Dynamic Containment High
DCL	Dynamic Containment Low
DESNZ	Department for Energy Security and Net Zero
DFS	Demand Flexibility Service
DM	Dynamic Moderation
DMH	Dynamic Moderation High
DML	Dynamic Moderation Low
DNO	Distribution Network Operator
DR	Dynamic Regulation
DRH	Dynamic Regulation High
DRL	Dynamic Regulation Low
DSF	Demand Side Flexibility
DSO	Distribution System Operator
EFA	Electricity Forward Agreement
ENA	Energy Networks Association

sFFR	Static Firm Frequency Response
GB	Great Britain
GW	Gigawatt
kW	Kilowatt
LDES	Long Duration Energy Storage
LoDES	Longer Duration Energy Storage
MPAN	Meter Point Administration Number
MW	Megawatt
NESO	National Energy System Operator
QR	Quick Reserve
RIIO	Revenue= Incentives + Innovation + Outputs
SMP	Simple Market Platform
STOR	Short Term Operating Reserve
UK	United Kingdom

6.0 Data Sources

DM/DC/DR/QR

Data from NESO Data Portal
Enduring Auction Capability (EAC) auction results

sFFR

Data from NESO Data Portal
Static Firm Frequency Response auction results

DFS

Data from NESO Data Portal
Demand Flexibility Service

STOR

Data from NESO Data Portal
Short Term Operating Reserve (STOR) Day Ahead Auction Results

BM

Data collated from monthly volumetric data (by instruction type) from Monthly Balancing Services Summary (MBSS) reports on the NESO Data Portal
MBSS Reports

BR

Data from NESO Data Portal
EAC-BR Auction Results

CM

Data collated from final result reports for T-1 and T-4 auctions by year on the NESO Data Portal
Capacity Market

DSO Services

Data from Energy Networks Association (ENA) publications.
Open Networks - 2024 Flexibility Figures

NESO
National Energy System Operator

The 2024 Power Responsive Annual Report has been written on behalf of Power Responsive by Everoze.

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