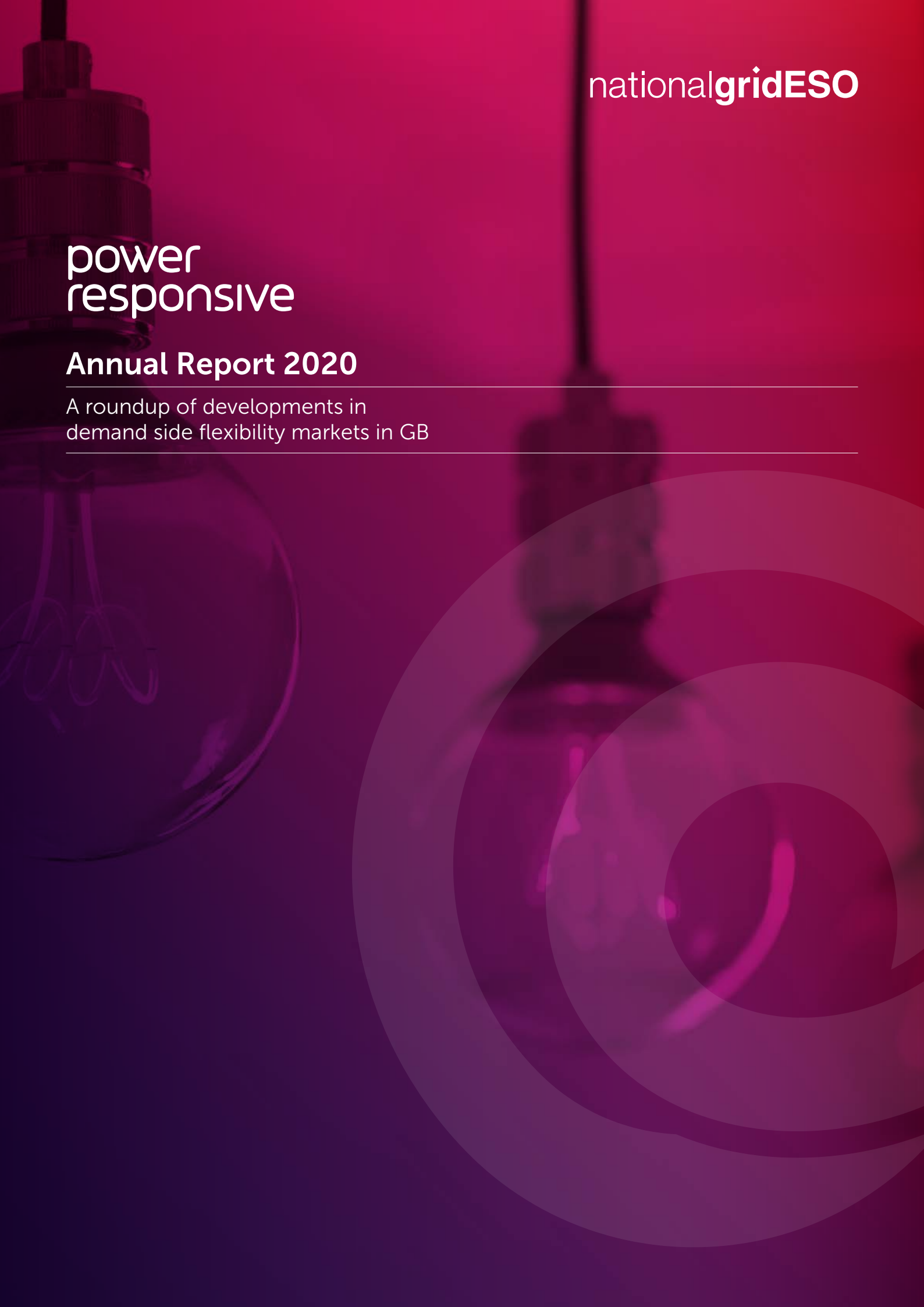

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power responsive

Annual Report 2020

A roundup of developments in demand side flexibility markets in GB

Contents

1.0 Foreword

Message from
Kayte O'Neill
Head of Markets,
National Grid Electricity System Operator

We are pleased to publish the 2020 Power Responsive Annual Report, which reflects on policy, regulatory and market developments over the past 12 months, as well as trends in demand side flexibility participation. This report is designed to help stakeholders navigate industry change and complexity and support the continued development of demand side participation in flexibility markets.

This last year was a challenging one for all of us, and the implications of the coronavirus were felt far and wide. One of the most notable impacts on the GB electricity system was the significant reduction in demand for electricity due to a decrease in energy use from commercial and industrial consumers. Demand side providers were key in enabling us to manage the system in these challenging new conditions, with over 4GW of new demand side flexibility (DSF) signing up to the ESO's temporary Optional Downward Flexibility Management (ODFM) service over the summer. This was a fantastic joint effort which was delivered in record time, and we will be taking the learning from this development forward in our other balancing service developments.

We also saw new market opportunities for DSF including widening of access to the Balancing Mechanism (BM), new balancing services (Dynamic Containment & ODFM), and pathfinder projects on voltage and inertia. Distribution Network Operators (DNOs) procured four times as many flexibility services as they did in 2019, which shows the range of new market opportunities for demand side providers.

Our experiences this year have increased the pace of change towards a low-carbon future, and we expect this to continue with policy makers laying out new ambitions throughout 2020 which clearly demonstrate the prioritization of net zero. The energy industry has a critical role to play in delivering this goal, and together we've been making significant progress. Through Power Responsive we are focusing on supporting and encouraging demand side flexibility, which provides us with a way of balancing the network and allowing energy users to reduce their carbon footprint by changing their energy consumption. Our work in this area is a collaborative effort, and I'd like to thank everyone who has engaged with and contributed to the Power Responsive programme in what has been a difficult and challenging year. I look forward to continuing this engagement as we continue to work towards delivering a cleaner, greener and affordable energy future for the UK.

2.0 Executive summary

Over 300 MW of battery storage contracts are winning contracts day-after day in Dynamic Containment auctions.

2.1 Headlines from the 2020 report

Coronavirus demonstrated the importance of flexibility in networks with high renewables

The coronavirus pandemic spread to almost every corner of the world in 2020, and the operability of the GB electricity system was not immune to its effects. The result was a power system suddenly seeking to manage a level of renewable penetration not expected until 2025: day-ahead power prices fell to record lows of minus £52/MWh and system balancing costs increased significantly. Rapid changes followed, including Balancing and Settlement Code modifications, an agreement with Sizewell B nuclear power station to reduce its output, and introduction of the new Optional Downward Flexibility Management (ODFM) service in record time. A joint effort from industry and the National Grid ESO (the ESO) was needed to maintain system security, shining a light on the value of flexibility in grids with high penetrations of renewables and offering a vision of the future GB electricity system.

Flexibility is at the core of the net-zero energy system now enshrined in government policy

The Government published a raft of new policy documents in 2020, including an ambitious new National Emissions Reduction Target, the Energy White Paper and the Ten Point Plan for a Green Industrial Revolution. Ofgem released its Decarbonisation Action Plan and finalised the RIIO-2 settlement, both with a clear focus on delivering net-zero. The ESO took significant steps towards achieving its mission of operating the electricity network carbon-free by 2025, while the Open Networks project continued to push for consistency and transparency in the DNO to DSO transition. Overall, the direction of policy is extremely positive for demand side flexibility (DSF), with flexibility essential to a net-zero energy system.

DSF technologies of all forms are beginning to realise their full potential

2020 saw significant new market opportunities including widening of access to the Balancing Mechanism (BM), new balancing services (Dynamic Containment & ODFM), and pathfinder projects on voltage and inertia. Distribution Network Operators (DNOs) procured four times as many flexibility services as they did in 2019 and the Capacity Market was reinstated.

These markets have been serviced by an increasing range of providers, with commercial success for standalone batteries, demonstration of the ability of storage and renewables to deliver reserve and a coming-of-age for domestic flexibility, including the first ever Firm Frequency Response contract secured by a domestic flexibility provider. All this is alongside continued success for longer standing providers of DSF, including industrial and commercial demand-side response and gensets.

A learning by doing approach has allowed service providers and system operators to work together to accelerate service development

Industry welcomed the more collaborative approach to service design taken in many areas in 2020 as network operators set clear requirements and then cooperated with industry to develop solutions together. This approached resulted in the smooth roll out of Dynamic Containment (DC) and ODFM along with rapid progress in the ESO's pathfinder projects. As pressures on the electricity system grow in the future, evidence from the last 12 months suggests an agile learning by doing approach is the way forward.

The energy data revolution delivers tangible system benefits

The ESO's Data Portal and Wider Access API have been essential for increasing participation in the Balancing Mechanism and ancillary service markets. At the local level, the Piclo Flex platform and ongoing data initiatives within the Open Networks project have unlocked record levels of DSF capacity for DSO service markets. With the Modernising Energy Data programme already live and a new Energy Data and Digitalisation strategy expected in spring 2021, data will continue to develop into cornerstone of our energy system and a key enabler of DSF.

2.2 Flexibility market reform brings beneficial changes for DSF assets

Firm Frequency Response

- DSF continues to deliver hundreds of MWs of FFR procured through the monthly and weekly tenders, with the total volumes remaining steady throughout the year.
- Prices of dynamic services continued to fluctuate, showing a surge in late 2020 to an average of over £10/MW/h in the monthly market. Static prices remained stable.

Dynamic Containment

- The new frequency response service launched in October with 90 MW of batteries winning contracts.
- Volumes grew to 300 MW in December, but remained below the 500 MW maximum requirement.
- Undersupply limited competition and prices were grouped around the £17/MW/hr implied price cap.
- The market requirement will increase to as high as 1400 MW in 2021.

ODFM

- Optional Downward Flexibility Management was rapidly introduced in spring 2020 to help manage the effects of coronavirus lockdowns.
- Over 100 GWh of downward flexibility was called on from assets not participating in the BM, primarily wind and solar generation.
- Utilisation prices varied widely with asset type, with wind generators receiving an average of £88/MWh to curtail their generation during periods of system stress in spring and summer.
- The service ran from May 2020 to August 2020 and will return in spring 2021.

Reserve

- Tendered routes to market for Short Term Operating Reserve (STOR) and Fast Reserve were put on hold throughout 2020.
- New day-ahead STOR tenders, compliant with the Clean Energy Package, are due to kick-off in April 2021.
- The ESO continue to work on the design of the future suite of reserve products.

The Balancing Mechanism

- The BM was worth over £1 billion in 2020, but only a small proportion of this is delivered by DSF providers.
- Rule changes came into effect allowing new participants to enter the market, including the DSF providers Flexitricity, Habitat Energy and Tesla.
- BM providers operating batteries and other flexible technologies in the BM have questioned whether their assets are being overlooked in favour of traditional generation. The ESO is working to increase the transparency of its actions in the BM to make clear why certain assets are dispatched over others.

DSO services

- A record 1 GW of contracts were signed by the six DNOs, up from just over 250 MW in 2019.
- Low barriers to entry have allowed a significant proportion of these contracts to be secured by novel forms of DSF, including aggregated domestic portfolios.
- The Open Networks project has continued to help accelerate and standardise service development across the country, with some DNOs making quicker progress than others.

The Capacity Market

- Capacity Market auctions resumed in early 2020 after the resolution of a legal challenge.
- Market rule changes have been pushed through to the benefit of DSR assets, reducing the threshold of participation to 1 MW and allowing DSR to bid for 15-year contracts.
- Significant de-rating of most forms of DSF and low clearing prices means revenues from the CM are limited.

2.3 A positive outlook for DSF

Industry anticipates the full impact of network charging reforms

- The Targeted Charging Review hit the DSF industry but the Access and Forward Looking Charges review may bring positive changes.
- Ofgem's minded to position is expected in 2021.

Major Government consultations are expected that seek to turn net zero policy commitments into reality

- Notable upcoming consultations and publications affecting the DSF sector include the Smart Systems and Flexibility Plan, Transport Decarbonisation Plan, Retail Energy Regulation, Heat and Buildings Strategy and the Future Homes Standard.

Balancing service reform continues

- Since early 2021 battery assets providing Dynamic Containment are able to simultaneously participate in the Balancing Mechanism.
- Two new frequency response services Dynamic Regulation and Dynamic Moderation are due to be launched within the next 12 months.
- Reform to reserve services will continue to progress, with announcements on the detailed design of the new suite of day-ahead products expected in 2021 before implementation in early 2022.

Greater focus on the carbon impact of flexibility markets

- As the penetration of renewables grows, the interest in the carbon intensity of flexibility services that support electricity supply is growing.
- A workshop held by BEIS and Ofgem in late 2020 kicked-off a discussion of carbon signals in which in time may lead to more direct measures to reduce the carbon impacts of flexibility markets.

A global leader in energy flexibility

- The UK's DSF sector is world-leading, pioneering the provision of many new services and technologies.
- Innovation projects continue to push the cutting-edge of flexibility even further.
- The COP26 conference in Glasgow offers huge potential for the UK to demonstrate the power of DSF in enabling a net-zero energy system.

3.0 About Power Responsive

Power Responsive uses the term demand side flexibility (DSF) to describe five categories of flexible energy technologies:

1

Demand side response (DSR) by flexible load shifting (e.g. heating/cooling systems, business operations and appliances).

2

DSR by onsite, behind-the-meter generation

3

DSR by onsite, behind-the-meter energy storage

4

Distributed generation for grid export

5

Distributed storage for grid export

3.1 The programme

Power Responsive is a stakeholder-led programme, facilitated by National Grid ESO, to stimulate increased participation in the different forms of flexible technology such as DSR, small scale generation and energy storage. Power Responsive class these technologies as demand side flexibility (DSF).

The programme brings the DSF industry and energy users together to work in a co-ordinated way. A key priority is to grow participation in DSF, by making it easier for industrial and commercial businesses to get involved and realise the financial and carbon-cutting benefits of participating in the energy flexibility industry.

The role of Power Responsive is to:

- Raise awareness of DSR and engage effectively with businesses.
- Shape the growth of the market in a joined-up way and ensure demand has equal opportunity with the supply side when it comes to balancing the system.

Power Responsive is overseen by a high-level steering group, composed of representatives from government, the regulator, system operators, and various industry players.

3.2 Work during 2020 and the impact of Covid-19

Since its creation in 2015, the role of Power Responsive has been to encourage collaboration, raise awareness, and deliver a concerted programme to further the success of DSF in all its forms. Power Responsive responded to the challenges of 2020 by launching the Summer Insight series; a two-week programme of podcasts taking the place of the annual Summer Reception.

3.3 The 2020 Power Responsive Annual Report

This report is the fifth annual report of the Power Responsive programme. It has two core aims:

1. **To provide an accessible summary of the key markets for potential new providers of DSF, and;**
2. **To function as a reference document for those already active in the distributed flexibility market.**

The content of this report has evolved from previous versions, with greater focus on the full range of flexibility markets and insights from industry players. It covers:

- A review of the DSF industry in 2020, covering major policy, regulatory and market developments.
- Key details on DSF markets, including service requirements and metrics showing trends in prices, volumes and technology breakdowns
- The outlook for flexibility markets and their participants.

3.4 Power Responsive strategic goals

Power Responsive's strategic goals for 2021 are to:

- Inform the development of inclusive markets for flexibility, which through competition can deliver economic efficiency, carbon reduction and innovation.
- Promote fair and equitable flexibility market participation, focusing primarily on markets facilitated by the ESO.
- Allow customers and DSF provider perspectives to be heard by policymakers and market actors, and to feed these perspectives into the development of flexibility markets, policy and regulation.
- Identify and champion the removal of barriers to flexibility.
- Support the progression of BEIS and Ofgem's Smart Systems and Flexibility Plan.
- Support the delivery of the ESO's ambitions to deliver a sustainable whole energy future, and achieve zero-carbon operability by 2025.


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4.0 Year in review

2020 has been a big year in the DSF world. Major policy announcements, new ancillary services, and a worldwide pandemic have all made their mark. This review of 2020 covers the impact of the coronavirus pandemic; describes policy, regulatory and market developments; and includes a focused section summarising the year from the perspective of four different types of DSF provider. The focus is on the perspective of DSF industry stakeholders throughout.

4.1 The impact of the pandemic

The electricity sector was significantly impacted by COVID-19. The first lockdown led to shifts in consumer behaviour and reduced demand by as much as 20%.

Like the rest of the country, the electricity sector was significantly impacted by COVID-19. The first lockdown in spring led to significant shifts in consumer behaviours and reduced demand by as much as 20%.

These changes occurred alongside periods of high renewable output. The result was record negative power prices of less than minus £50/MWh; system balancing costs increasing by 39%; and renewable penetration reaching levels not expected until 2025. This led to a number of rapid changes: Ofgem introduced code modifications to cap BSUoS charges, the ESO reached agreement with Sizewell B nuclear power station to reduce its output, and the new Optional Downward Flexibility Management (ODFM) service was introduced in record time, allowing distributed generators including substantial quantities of wind to contribute to system balancing.

Maintaining system security through this unexpected and challenged period would not have been possible without the collaboration of industry and the ESO. It also gave a preview of the challenges that the electricity system may be facing in the near future as renewable penetration grows and demand becomes more volatile. The evidence of 2020 shows that flexibility will be an essential tool for solving these challenges.

4.2 Policy, regulatory and market developments

Government

2020 saw the government unveil its policy direction with clear focus on the delivery of net-zero.

An ambitious new national emissions reduction target was set to cut carbon emissions to 68% of 1990 levels by 2030, up from 53% previously. The CCC also published advice for the sixth carbon budget, proposing a 78% reduction in emissions by 2035, again compared to 1990 levels.

In terms of energy, major policy publications detailed the government's approach to delivering a net-zero energy system. Most notable were the new Energy White Paper, The Ten Point Plan for a Green Industrial Revolution and the National Infrastructure Strategy. Many announcements from these papers are important for DSF industry, including an increased commitment to renewables, acceleration in the electrification of transport, significant increase in heat pump installation, focus on open data, £1 billion public sector decarbonisation scheme, energy market reform, and a review of governance arrangements (including the ESOs long term role and structure).

The year closed with the Treasury's Net Zero Review publishing an initial analysis of the green transition, and the finalisation of the Brexit Trade Agreement, which set out details on trading, interconnectors and a new UK emissions trading scheme to replace the equivalent EU scheme that would no longer apply in the UK.

The Government also announced details on the CfD Allocation Round 4, reintroducing solar and wind into the process and strengthening the negative pricing rule.

Impact on DSF

Despite receiving few explicit mentions in the Energy White Paper, the overall policy direction for DSF is undoubtedly positive. Furthering the electrification of transport and heat and integrating renewable generation into an increasingly green, decentralised and digital electricity grid is a core government aim. Achieving this will be impossible without a substantial increase in the capacity of DSF in GB.

Ofgem publishes its 9-point decarbonisation action plan outlining how regulation of the energy system will evolve.

Ofgem

In February Ofgem published its decarbonisation action plan outlining how regulation of the energy system will evolve to support delivery of net-zero. The 9-point plan builds on the Smart Systems and Flexibility Plan and makes clear that the regulator will be prioritising ensuring a level playing field for flexibility, enabling EVs and facilitating development of low carbon heat. Ofgem will also launch a new strategic innovation fund dedicated to decarbonisation.

Implementation of the Targeted Charging Review decision continued in 2020, with Ofgem consenting to a 12 month delay in implementing the changes to the Transmission Demand Residual charge. This means that it will not be until April 2021 that the generator transmission residual will be removed and suppliers will be charged balancing service use of system (BSUoS) charges on gross demand. In April 2022, changes affecting distribution connected assets will go live. These reforms represent a significant change to the charging regime on distribution networks: residual charges will be fixed for demand customers, with customers allocated into four bands based on site capacity and voltage connection. Licensed storage assets will be exempt from these residual demand charges.

Ofgem's work on the Significant Code Review on Access and Forward Looking Charges went out to consultation on shortlisted policy options in March. Ofgem continue to review responses and are expected to publish a minded to position in 2021.

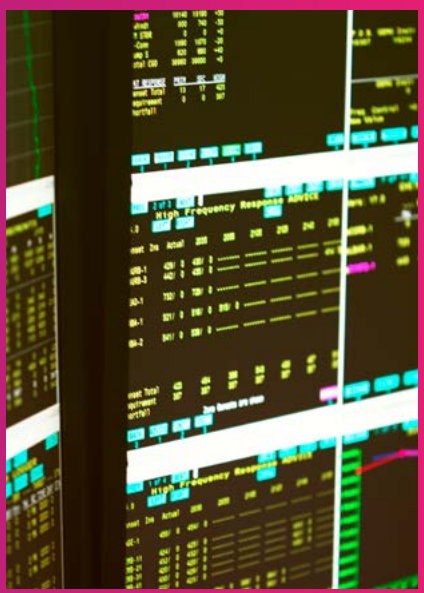
Ofgem issued a consultation on a minded-to-position allowing DNOs to provide Customer Load Active System Service or CLASS services to the ESO on a neutral basis. This was considered controversial by industry, given the role that DNOs play in procuring flexible services on their network. The consultation closed in March 2020.

Another major event in 2020 was the release of the RIIO-2 framework decision. This included price controls for ESO for the first time and gave go-ahead for network companies to invest up to £30 billion with a focus on supporting net zero. The settlement also provided a minimum of £450 million under the Strategic Innovation Allowance and £209 million under the Network Innovation Allowance. The returns network operators earn on their investments was a key point of discussion and may be subject to appeal by the operators. A new feature in RIIO-2 are 'reopeners' giving Ofgem more flexibility to change price controls in response to changes in policy, new technologies and uptake rates.

Impact on DSF

Ofgem have clearly recognised the importance of flexibility in the energy system and are taking positive steps to ensure DSF is allowed the same opportunities as other technologies. However, despite the general positive direction of travel for DSF, there are still some changes occurring that seem counterproductive.

The RIIO-2 framework puts significant focus on the delivery of a net-zero energy system, in the shorter term, the Targeted Charging Review decision, when it finally takes effect, will render much of the commercial benefit available to DSF through peak charge avoidance obsolete. But the industry will have to wait for the outcome of the Access and Forward Looking Charges review to know the net impact of current charging reviews.



The Electricity System Operator

The ESO published their annual Forward Plan in March detailing their mission to be able to operate the electricity system carbon free in 2025; provide a whole system support to net zero by 2050; and to facilitate 'competition everywhere'. The Future Plan is built on the RIIO2 business plan submission and foresighting work including the Future Energy Scenarios, Electricity Ten Year Statement and Network Options Assessment process. The Operability Strategy Report converted this analysis into near term requirements for voltage, frequency, restoration, stability and thermal, while the pathfinder projects trialled new ways of meeting system needs. The ESO also produced a Wider Strategy for Flexibility from Intermittent Generation and consulted on an early competition plan for onshore transmission delivery in advance of submission of recommendations to Ofgem in April 2021.

There were major changes across ESO's balancing services. The detail of this is covered in the market metrics section of this report, with the headline messages summarised here:

- Frequency response: Weekly FFR auctions and the new Dynamic Containment service were introduced, complementing existing monthly FFR tenders
- Reserve: Tendered routes-to-market for Short Term Operating Reserve (STOR) and Fast Reserve were put on hold from January as the ESO and Ofgem worked through the implications of the new Clean Energy Package. The ESO later confirmed that Fast Reserve would not be procured again in the future.
- ODFM: a new negative-reserve service designed specifically for distributed assets was launched in record time to help manage pressures on the electricity system brought about by the coronavirus pandemic.
- The Balancing Mechanism: Easier access for DSF participants and rollout of improved tools (such as increasing dispatch capability for smaller BMUs) helped open up the Balancing Mechanism to DSF providers.
- Pathfinder projects: The ESO launched various pathfinder projects covering stability, voltage support & constraint management. These projects explore new, low-cost and low-carbon methods for managing operational issues on the transmission network.
- Black Start: The ESO announced results from the first competitive tenders for 5-year Black Start contracts in the South West & Midlands region. Results for the North West, North East and Scotland zones will be announced in Q1 2021. In the meantime, the three-year Distributed ReStart innovation project (looking at provision of Black Start from distributed assets) has continued, with results expected in 2022.

Impact on DSF

The ESO's commitment to be able to operate the network carbon free by 2025 is helping to drive favourable reforms for DSF across the whole suite of balancing services. Perhaps most significant is the easing of access to the BM that provides access to a deep and potentially high-reward market.

"2020 was a year of change for DSF markets. On one hand, STOR was put on hold, Fast Reserve cancelled, and volumes of static frequency response fell, while on the other new services DC and ODFM were launched, both with great success. Lockdown conditions underlined just how essential DSF is for system stability and looking to the future I expect the evolution of markets to reflect this, creating further opportunities for all forms of DSF assets."

Emma Burns, Senior Consultant, Cornwall Insight

DNOs and the Open Networks Project

2020 saw a significant increase in DSO services with 1.2 GW of flexibility contracts awarded by DNOs and over 2 GW of contracts put out to tender, compared to around 250 MW contracted in 2019.

The ENA's Open Networks project helped drive this growth and delivered the DSO implementation plan in January. The Flexibility workstream saw significant activity, including publication of a common evaluation methodology for DNOs to assess flexible vs non-flexible options; publication of the first ever common contract for procurement of flexibility services (with the updated version 2 expected to be published soon); and ongoing work on aligning procurement processes. In addition, the project has continued to work to standardise and push forward the DSO services markets, seeking to standardise active power service parameters, clarify interaction between flexible connections and services, and deliver a common baselining methodology.

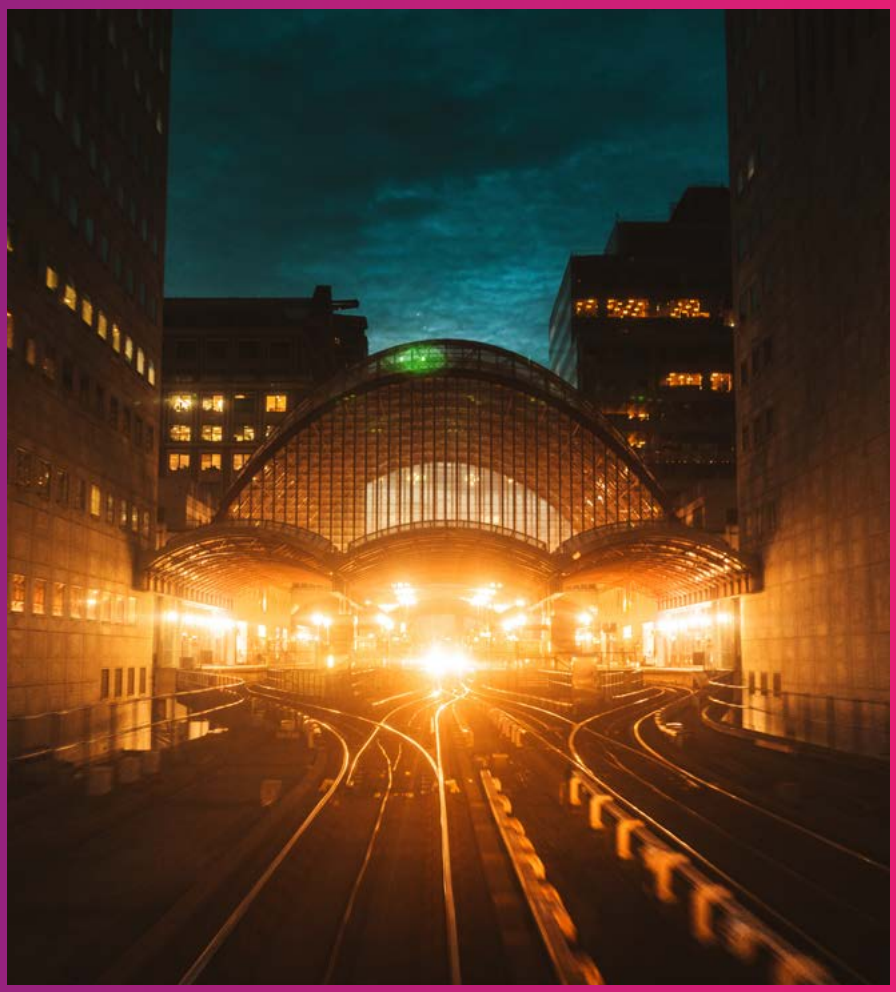
Data transparency has been another key theme. The Piclo Flex platform has advertised flexibility tenders from five of the six DNOs, and four DNOs collaborated on the Flexible Power website to signpost and manage flexibility requirements. All DNOs published a standardised register for distributed energy resources of sites larger than 1 MW (including generation assets, storage assets and demand sites providing DSR) while WPD published the first batch of standardised electricity distribution network data using the Common Information Model.

Community energy

The community energy sector had a mixed year, struggling with the loss of the feed-in-tariff and hike in the VAT rate for energy saving measures and lack of focus on community energy within the White Paper and Ten Point Plan. A Local Electricity Bill seeking to allow consumers to purchase energy from local groups was successfully introduced into parliament, with 150 MPs supporting it, but is unlikely to be debated or passed into law.

Impact on DSF

DSO services have become an increasingly important revenue stream, particularly for domestic flexibility providers. Unlike most ESO services, DSO services are targeted at specific geographic locations, with only those assets in the right locations able to access competitions. The Open Networks project is helping push for consistency and standardisation across the DNOs, making it easier for DSF providers to extract value from the market, but more work is needed before the DNOs can maximise the potential of the DSF assets on their networks.



4.3 2020 developments: a technology perspective

Distributed and behind-the-meter storage

Lithium-ion batteries continued to see significant commercial growth in 2020, with increased volumes participating in ancillary services, further cost reductions and a general maturation of the technology. This has been supported by an improving regulatory landscape, with Ofgem approving a new 'electricity storage' definition within electricity generation licences and a code modification that means storage assets will no longer pay BSUoS charges on power they import. Battery storage has also been taken out of the Nationally Significant Infrastructure Projects (NSIP) planning regime in England and Wales, removing a major barrier to the development of 50 MW plus battery projects (and 350 MW plus projects in Wales).

The year saw a range of new business models emerge involving battery storage. Highlights include Zenobe Energy winning long term reactive power contract in Mersey and completing full service electrification (including onsite battery) of bus garages in London and Birmingham; GridServe opening the world's first electric vehicle forecourt with 24 rapid chargers, rooftop PV and an onsite battery; and aggregators such as Centrica offering revenue floor prices to storage projects.

Although earlier in the innovation cycle, long duration storage also made the news in 2020 with construction beginning on Highview's 50 MW, 250 MWh liquid air storage facility in Manchester (supported by £10 million grant from BEIS). The Energy White Paper also announced a major competition to commercialise first-of-a-kind longer-duration energy storage and a commitment to 5 GW of hydrogen production capacity by 2030.

Distributed generation

The Energy White Paper capped a year of strengthening support for large-scale renewables by announcing an increased commitment to 40GW of operational offshore wind by 2030 (including 1GW of floating wind), the reintroduction of solar and wind to the CfD support mechanism, and a call for evidence on future renewables support schemes. There was also increasing focus on co-location and alternative offtake arrangements, including growth in corporate PPA agreements.
At the smaller scale things were more challenging, with the feed-in-tariff finally being removed in April 2020 and a VAT rate for energy saving measures (including domestic solar panels and battery storage systems) increasing from 5% to 20%. A notable trend was in distributed renewables providing flexibility and helping manage the grid – this includes vast majority of ODFM participation and provision of reactive power in the Power Potential trial. Gas gensets capitalised from tight system margins leading to high electricity prices in Q4 2020.

Industrial and commercial scale DSR

DSR providers benefitted from the introduction of the Dynamic Containment and ODFM services along with improved access to the BM. In parallel, technical improvements to control hardware has made onboarding companies quicker and easier, with smaller companies now being targeted as potential sources of flexibility. This has driven increasing scale in aggregator portfolios. Providers whose business model was based on peak charge avoidance are readjusting to the significant reduction in peak charge elements within the Targeted Charging Review and are waiting for the results of the Access and Forward Looking Charges review.

Domestic flexibility

2020 could be said to be the year that domestic flexibility came of age. There was significant participation from domestic assets in DSO Services, driven primarily by technical improvements, greater data availability and service entry requirements designed with domestic DSR in mind. The Energy White Paper commitments on electrified transportation and heat look set to significantly increase the potential flexibility in the home in the future.

Domestic flexibility highlights from the last 12 months include Social Energy securing the first ever FFR contract for a domestic portfolio; the rise in flexible energy tariffs including Good Energy's heat pump-specific tariff and Shell Energy's solar-storage domestic supply offer; and technology company Kaluza installing and managing 320 vehicle-to-grid EV chargers in the largest project of its kind in the world.

"2020 has seen huge advances in domestic flexibility technologies and the development of business models to maximise their potential. DNOs and the ESO have taken important steps towards wider access to ancillary markets for domestic flexibility. In the future, closing the knowledge gap between in-home equipment manufacturers and network operators, particularly through innovation projects and trials, will be key in leveraging domestic flexibility. This work will help both to ready the networks for future demand and to ready the domestic flexibility sector to capitalise on the opportunities that come with it."

Valts Grintals, Senior Flexibility Analyst, Kaluza

5.0 Market metrics

DSF technologies participate in a wide range of flexibility markets. This section reviews price and volume trends in key flexibility markets, including Dynamic Containment, Firm Frequency Response, Optional Downward Flexibility Management, DSO services, the Capacity Market, and the Balancing Mechanism.

5.1 Dynamic Containment

The ESO's new Dynamic Containment service was introduced in October 2020 as the first of the new suite of frequency response products. The service had attracted over 300 MW of battery projects by December 2020, all securing competitive prices through the daily pay-as-bid auctions.

Undersupply presents a significant opportunity for new market entrants

Dynamic Containment (DC) has only been running for a matter of months, and the 500 MW market requirement in place from the first auction round was not reached in 2020. Although more assets are entering the market each week, it may still be some time before projects start to compete on price given the announcement that the market cap will rise to over 1 GW during 2021.

Good returns on offer for assets who make the qualification cut

Undersupply means that prices remain high for assets qualified to deliver the service. DC offers a significant uplift in payments compared to current rates in the FFR market, but the fast response speeds and need for high quality monitoring equipment means that not all flexibility assets can qualify without hardware upgrades.

Rollout has been collaborative, smooth and efficient

The industry has valued the collaborative 'soft-launch' approach taken with the rollout of Dynamic Containment. Consultation and transparent communication allowed service providers to come on the journey of service development with the ESO, and helped to avoid teething issues come launch. The service has been an operational success, providing high-value rapid frequency response from day one.

Service description

Technical and procurement details of the service are described in greater detail in appendix A. The headlines for Dynamic Containment are:

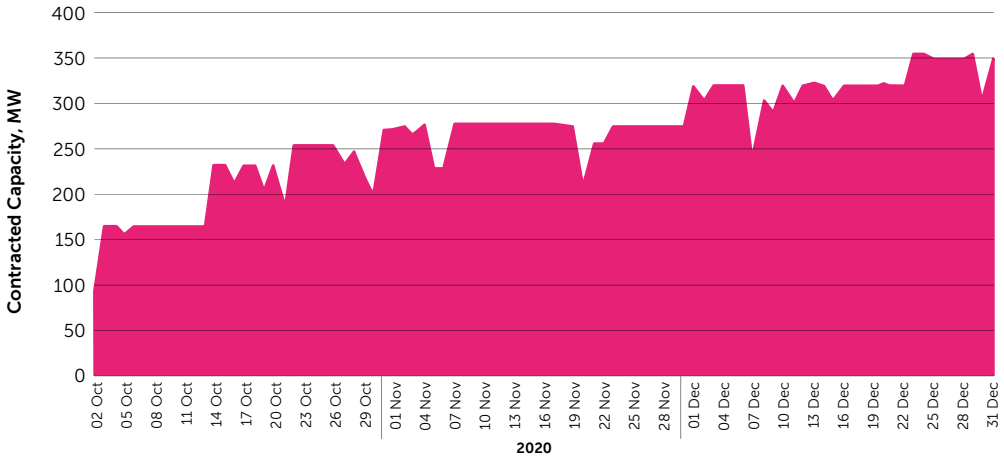
- **Rapid frequency containment:** DC is rapid response service designed to protect the system from large deviations from the nominal frequency of 50 Hz.
- **Quick speed of response:** The service requires full response in under 1 second, with output sustained for 15 mins.
- **Export only:** At present DC is called on only for low-frequency events (when there is less generation than demand). In 2021 negative response will also be required for high frequency events.
- **High-resolution metering:** The service requires 20 Hz high-resolution metering capability.
- **Day-ahead auctions:** DC is procured day-ahead and paid based on an availability fee (£/MW/hr).
- **Well defined market requirement:** The ESO place a market cap on the daily auctions, which during 2020 was fixed at 500 MW but will rise to over 1 GW during 2021.

Contracted volumes and service providers

Contracted volumes have grown steadily from the 90MW secured when the service was launched in October, to over 300MW in December (shown in chart 1). However, volumes have remained below the 500 MW market requirement. This can be attributed to the high technical bar required to qualify for the service, along with the time needed for the industry to respond to this new service opportunity, for example by upgrading monitoring systems and building new flexible capacity.

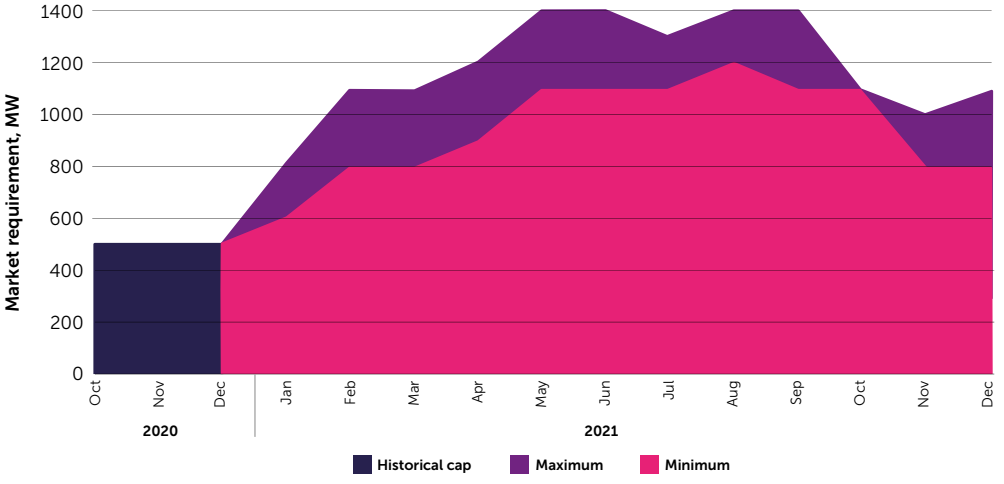
The market is technology-neutral, but to date only battery storage projects have been able to meeting the full suite of service requirements. Other flexibility technologies will have to demonstrate that they can meet the technical requirements, including the rapid response speed, that make DC such a high-value service for the system operator.

Chart 1: DC volumes have grown steadily in 2020
Contracted capacity of low frequency Dynamic Containment since launch, MW



The market requirement will increase in 2021 with the ESO forecasting a need of up to 1,400 MW during some months of summer 2021 (as illustrated in chart 2). This requirement is over and above existing capacity requirements in other frequency response markets.

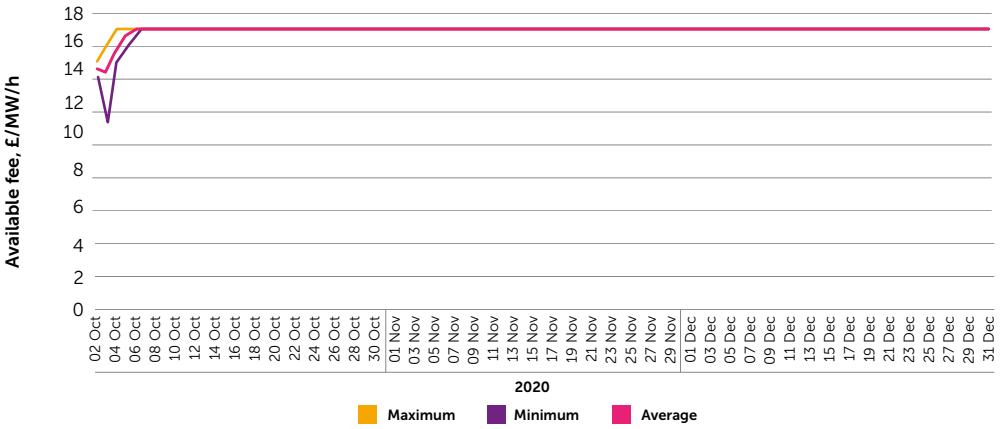
Chart 2: The market requirement will increase in 2021
Forecast requirements for Dynamic Containment, MW



Service prices

Since the second week of active procurement, prices settled at a consistent and high rate, compared to other frequency response services (shown in chart 3). This is due to the absence of competitive pressure in the market while the capacity entering each auction remains below the market need. A small number of early bids were rejected on economic grounds – signalling they breached the implicit market price cap – making clear to the market that bids above £17/MW/h were likely to be unsuccessful and setting an upper limit on prices. The prices compare favourably to those available in FFR markets, offering battery projects a good return on investment.

Chart 3: Prices quickly stabilised near the market cap, and stayed there
Availability prices of successful Dynamic Containment bids, £/MW/h



Learning by doing approach ensures a smooth rollout

The ESO took a fresh approach to service launch with Dynamic Containment. Instead of waiting for every detail of the technical and procurement design to be perfected, DC 'soft-launched' with a simplified, smaller market, which was to pick up learnings and improvements along the way.

This was made possible by a commitment to regular communication with industry and gradual improvement of the service as issues were uncovered. This learning-by-doing approach has been roundly praised as offering a quicker and more efficient way of developing services.

The Dynamic Contaminant EGBL consultation summarises industry feedback from the first few months of service procurement and describes the ESO's proposed changes in response. Notable upcoming changes made in direct response to feedback from DC providers include:

- Aligning timeframes of penalties: Performance penalties will soon apply only to the day in which poor performance occurs, rather than the whole week, aligning the penalty structure to the contract length.
- Resetting low power testing tolerances: The original design of pre-qualification tests was causing problems for providers at low response levels, where tolerances were extremely small due to a mistake in the test document wording. This will now be changed, putting tolerances back to sensible levels.
- Tendering flexibility: The ESO will adjust tendering rules to allow service providers to change the capacity of their bids on a daily basis. This comes after comments that the unavailability of a single unit at a site would force the provider to withdraw their full capacity from the auction.

5.2 Firm Frequency Response

The longstanding FFR market has continued to evolve and remained a valuable market for DSF technologies. Most months saw well over 1 GW of flexible capacity contracted for dynamic services across the two routes to market.

Weekly auction trial proved near-time procurement of frequency response can work

The two-year FFR auction trial still has several months left to run but has already been judged a success by the industry. The weekly tender showed that near-real time was not only possible, but worked well, and helped give both the ESO and service providers confidence for the launch of day-ahead Dynamic Containment in late 2020.

Prices of dynamic services have refused to settle

Dynamic FFR prices continued to fluctuate throughout the year. High rates seen toward the end of 2019 did not last, but average availability fees have surged in towards the end of 2020, again breaking through £10/MW/h in the monthly market.

Procured volumes remained high over the year

The volume of FFR procured in the monthly market remained high throughout 2020, setting a new record of over 1.6 GW in July. Yet this trend may not last long. The introduction of two new frequency response services to compliment Dynamic Containment will gradually replace the FFR market.

Service description

Technical and procurement details of the service are described in greater detail in appendix A. The headlines for Firm Frequency Response are:

- **Quick response, short duration:** FFR is frequency response service that requires a quick response (between 10 and 30 seconds) and short duration (20 seconds to 30 minutes).
- **In-build optionality:** Several different forms of FFR exist, each with different technical requirements. For monthly FFR tenders these include static and dynamic services. For weekly FFR tenders the two options are low frequency static (LFS) and dynamic low high (DLH). Static services provide a fixed response to a defined frequency deviation while dynamic delivers a response proportional to the system frequency deviation.
- **Monthly tenders:** The monthly tenders award contracts based on price and alignment to ESO requirements. Successful providers are paid on an availability basis.
- **Weekly auction:** The FFR auction trial procures capacity for the week ahead through a pay-as-clear auction against the ESO's requirements. The availability-based clearing price can vary with each 4-hour EFA block.

Monthly FFR market volumes, prices and service providers

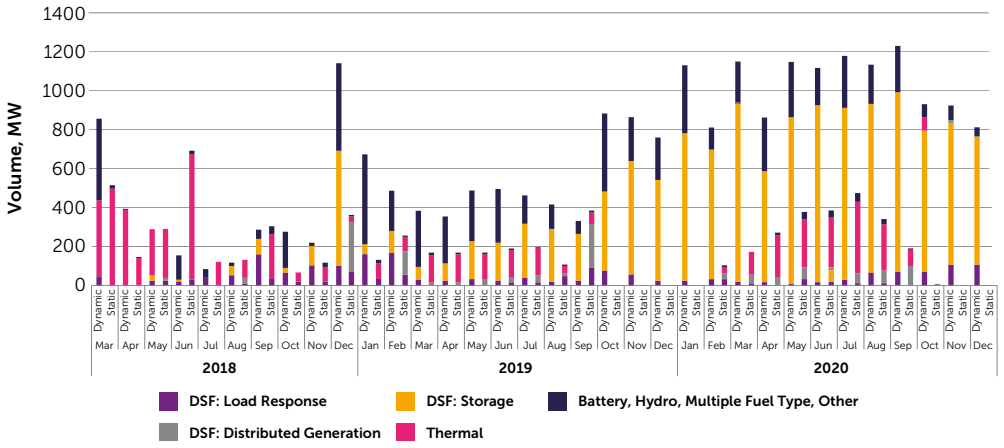
Volumes

Monthly FFR volumes have generally increased in 2020, even with the introduction of the weekly auction and Dynamic Containment service. Volumes contracted through the summer months of 2020 reached 1600 MW across dynamic and static services (shown in chart 4).

The fall in dynamic contracts awarded from October through to the end of 2020 was due to the seasonal trend in frequency response requirements and not a direct consequence of the introduction of Dynamic Containment. The roll-out of the other new frequency response services Dynamic Moderation and Dynamic Regulation will lead to a reduction in FFR requirements.

There was no system requirement for static FFR in January 2020, as was also the case for the three last months of 2019. An increased need in the spring and summer was met through up to 479 MW of contracts in July, before the system requirement fell away again significantly towards the autumn, and reduced to zero in November and December.

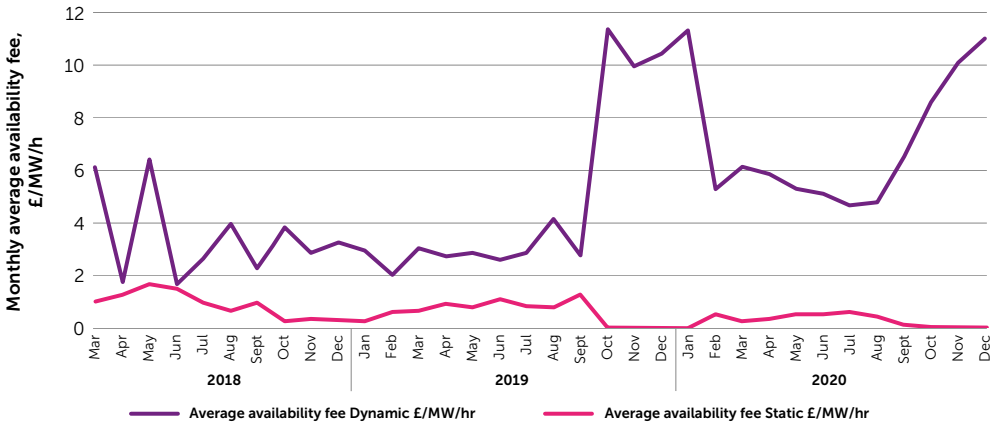
Chart 4: DSF assets secured record FFR contracts in the monthly tenders of summer 2020 Dynamic and static FFR contracts secured in the monthly market by technology, MW



Prices

Pricing in the dynamic monthly market during 2020 shows significantly higher average availability fees (£10-12/MW/hr) in autumn and winter compared to the summer months (illustrated in chart 5), particularly following the introduction of DC in October. Pricing in static FFR; however, remained low over the course of the year, with average monthly availability fees staying under the £1/MW/h barrier in 2020.

Chart 5: Dynamic prices rose year-on-year, with higher prices in winter Average dynamic and static FFR availability fees for accepted tenders, £/MW/h



Weekly FFR market volumes and prices

Volumes

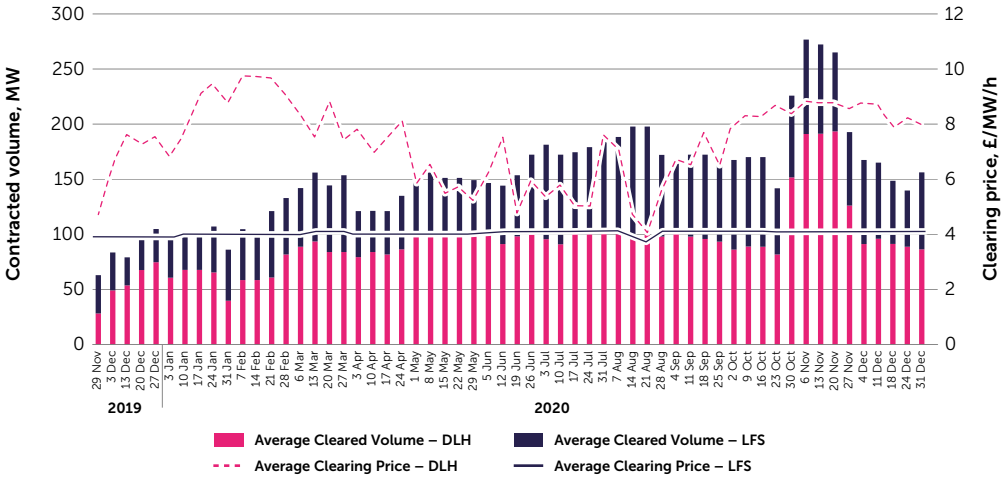
The trial of weekly close-to-real-time FFR procurement began in 2019, with a 100MW cap for both the dynamic (DLH) and static (LFS) services. Volumes of dynamic services have consistently been restricted by the cap (shown in chart 6), while the static market has not seen the same steady high levels of procurement.

The trial has also shown the value to the ESO of having multiple procurement routes through which to source their system balancing requirements. High prices in the November FFR tender led the ESO to source their FFR requirement in the weekly auction instead, relaxing the volume cap. This led to 300 MW of the DLH product being awarded contracts at prices significantly lower than otherwise would have been accepted in the monthly market.

Prices

Weekly DLH FFR prices have roughly tracked dynamic service prices from the monthly market, with higher rates in autumn and winter, ranging from just under £10/ MWh in the first two months of the year to around £6/MW/h in the summer (shown in chart 6). However, this trend is less pronounced than the monthly market. Prices for the LFS product have been consistent at £4/MW/h for the trial's duration, with the only deviation a minor drop in the average price for a single week in late August.

Chart 6: Growing volumes and steady prices in the FFR weekly auction trial
FFR weekly auction average contracted volume and clearing per week, MW and £/MW/h



Auction trial evaluation report

The ESO commissioned an independent evaluation of the FFR weekly auction part-way through its two-year term, which was published in July. The evaluation report touched on all areas of the trial, including auction design, participation, results, the EPEX SPOT procurement platform and the plans for the remainder of the trial's term. Its conclusions were positive, highlighting the success of the automated auction process along with the engagement of participants and their positive feedback. Nonetheless, the report made several recommendations for improvement, including:

- The removal of the 20 MW unit cap (delivered by the ESO in September)
- A review of the 100 MW per product market cap
- Separating procurement of low and high frequency dynamic products to allow participants with asymmetrical capabilities to optimise their bids
- Development of the auction clearing algorithm to allow providers to submit conditional bids

The ESO published their response to the evaluation report in September. It highlighted the success of the trial and the learnings that had been generated and helped inform the launch of Dynamic Containment and continued development of the response and reserve product suite. The majority of the report's recommendations would be implemented.

5.3 Optional Downward Flexibility Management

The Optional Downward Flexibility Management service was rapidly introduced in spring 2020 to help manage the effects of coronavirus lockdowns in Great Britain. Demand fell to record lows, creating an unforeseen requirement to take generation off the grid. Rapid development and deployment of a low-barrier-to-entry service by the ESO helped keep the system safe and, at the same time, created a new opportunity for DSF.

Coronavirus gave a vision of the future energy system's reliance on flexibility

Demand lows as lockdowns took hold combined with wind generation highs gave a preview of how the electricity system may look in the near future. The ODFM service was just one example of the criticality of flexibility in that vision, showing that the right market mechanisms can rapidly bring forward flexible capacity to address system management problems on a network heavily influenced by weather.

Relaxed requirements can allow lightning-fast service development

The need to design and launch a brand-new service in a matter of months proved that the ESO and industry are prepared to act quickly. Relaxing approaches to metering and testing reduced the burden to service entry, permitting ODFM to be brought online at a record pace.

Distributed, renewable generation proves its worth as a source of flexibility

Renewables are often cited as the cause of system operation headaches. The price-inelasticity of renewable (and nuclear) generation does brings some new challenges, but ODFM has shown that renewables possess the inherent flexibility to be the solutions to these problems, and need only the right market incentives to do so.

Service description

Technical and procurement details of the service are described in greater detail in appendix A. The headlines for ODFM are:

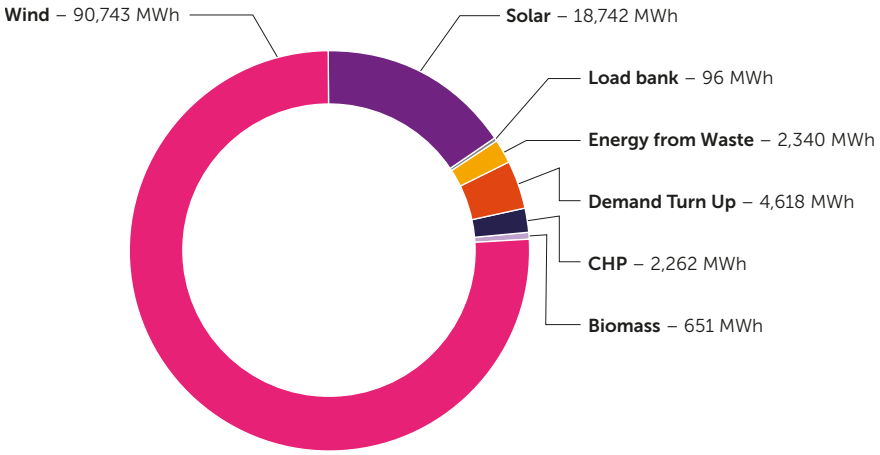
- **A source of negative reserve:** ODFM is a negative reserve or 'footroom' service, rewarding providers for increasing consumption or reducing generation.
- **For long-duration non-BM assets:** Providers were required to be non-BM units capable of providing at least 1 MW of capacity (which could be aggregated from smaller units) for at least 3 hours continuously. Generation assets were required to reduce their output all the way to 0 MW.
- **Simple requirements:** ODFM ran only from May to August in 2020. It was dispatched day-ahead via email and did not require submission of real time operational data. Availability and utilisation fees were submitted week ahead.

ODFM will be reinstated from 30 April 2021 and remain in place through to 31 October. In the run up to the relaunch the ESO consulted on updated terms and conditions for the service.

Volumes and service providers

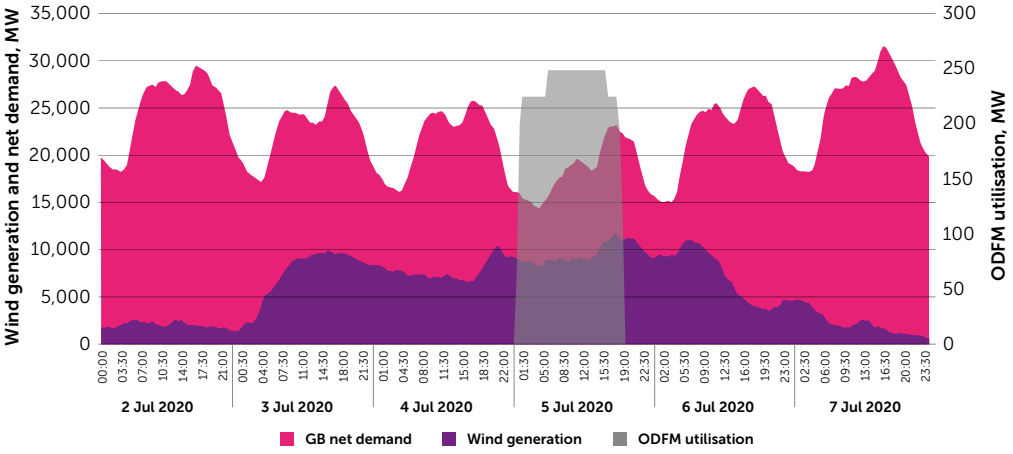
More than 100,000 MWh of negative reserve was delivered under ODFM, the vast majority of which was provided by wind and solar generation (shown in chart 7). Other providers included demand turn up, energy from waste, combined heat and power (CHP), biomass and load banks.

Chart 7: Wind and solar provided the majority of reserve
ODFM utilisation by technology over the summer 2020 season, MWh



ODFM was called upon several times during the spring and summer 2020, generally during periods of high wind generation and low demand. One example was on Sunday 5th July, which saw reasonably warm, sunny weather combined with strong winds. Low demand, typical of a summer Sunday but exacerbated by lingering effects of lockdown measures, in addition to weather conditions required the ESO to take measures including the dispatch of over 4 GWh of ODFM (shown in chart 8).

Chart 8: ODFM utilisation linked to low demand, high wind conditions
System conditions corresponding to ODFM utilisation event on 5th July 2020, MW

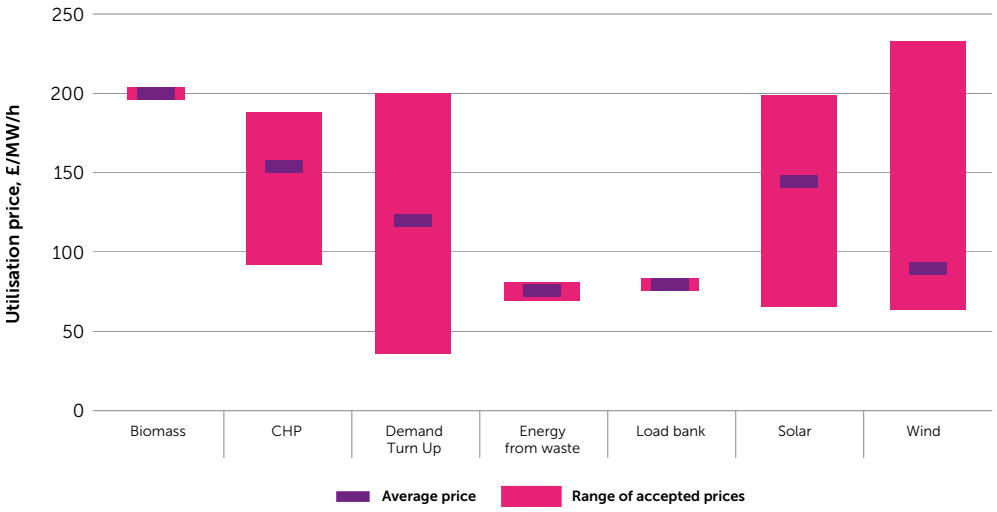


Prices

Utilisation prices varied widely over the year, both within the same asset type and across technologies (illustrated in chart 9). Wind generators received an average of £88/MW/h to turn down, ranging from £62/MW/h up to £234/MW/hr. The price range for solar was broadly similar (£66/MW/h to £199/MW/h) but the average was much higher at £144/MW/h.

The difference in prices reflects the varying cost and opportunity cost of providing ODFM, with factors such as subsidies (ROCs, FITs etc), PPA terms and fuel costs all having an effect.

Chart 9: ODFM prices varied widely
Range of accepted reserve utilisation costs by technology, £/MW/h



"We have to give credit to the ESO for the agility they displayed in quickly introducing ODFM – the simplified terms helped bring new asset owners into flexibility services, showing them how they can help manage the grid."

Claire Addison, Head of Regulation, Flexitricity

Relaxed requirements can allow lightning-fast service development

The need to design and launch a brand-new service in a matter of weeks proved that the industry is prepared to act quickly. Relaxed approaches to metering and testing reduced the burden to service entry, permitting ODFM to be brought online at a record pace.

5.4 The Balancing Mechanism

The ESO's central clearing house for energy balancing, containment management and dispatch of some ancillary services is the largest market for balancing services in GB worth over £1 billion in 2020. Recent changes have allowed smaller DSF assets access to the market, but this opportunity needs specialist skills to capitalise on.

Access reforms crack open the door to the largest non-energy market in GB
Reforms to BM access including the Virtual Lead Party registration route and the reduction in the minimum asset size to 1 MW mean DSF assets now have significantly easier access to the BM. As the largest flexibility market in GB, this represents a significant new opportunity.

The value of the BM to DSF technologies is hard to assess and to capture
The Balancing Mechanism is a complicated tool used to meet a wide range of system requirements that are constantly evolving based on demand, generation, weather conditions and more. Participation requires round-the -clock monitoring of system conditions, as well as control resource to submit bids and offers and to respond to dispatch instructions. Because of this complexity it is difficult for some DSF providers to determine how much value BM participation can offer, and even harder to successfully capture maximum value consistently.

Service description

The Balancing Mechanism is the ESO'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.

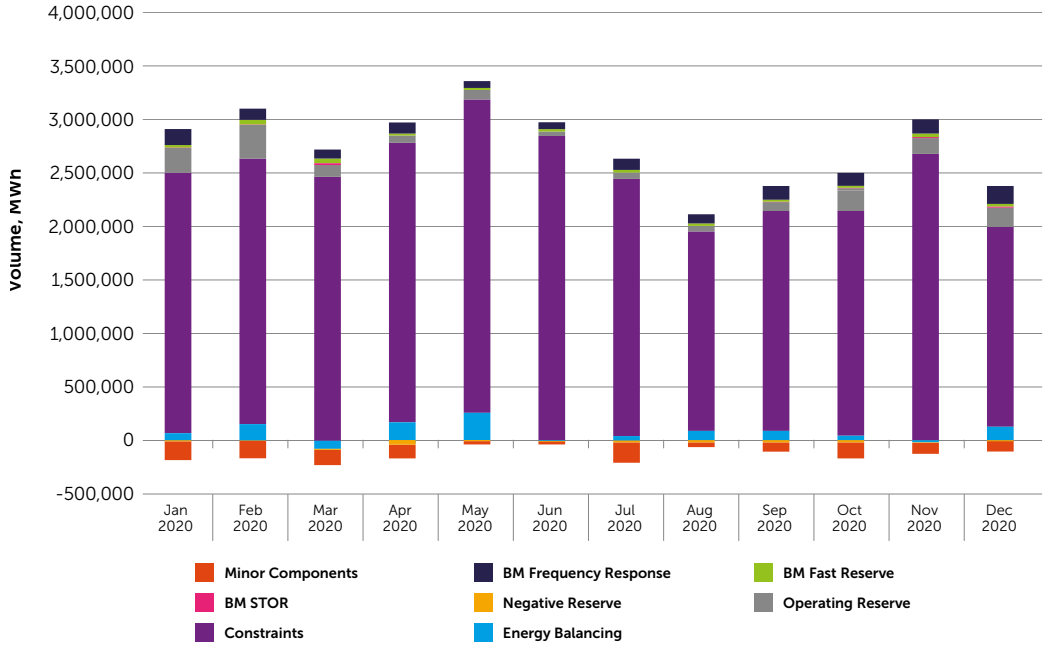
Several changes came into effect in 2020 that opened up access to the BM to DSF providers, including a reduction in the threshold of participation from 100 MW to 1 MW; introduction of the Virtual Lead Party role for aggregators; and the release of an API improving data and access for providers. The ESO have also improved dispatch systems to 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. The ESO then calls on these providers as needed, paying the bid or offer price for the volume dispatched.

Volumes

The volumes of energy traded and the overall cost of the BM dwarf tendered ancillary services markets and DSO services, with terawatt hours dispatched every month (as shown in chart 10). The vast majority of this is delivered by large scale generators, with DSF contributing only a small percentage at present.

Chart 10: Dispatched volumes range from 2 to over 3 TWh per month
Balancing Mechanism volumes by type of instruction, MWh



"The scale of the Balancing Mechanism makes it attractive for flexibility assets. Such a deep market gives investors and developers confidence that ancillary service markets cannot. In order to get more low-cost flexibility to participate we need to see evidence of a higher dispatch rate of non-traditional assets in the BM, following the merit order. We recognise there has not been much opportunity with batteries thus far for the ESO to build this track record, but this is critical in building investor confidence."

Ned Ponsonby, Senior Associate, Zenobe Energy

Consistent track record of dispatch is needed to build business case

Dispatch of assets in the BM follows the economic merit order, meaning that bids or offers that meet the system need are dispatched in ascending price order, keeping balancing costs as low as possible. As more flexible assets have entered the BM it has become apparent that greater clarity is required to explain why certain actions are taken. This is of particular importance for new entrants to the market, who have raised concerns that more economic bids/offers from new flexibility technologies are being overlooked in favour of traditional generation assets.

As part of their Forward Plan, the ESO have made a commitment to bring greater clarity to their operational decision making. One way that they will do this is through the Dispatch Transparency process. The ESO have built a tool to analyse and publish all BM actions taken each day and will be publishing this data, complete with justifications of why each action was taken. The ESO hope that this will provide greater transparency and help highlight any potential sub-optimal dispatch decisions so that improvements can be made.

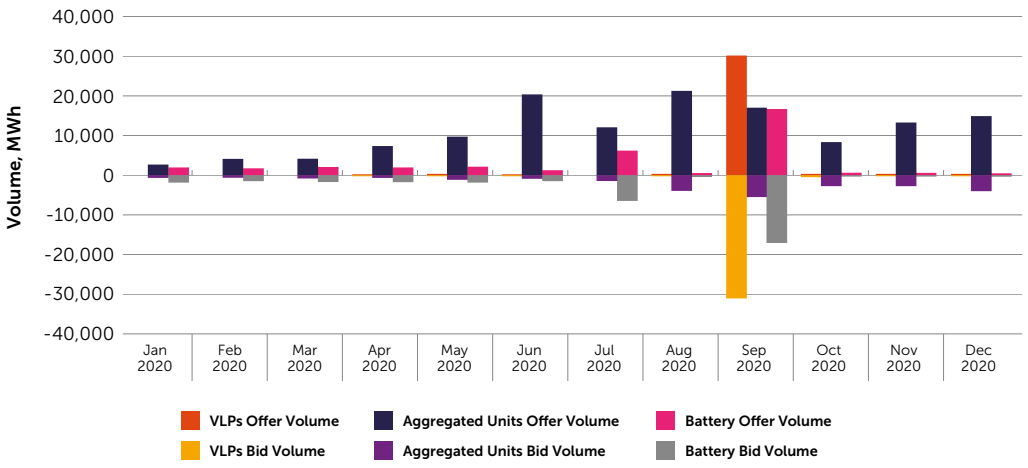
As barriers to entry in the BM are removed and more DSF assets target the market, a growing resource of low-carbon and often low-cost flexibility will be available for system balancing. For DSF providers to have confidence in BM-focussed business cases, a consistent track record of equitable dispatch is important. In return, batteries and other technologies will bring down the cost of the balancing mechanism as a whole, bringing a positive benefit to end consumers.

A look at the activity of battery BMUs, aggregated BMUs and secondary BMUs registered by VLPs provides an indication of the success of newer DSF technologies in the BM (chart 11). In 2020 there has been a relatively gradual increase in total accepted bids and offers from the BMU classes, including from the new VLP classification launched in April, which had six participants registered by the end of the year. Tens of megawatt-hours of volume have been dispatched from these units in some months, against a total monthly market size of 2-3 TWh.

A large spike in battery and secondary VLP units in September resulted from phase three of the reserve from battery storage trial. Battery assets registered both as battery units and secondary units were dispatched during the trial. Volumes tailed off in October as Dynamic Containment was launched, drawing some assets away to the new service.

Chart 11: Dispatch of DSF assets in the BM is rising
Balancing Mechanism volumes by BMU type for aggregated, battery and secondary (VLP) BMUs, MWh

Source: Cornwall Insight



"The reserve from storage trial proves that the industry is ready to offer up solutions to difficult problems that offer more flexibility at lower cost, with less emissions – we just need to be given the chance to do so. Collaboration between system operators and flexibility providers has improved but could go further still. Working together will be the quickest route to a low carbon grid."

Andy Hadland, Chief Product Officer, Arenko Group

Unlocking reserve from battery storage

At the time of the ODFM service launch, the ESO published a letter inviting the industry to propose alternative options for accessing underutilised sources of flexibility. This led to a trial with Arenko, Habitat Energy and Flexitricity to assess whether batteries could provide cost effective upwards and downwards reserve, providing a viable alternative to the positioning of thermal assets in the Balancing Mechanism.

The initial results suggested that batteries could do this. This has two potential low carbon benefits – it could open up a large new market for batteries, and at the same time reduces the need for part-loaded thermal plant that displace renewables generation off the system.

Prices

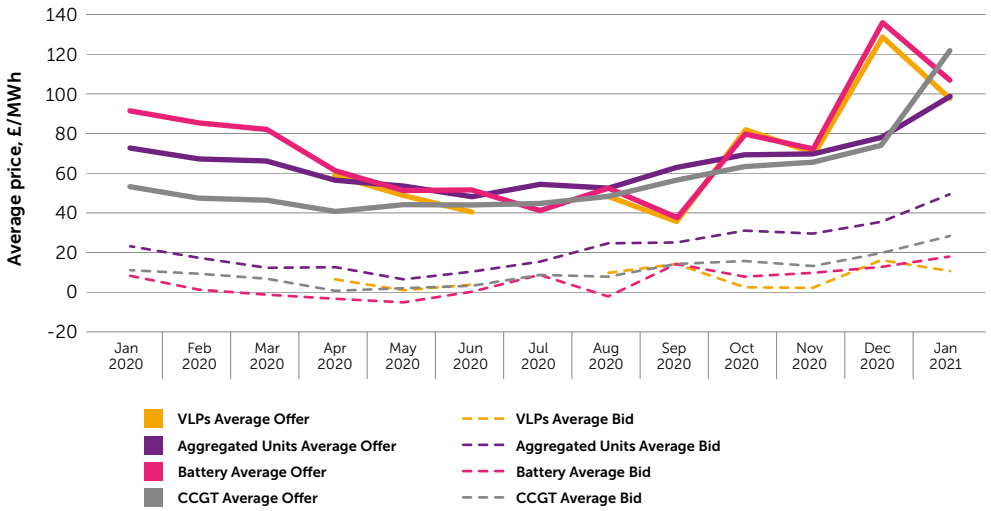
Average accepted bid and offer prices provide an indication of the long-run value of the BM (shown in chart 12). There is a relatively little difference between the monthly average bid and offer prices between the different BMU types over the year. Battery and secondary VLP units (after their introduction in April) show strong correlation, and above average offer prices over the winter months of 2020.

A surge in average bid and offer prices towards the end of 2020 can be attributed to tight power supply margins. Supply scarcity led to increased power prices in wholesale markets, drawing some assets away from the BM and increasing balancing costs as a consequence.

Chart 12: Bid and offer prices climbed in winter 2020

Source: Cornwall Insight

Monthly average accepted bid and offer prices by BMU type, £/MWh



5.5 DSO Services

The way that we use electricity is changing, with the growth in distributed generation and the advance of local-level energy flexibility creating both challenges and opportunities for Distribution Network Operators. For DSF assets, these opportunities include DSO services – ancillary services designed for embedded flexibility and procured directly by DNOs.

2020 sees record growth in contracted services

2020 was a boom year for DSO services, with exponential growth in the number of different competitions launched by GB's six DNOs and well over 1 GW worth of contracts signed. The quantity of services put out to tender in 2020 significantly exceed the quantity of services contracted, showing that there are opportunities for new DSF assets to enter the market.

Open Networks continue to drive progress, with some DNOs making more headway than others

The Open Networks project acts as a central coordination body for the transition to smart distribution networks. Their work to accelerate the rollout of DSO services and to standardise services and procurement is a benefit to DSF providers. Progress may not be at the same rate across all network zones, but the gap between early innovators and the rest is closing.

A less stringent approach to fixing service requirements has created opportunities for new asset types

Compared to ESO services, DSO services typically have fewer barriers to entry, especially for smaller assets and domestic flexibility technologies. There is a minimum portfolio size of just 100 kW for many services, and many DNOs are showing an open-minded approach to the trial of innovative models for service provision.

Service description

Technical and procurement details of DSO services are described in greater detail in appendix A. Key details include:

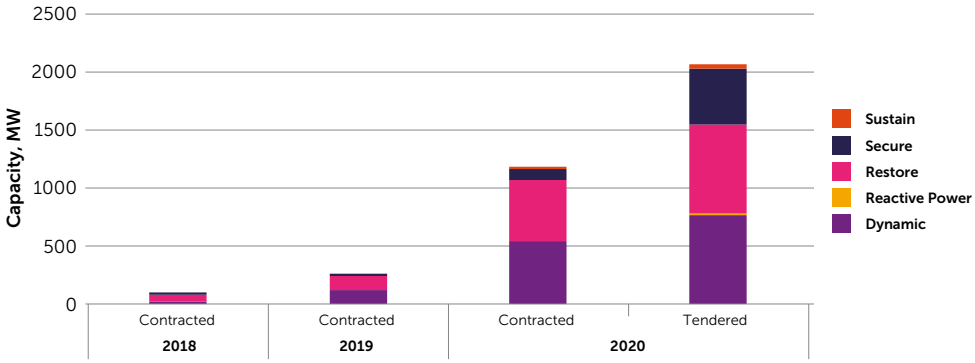
- **Standardising services:** The Open Networks project have defined four primary service types, each with a 100kW minimum threshold. Uptake of the standard service forms is growing, but is not universal, and many competitions are for service that do not follow the standardised service definition exactly. 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.
- **Centralised procurement:** Procurement is coordinated across the Piclo Flex and Flexible Power platforms, which communicate the timing, location and technical details of upcoming tenders, as well as providing DSF asset operators with the information they need to bid for 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

2020 was a watershed year for DSO services, with ENA data showing that over 2 GW of competitions were put out to tender and over 1.1 GW of contracts awarded (shown in chart 13). This represents an exponential increase on previous years, and points to the expanding scale of the market for DSO services in GB.

Chart 13: Contracted capacity has increased exponentially
Contracted DSO services by service type from 2018 to 2020, MW

Source: Energy Networks Association



The 2 GW of contracts tendered were primarily for the Dynamic, Restore and Secure services. 2020 also saw direct procurement of reactive power services at DNO level for the first time.

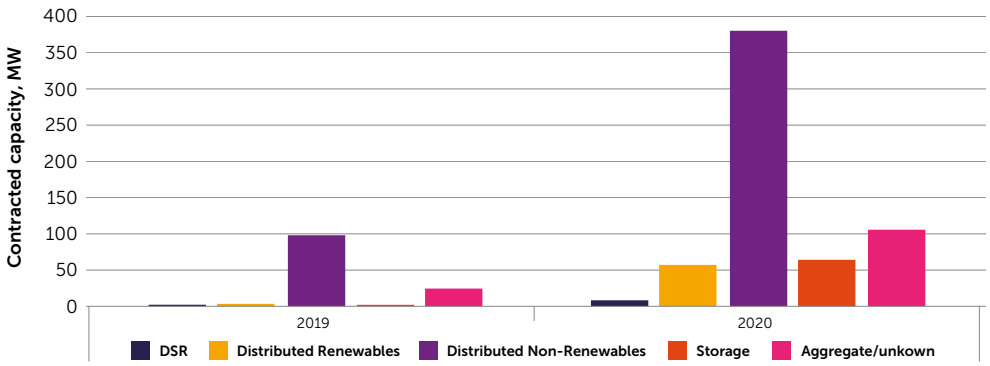
There remains a large gap between tendered and contracted capacity in 2020. This is explained by the locational nature of DSO services. Because these services only exist in certain geographical areas where the distribution networks are under stress, they can only be provided by assets located in the right zone. Even when taken together, the 2 GW plus of competitions still represents a relatively small proportion of the country, meaning many DSF assets still do not fall into zones where they are able to deliver DSO services.

Service providers

In 2020 the bulk of DSO services were provided by distributed non-renewable assets, primarily diesel generators and gas peaking plants (as shown in chart 14). But there has also been a significant growth in the quantity of services provided by aggregated portfolios, particularly at the domestic level, as well as contracts awarded to battery storage projects and distributed renewables.

Chart 14: Traditional generation has taken the bulk of DSO service contracts to date
Contracted DSO services by technology type, MW

Source: Energy Networks Association (data does not include all DSO service competitions)



5.6 The Capacity Market

The Capacity Market resumed in late 2019, offering long-term agreements that can be easily combined with other revenue streams. Market rule changes have benefited DSF assets, reducing threshold of participation to 1 MW and giving DSR the chance to secure 15-year contracts. Significant de-rating of most forms of DSF and continued low clearing prices means revenues from the Capacity Market are limited, although stackable with other services.

Market kicks back into action after suspension

A case brought before the European Court of Justice led to the suspension of the CM in 2018, putting a halt on payments to contracted providers and leading to the cancellation of upcoming auctions. In late 2019 the European Commission reapproved the State aid support for the CM, allowing auctions scheduled for January 2020 to go ahead, including a bonus T-3 auction to make up for the missed year.

DSR assets secure GWs of capacity, even before positive changes take effect

The scale of the CM means that although DSF technologies take only a small share of the market, that share still represents GWs worth of capacity. This share is growing and may well grow further as the DSF-friendly changes to the auction rules take effect.

Rules changes are good news for DSF assets

Several changes to the Capacity Market rules and regulations came into effect in 2020 which directly impact most forms of DSF participating in the CM.

- **Reduced entry threshold:** The minimum unit capacity has been reduced from 2 MW to 1 MW, allowing smaller units to enter the CM without the need for aggregation. In 2020, 44 Capacity Market Units (CMUs) under 2 MW entered prequalification.
- **Long term agreements for DSR:** Previously only new build generators could apply for multi-year agreements, but now demand-side response CMUs are permitted to bid for terms of up to 15 years, helping secure long-term income security.
- **Easements during the pandemic:** During 2020 several changes to rules and regulations were made to ease the burden on providers during the coronavirus pandemic. These included a relaxation of the satisfactory performance testing process and a 12-month extension on metering tests.

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 are available in T-4 auctions for some new build assets.

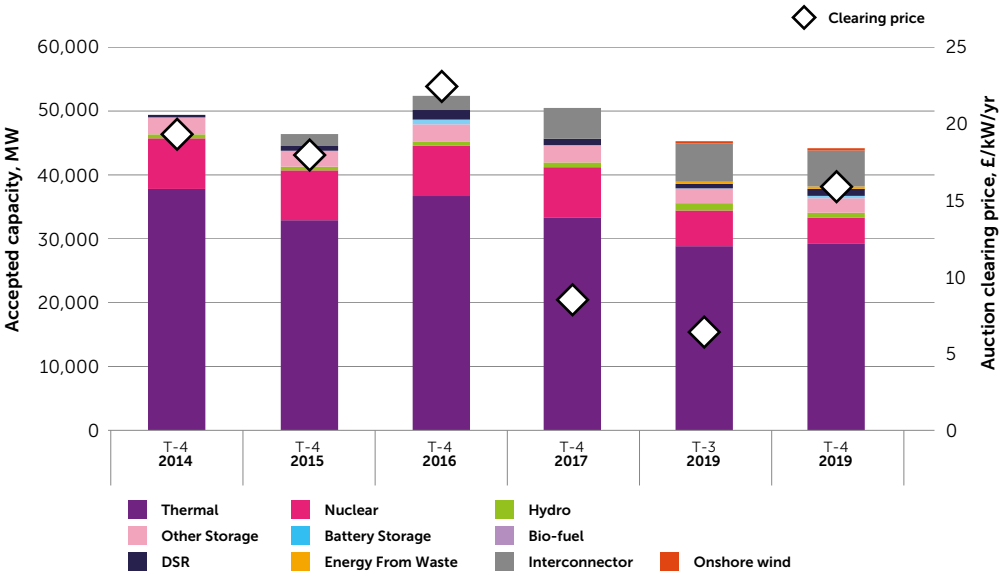
The minimum capacity limit is set at 1 MW, although each technology is given a de-rating assumption linked to the likelihood of it being available during system stress events. Generators in receipt of renewable energy subsidies are not eligible.

System stress events, if they occur, are preceded by a Capacity Market Notice, provide a warning at least four hours in advance that there may be a generation shortfall approaching.

Volume and prices

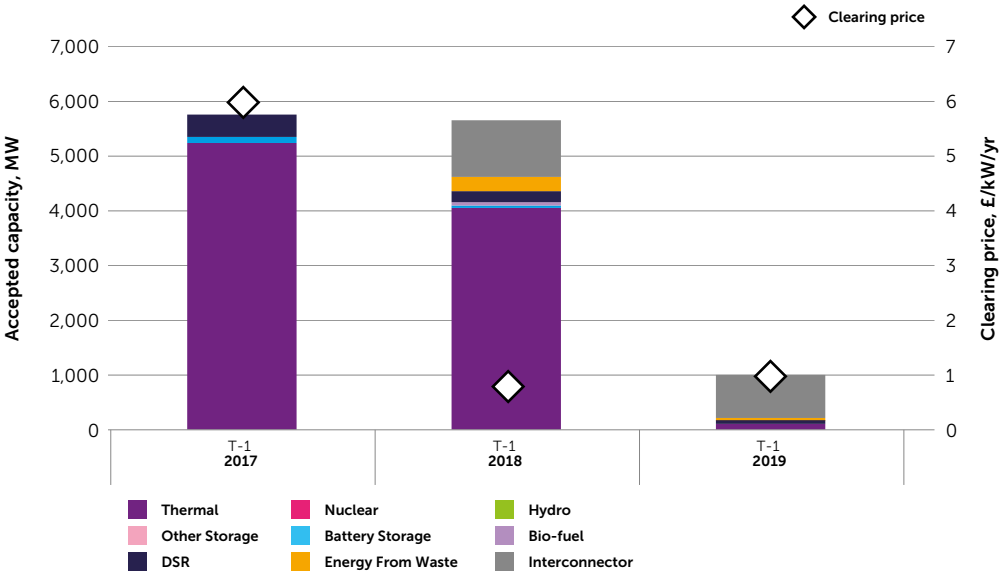
2020 was an unusual year for the CM, following as it did the (re)approval of State Aid allowance by the European Commission and reinstatement of the market. Three auctions were held in early 2020: the 2019 T-4 and the 2019 T-1, and the 2019 T-3 auction to make up for the missed 2018 T-4.

Chart 15: DSR takes a small share of 2019 T-4 auction
Clearing price and accepted capacity by technology of T-4 Capacity Market auctions, MW and £/kW/yr



It is unclear if any of this calendar reshuffling influenced the auction results. Both T-1 and T-4 cleared at a volume below that of previous auctions (shown in chart 15 and chart 16, respectively). Conversely, prices rose in both auctions, although they remain low in the context of other flexibility services. The £1/kW/yr clearing price in the T-1 was only a marginal increase on the 2018 auction's record low.

Chart 16: Prices remain low in a reduced 2019 T-1
Clearing price and accepted capacity by technology of T-1 Capacity Market auctions, MW and £/kW/yr

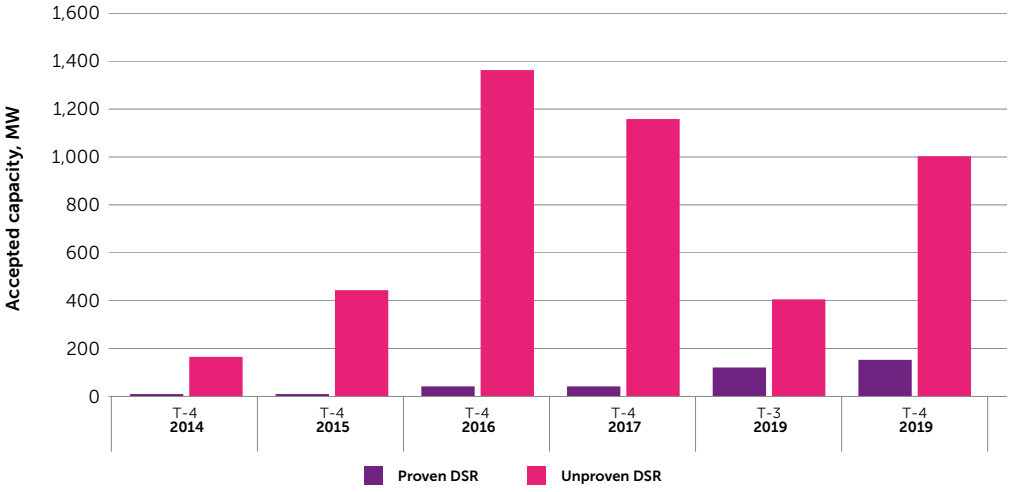


Service providers

Demand side response assets have maintained their share of cleared capacity in recent auctions. In T-4 auctions, DSR technology has continued to secure hundreds of MWs of agreements, and while the total capacity of DSR agreements in T-1 auctions has reduced, the share of the total secured capacity has been maintained.

What has changed in recent auctions is the growing proportion of DSR that is entering as proven capacity. In the CM, DSR providers must take a test to prove that they can achieve their stated capacity. Those that complete this test prior to prequalification enter the auction as proven capacity. Any contracts secured by unproven providers are conditional on successfully carrying out the DSR test prior to delivery. The growing proportion of proven DSR capacity (illustrated in chart 17) is evidence of a maturing sector.

Chart 17: Proven DSR capacity is increasing, reflecting a maturing sector
Proven and unproven DSR capacity accepted in CM T-4 auctions, MW



6.0 Outlook

DSF is a young industry at the heart of the energy transition, and developments in policy, regulation, markets and technology are continually introducing new opportunities. This section summarises the most important upcoming developments in policy and regulation, markets and innovation.

6.1 Policy and regulation

Policy will start to add substance to net-zero commitments

The 2020 Energy White Paper set out the government's plans for UK energy sector. There is now a huge amount of work to be done to turn those plans into reality: consultations, target-setting, bill-drafting, planning and implementation. Much of that effort will directly concern DSF industry stakeholders, and the industry can expect a busy few years of responding to consultations.

Notable upcoming work of interest to the DSF-industry includes the following:

Transport Decarbonisation Plan	Decarbonisation of the UK's most polluting sector is critical for meeting net zero. The government's plan will prioritise public transport and support the transmission to zero emissions road vehicles.	Spring 2021
Retail energy regulation	A formal consultation on the market framework changes needed to facilitate innovative energy supply tariffs will follow industry engagement throughout 2021.	2021 and onwards
Heat and Buildings Strategy	This dedicated strategy will aim to balance emission-reductions in the sector with affordability, prioritising energy-efficiency and low carbon heat. It will announce a range of policy measures designed encourage the transition.	Early 2021
Smart Systems and Flexibility Plan	Published in 2019, government have reiterated commitment to deliver the remining policies announced in the plan by 2022.	2022
BEIS Strategy and Policy Statement for Ofgem	Announced in the Energy White Paper to help Ofgem regulate for the net-zero energy system.	2021
Future Homes Standard	The new standard will ensure all new-build homes are zero-carbon ready, mandating low-carbon heating and high levels of energy efficiency to lead to 75-80% lower emissions compared to homes built to current standards.	'As soon as possible'
Funding schemes for storage, EVs, green homes and more	Funding announcements include the £2 billion Green Homes Grant scheme, £1 billion towards decarbonisation of public buildings, money towards development of local heat networks, a funding competition for novel long direction storage technologies, and £1.3 billion to accelerate the rollout of EV chargepoints and future proof grid capacity along major road networks.	Various

Energy data to become more open than ever before

Availability of energy data continues will continue to improve in the future, enabling markets to function more efficiently and allowing the DSF industry to better understanding the needs of DNOs and the ESO.

Alongside ongoing implementation of the recommendations within the Energy Data Taskforce's 2019 final report and Ofgem and Innovate UK's Modernising Energy Data programme, the Government is due to publish a new energy data and digitalisation strategy in spring 2021, and a national energy data catalogue in the summer. With efforts continuing across the industry, 2021 looks to be the year when data begins to fully realise its potential for demand side flexibility.

Increasing focus on the carbon impact of flexibility markets

In late 2020, BEIS and Ofgem ran a workshop to discuss existing carbon signals in flexibility markets and options for reducing emissions. Data presented showed that despite the increase in low-carbon technologies (particularly for frequency response) most services, and the vast majority of dispatched volume, remain monopolised by fossil fuels.

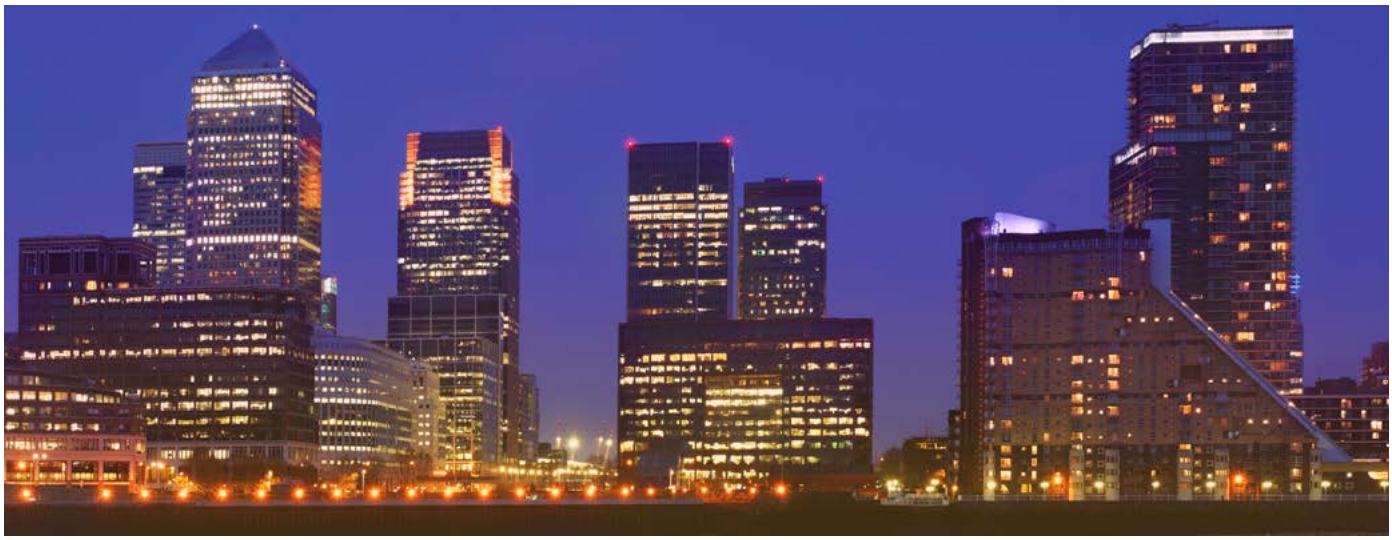
2021 will bring some change. Ongoing reform to ancillary services is designed to remove historic technology bias towards traditional assets, and while this may be unlikely to make a significant change to carbon emissions in these markets on its own, the work of BEIS and Ofgem is opening up the possibility of more direct measures in the future. There is clear potential to enact change and support the government's net-zero ambition by creating incentives for low-carbon provision of all balancing services.

More details on the government's plans are expected to be revealed in the upcoming Smart Systems Plan.

The final impact of network charging reforms will be revealed

Network charging reforms will start to take effect in 2021, with the implementation of Targeted Charging Review on transmission assets taking place this year, and for distributed technologies from April 2022.

Hand in hand with the TCR comes the access and forward-looking charges significant code review (SCR), and to get a full perspective on the outlook of network charging the two must be taken together. The delayed minded to decision is expected in 2021, but until then it remains unclear what the final, cumulative impact of the SCR and TCR might be.



6.2 Flexibility markets

Ongoing reform to frequency response service near completion

The ESO's current programme of frequency response reform will make further steps towards its conclusion in the next year. Dynamic Containment is due to be joined by two other services in 2021, which together will make up the full suite of the ESO's frequency response services, ultimately replacing other ancillary services designed to control system frequency, including FFR.

- Dynamic Regulation is a symmetrical, bidirectional service designed to provide regulation of frequency when it is close to 50 Hz. Response is required within 2 seconds, ramping to full output within 8 seconds. The service is continuous, with not limit on duration of response.
- Dynamic Moderation is also symmetrical and bidirectional, but has a wider deadband, meaning providers will respond to occasional moderate deviations in frequency. A full response is required within 0.5 seconds and duration is limited to 20 minutes.

The ESO has also stressed that the technical and procurement design of the new services will aim to enable participation from a wide variety of technologies, including demand side response as well as battery storage and distributed generation.

Stacking of Dynamic Containment in the BM is a potential gamechanger for storage

The combination of revenues from two high-value markets for flexibility – Dynamic Containment and the Balancing Mechanism – was made possible from January 27th 2021 following an announcement from the ESO. This allows the simultaneous stacking of the two revenue streams by permitting contracted DC providers to participate in the BM without restrictions.

The move is a significant boost for battery assets already participating in DC and is expected to be extended to Dynamic Regulation and Moderation services when they are launched in the future.

Major changes to come for reserve products

Like frequency response, reserve services are part way through a programme of major reform. The first major change in 2021 will be the launch new day-ahead from of STOR in April. Technical requirements will be maintained, meaning STOR remains a service for larger (3 MW or more) and longer duration (at least two hours) technologies. There will be rolling day-ahead auctions, closing at 05:00 the day before delivery.

Looking ahead, the ESO envisions a standardised suite of upwards and downwards reserve products procured at day-ahead and designed to work harmoniously with the new frequency response products and European reserve services MARI and TERRE. Implementation of the new products is scheduled for Q1 2022.

DSO services continue to expand and develop, coordinated by the Open Networks project

The DNO to DSO transition continues to be supported by the work of the ENA and their Open Networks project. The plan of work for 2021 marks out flexibility markets as the primary focus area, with specific attention to be devoted towards opening markets for local flexibility and standardising and improving the experience for DNO customers.

The growth of commercial procurement of DSO services is expected to continue in 2021, with all six DNOs procuring services using the marketplaces Piclo Flex and Flexible Power to advertise Secure, Dynamic and Restore services. Procurement of Sustain and reactive power services is also expected to grow.

Pathfinder projects highlight innovation on the transmission network which may trickle down to distribution-connected assets with time

Alongside the procurement of their regular suite of services, the ESO has been working a series of 'pathfinder' projects that are exploring alternate methods to manage challenges faced by the transmission network, as described by the Network Development Roadmap. Highlights to date include the award of 9-year reactive power contracts to large scale batteries, and the contracting for stability services with a flywheel and asynchronous condenser.

The majority of these projects are available only to transmission connected projects at present, but there will likely be learnings also applicable to distribution network challenges. The pathfinder projects are currently exploring three distinct network needs:

- Constraint management: This work is exploring options to alleviate constraints on the Anglo-Scottish boundary and will go to tender for commercial services in summer 2021.
- Stability: The stability pathfinder is looking at the alternate sources of inertia to help regulate system frequency. The upcoming phase 2 tender aims to procure low-cost and efficient stability solutions across Scotland from providers connected at 132 kV or above.
- Voltage: Maintaining voltage levels within safe limits on the transmission and distribution systems is a growing challenge. The voltage pathfinder is exploring market-based solutions to this problem and will soon launch a commercial tender in the Pennine region.

Separately to the voltage pathfinder, the ESO is investigating the future of all reactive power services. Updates on the ESO plan for the commercial procurement of reactive power are expected in early 2021.

Unlocking intermittent generation as a flexible resource

Most flexibility services in GB are dominated by a small group of technologies – typically storage, demand side response and small-scale thermal generation. But there are GWs worth of intermittent generation connected across distribution networks in GB, much of which remains untapped as a source of flexibility.

The ODFM service helped prove the potential value of intermittent generation in flexibility services and will be reinstated again in spring 2021. But it is not only turn-down or negative reserve services that could be offered. The Future of Balancing Services team has been exploring these issues and published their *strategy for intermittent generation* in March 2020.

The report outlines key factors that could help open up flexibility markets to these technologies. Close-to-real time auctions are identified as crucial enabler, as is improved signalling of power reserves available, and separating of high and low frequency response products to allow provision of services in one direction, rather than both.

The recognition of the flexible potential for renewables is increasingly important as their penetration continues to rise. This is also being recognised outside of the ESO, notably in the Energy White Paper and in the *proposed changes to CfD auction round 4*. AR4 will strengthen the 'negative pricing rule', which previously allowed CfD holders to continue to receive top-up-payments for up to 6 hours during periods when the wholesale price was negative. Future CfD projects will be exposed to electricity market pricing if they generate during any negative price periods, creating a strong incentive for curtailment of renewables when market signals show that further generation is not needed.

6.3 Innovation projects

The scale and diversity of energy flexibility innovation is huge, and the type of projects being approved continue to serve as an important sign of the longer-term direction of the DSF industry. Large Network Innovation Competition (NIC) projects with budgets in the millions of pounds are supplemented by hundreds of smaller Network Innovation Allowance (NIA) projects led by the distribution network operators. These are supplemented by additional funding pots allocated to specific innovation areas from BEIS and Innovate UK.

Many of these projects specifically concern the uses of distributed flexibility.

Several large NIC projects are working to open up new markets for DSF

Distributed ReStart is a 3-year innovation project aiming to assess the potential of distributed energy to participate in Black Start – the restoration of the electricity network after a major black out. The project is due to run through to April 2022 and could potentially lead to competitive procurement of Black Start services from DSF by mid-2022, if deemed feasible and cost-effective.

Power Potential is a joint project between National Grid ESO and UKPN trialling the use of distributed energy resources for voltage support and transmission network constraint management. The trial ran in UKPN's south eastern network zone until March 2021 and could pave the way for new commercial services in the future.

Residential Response is testing innovative new ways for residential flexibility assets to enter ESO balancing services markets. It addresses the specific barriers to entry faced by domestic technologies, including testing, commissioning, monitoring and performance testing. Element Energy, Kaluza, Lightsource, Moixa, and Upside Energy are all involved and the findings are due to be published in the near future.

Several current NIA projects are tackling a range of issues preventing DSF technology from reaching its maximum potential

Future Flex is a trial of second-generation DSO services, deploying step-change innovations for domestic flexibility. The project aims to improve market liquidity through greater participation of domestic flex in DSO services and addresses the specific barriers that exist in provision of DSO services by domestic assets.

IntraFlex is working to deliver a link between DNO flexibility services and Balance Responsible Party (BRP) imbalance positions. As part of this project, Western Power Distribution is trialling a short-term marketplace for the procurement of DNO flexibility which will include a rebalancing link to the intraday market operated by Nord Pool. The project includes the delivery of flexibility services from a complex combined portfolio of home batteries, smart EV charging and vehicle-to-grid technology.
Project LEO (Local Energy Oxfordshire) was set up to deliver a transformative integrated smart local energy system to maximise prosperity and demonstrate new value creation opportunities, develop innovative funding models for new distributed energy resources, and demonstrate novel local energy markets.

Innovate UK V2G projects have secured a total of £30 million of Government funding. The 8 separate vehicle-to-grid (V2G) demonstrators are tacking a broad range of challenges, including understanding the value of V2G for the customer and for the electrical system, as well as how to dismantle barriers to entry. The projects have shown that there is a value for the customer of between £60-£200 per year.

The BEIS FleX competition awarded over £2 million to projects which are now developing ways to exchange energy flexibility between domestic and business customers

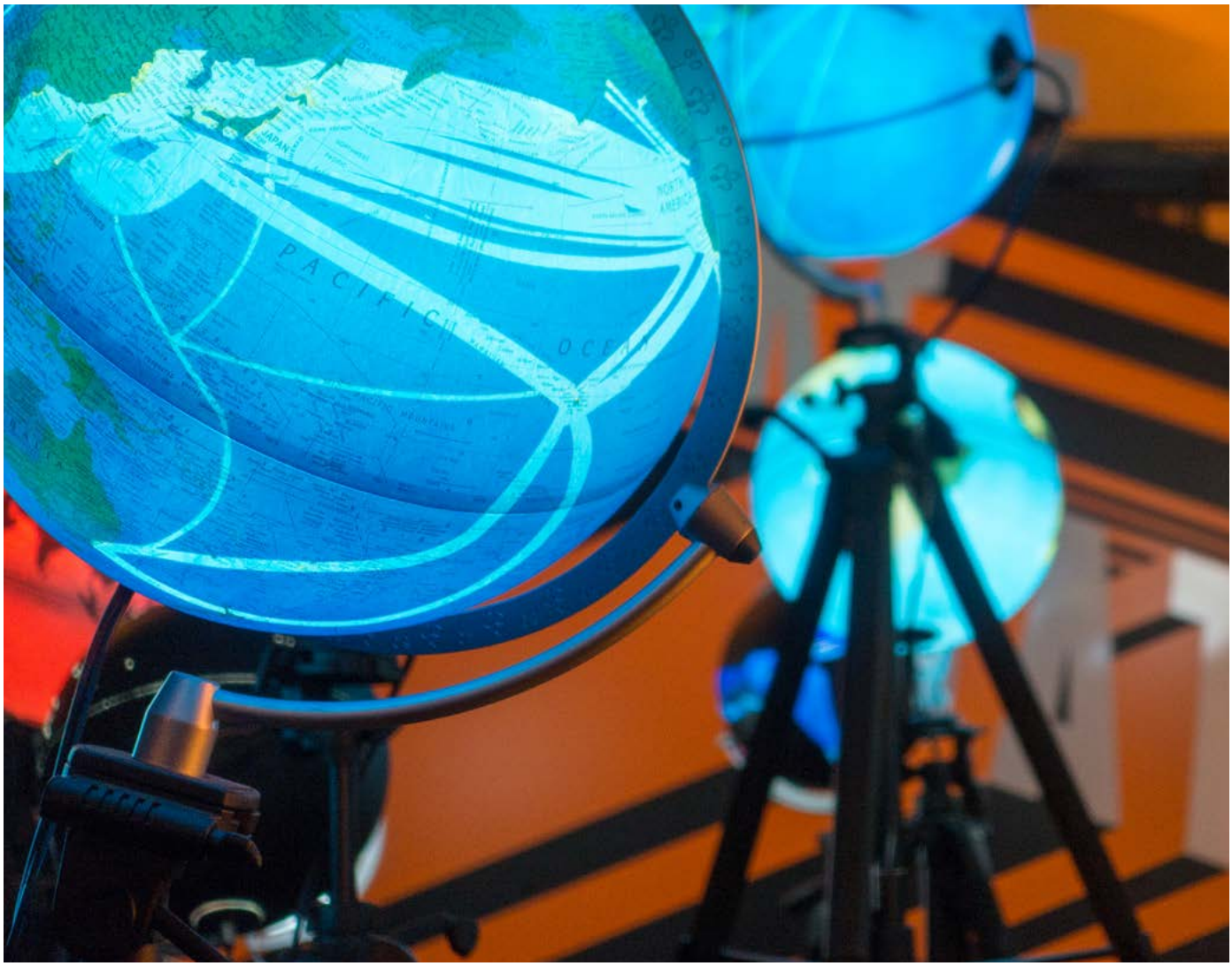
Piclo Exchange has received support from the competition to expand its open flexibility marketplace. The trial will build on the successful marketing of DSO services to allow flexibility providers to bid for and exchange flexibility products including ESO ancillary services and flexible power purchase agreements. All UK DNOs and the ESO are involved.

Project TraDER is developing a local flexibility exchange on the Orkney islands, designed to optimise the integration of the islands' plentiful renewable generation. The marketplace, operated by Electron, connects curtailed renewable generators with flexible energy assets in real time to allow the exchange of spare grid capacity in a bid to maximise renewable output.

6.4 A global leader in energy flexibility

As this report has shown, the DSF industry has made an enormous step forward in 2020. The policy position on net zero is now clear, market entry barriers have been reduced and flexibility services are being delivered by an expanding range of technologies, all of this ultimately enabling lower-cost and lower-carbon energy to reach the consumer. The GB DSF sector is world-leading and cause for celebration.

The COP26 conference in Glasgow in November 2021 offers huge opportunity to demonstrate the brilliance of the UK DSF industry, and to show how the lessons learnt in GB can help enable net-zero energy systems globally.



7.0 Appendix A – service details

7.1 Dynamic Containment

Procurement

The new service is still in its 'soft launch' phase meaning procurement details could change in the future. What is certain is that DC will continue the trend of close-to-real time auctions and short-term contracts in ancillary service procurement.

1. To qualify, all assets must pass relatively stringent testing criteria. These demonstrate capability to respond to frequency deviations according to the service requirements and meet the response speed and delivery duration obligations.

2. Auctions are held day-ahead, with delivery commencing at 23:00 each evening.

3. There is a single delivery window of 23:00 to 23:00 for all providers

4. Providers must submit an availability fee in £/MW/h and are settled at this rate if successful: a pay-as-bid auction.

5. If there is an oversupply of capacity, bids are ranked against their availability fee and only the cheapest accepted.

6. A price cap in each auction allows the ESO to reject bids that do not offer good value when compared to alternative sources of frequency response. The cap is unpublished, but auction dynamics suggest it currently sits at just over £17/MW/h.

Technical details

DC's primary role is to contain frequency within acceptable limits. This means protecting against extreme events that threaten the safe operation of the grid. The service is called on only when frequency strays far from its usual operational zone. DC is dynamic, providing an output that is proportional to the change in grid frequency.

Response speed	Between 0.5 and 1s to full output
Response duration	15 minutes maximum at full power output
Deadband	No response is required between plus or minus 0.015 Hz
Small linear delivery zone	A small response is required between 0.015 Hz and 0.2 Hz (from 0% output at 0.015 Hz to 5% at 0.2 Hz)
Full delivery zone	From 0.2Hz (5% output) to 0.5 Hz (100%)
Metering resolution	20 Hz

7.2 Firm Frequency Response

Procurement

Mechanisms differ between the monthly and weekly forms of FFR.

Monthly tenders

A tender is held at the start of each month to procure capacity for the upcoming month. Prospective providers can sculpt their bid as they choose, matching their asset capabilities and NG's stated requirements for the different forms of the service.

Tenders are accepted or rejected according to both requirement and price. Low-cost bids are unlikely to be successful if they do not fit the service requirements for the coming period.

Those awarded contracts are paid on an availability basis at their specified £/MW/h rate.

Weekly auctions

The auction trial procures FFR in a weekly, pay-as-clear auction via the EPEX SPOT platform. There is less complexity than the monthly service with only two forms of service on offer: low frequency static (LFS) and dynamic low and high frequency (DLH).

The auction runs to determine the volumes of LFS and DLH and their respective availability-based clearing prices over each 4-hourly EFA block in the week.

Technical details

The monthly and weekly forms of FFR also have slightly different technical requirements. Minimum asset size is 1 MW across the board.

Monthly tenders

Static	
Response speed	30s
Response duration	30 minutes
Trigger frequency	49.7 Hz

Primary dynamic	
Response speed	Full response within 10s
Response duration	20s
Deadband	50 ± 0.015 Hz

Secondary dynamic	
Response speed	Full response within 30s
Response duration	30 minutes
Deadband	50 ± 0.015 Hz

High dynamic	
Response speed	Full response within 10s
Response duration	Indefinite
Trigger frequency	50.015 Hz

Weekly auctions

LFS	
Response speed	Full response within 1s
Response duration	30 minutes
Trigger frequency	49.6 Hz

DLH	
Response speed	Full response within 1s
Response duration	30 minutes
Deadband	50 ± 0.015 Hz

7.3 ODFM

Procurement

ODFM is designed to enable quick and simple access to downwards reserve from distributed energy resources. Accordingly, the procurement mechanism is simple and aligned with the typical features of DSF technologies.

1. Prospective providers are required to submit their availability to provide the service and utilisation fee on a week-ahead basis. Submission deadlines during the summer operational period were each Wednesday at 15:00, for delivery for the week starting Friday at 23:00.

2. The ESO call on providers as and when downward reserve is required. Instructions are made by email, the day before service delivery is required.

Technical details

Continuing the theme of simplicity, technical requirements are undemanding and designed specifically to be suitable for DSF technologies.

- Providers must not be registered as a Balancing Mechanisms Unit
- The total capacity of each bidder must be at least 1 MW, although aggregation is permitted for smaller units, providing all individual assets are connected behind the same grid supply point and are same technology type.
- Delivery of the service must be sustained for a minimum of 3 hours.
- Generation assets are required to reduce their output to 0 MW.
- Units whose connection agreement is subject to an active network management system are not permitted to participate.

7.4 DSO Services

Procurement

DSO services are locational, meaning only assets which are both inside the right geographical zone and meet the competition technical requirements are eligible.

The launch of the platforms Piclo Flex and Flexible Power has greatly simplified the procurement process for DSO services. Each acts as a central 'clearing house' for DSO needs, communicating the timing, location and technical details of upcoming tenders and providing DSF asset operators with the information they need to tender for services.

The specifics of procurement process still differ slightly between DNOs, but generally follow a process of qualification, testing and delivery, only including a competitive element in the current rare case of an oversubscribed competition.

Technical details

The Open Networks project's four service types each have general technical requirements attached to them.

Service	Minimum capacity	Minimum duration	Notice period
Sustain	100 kW (can be aggregated)	0.5 hours	Months in advance
Secure			Day- or week-ahead
Dynamic			Close to real time
Restore		3 hours	

The above are a general guide, but specific competitions may not follow these exactly – each DSO sets their own specific requirements. The data presented in this section groups past competitions into these categories for ease of interpretation, but it is important to remember than DSO services do not always follow the same rigid definitions as national level ancillary services.

8.0 Appendix B – glossary

Aggregator	A business that combines or aggregates a diverse mix of loads and generation assets and manages participation in markets on behalf of customers.
Balancing Mechanism (BM)	The ESO's primary tool for managing the balance of supply and demand on the electricity transmission system within each half-hour trading period of every day.
Capacity Market (CM)	A mechanism designed to provide incentives for investment in the overall level of reliable capacity (supply and demand side) and secure supply of electricity.
Demand Side Flexibility (DSF)	The increase, reduction or shift in electricity demand or generation in response to an external signal. DSF includes flexible load shifting from domestic, commercial and industrial energy users, generation from onsite behind-the-meter generation and storage, distributed generation and distributed storage.
Distribution Network Operator (DNO)	Regulated companies that build, maintain and operate electricity distribution networks.
Distribution System Operator (DSO)	An emerging role for DNOs which involves more active management of supply, demand and constraints at a local level.
DSO Services	Flexibility services procured directly by DNOs to manage constraints, voltage levels and other issues on the distribution networks.
Dynamic Containment (DC)	A frequency response service procured through day-ahead tenders to provide rapid response after a significant frequency deviation.
Dynamic Moderation (DM)	A frequency response service due to launch in the near future, complimenting DC. Dynamic Moderation is designed to provide rapid response to occasional, moderate frequency deviations.
Dynamic Regulation (DR)	A frequency response service due to launch in the near future, complimenting DC. Dynamic Regulation is designed to provide quick and continuous dynamic response to small frequency deviations.
Electricity System Operator (ESO)	The ESO is responsible for the management and real-time balancing of the electricity transmission system. The ESO is a regulated entity legally separate from the owner of the electricity transmission network, National Grid Electricity Transmission.
Firm Frequency Response (FFR)	A frequency response service procured by the ESO through monthly tender rounds and a weekly auction trial. FFR exists in both dynamic and static forms.
Frequency Response	System frequency is a continuously changing variable that is determined and controlled by the second-by-second balance between system demand and total generation. The ESO is required to maintain a frequency of +/-1% of 50Hz at all times. To do this they procure frequency services to respond to fluctuations in electricity demand or generation from forecast volumes or to withstand faults to the network or connected generation.
Industrial and Commercial (I&C) Customers	Large business electricity consumers, including manufacturing facilities, public sector organisations and public commercial facilities such as supermarkets.
Optional Downward Flexibility Management (ODFM)	A negative reserve service launched in spring 2020 and designed to access additional, non-BM flexibility resources during low demand periods.
Reserve	Reserve services provide additional electricity to the grid or reduce electricity consumption to manage unforeseen changes in demand or shortfalls in of generation. They can be distinguished from frequency response services by their slower response speeds and longer delivery durations, and by the fact that they are dispatched by instructions from the ESO rather than in response to local measurements of grid frequency.
Targeted Charging Review (TCR)	An Ofgem review that is reforming the way that residual network changes are levied on all users of the electricity network.

Look out for the Flex Assure Mark

Flexibility you can trust
Flex Assure is a Code of Conduct scheme which uses the Demand Side Response (DSR) Code of Conduct which was developed by industry to set standards of practice for DSR aggregators providing business to business services.

Flex Assure Scheme Members are committed to abiding by the industry-leading standards defined in the *Flex Assure Code of Conduct.*

Look out for the Flex Assure Mark as it provides a clear sign to business energy users that Flexibility Services Providers meet these standards, strengthening consumer trust in the rapidly evolving market for energy flexibility services.

Visit the Flex Assure website *here* for further information or contact *info@flexassure.org.*

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