

Power Responsive Summer Reception 2018

Celebrating Demand Side Success

This note has been prepared by National Grid to summarise the Power Responsive Summer Reception 2018 to bring together Demand Side Flexibility stakeholders from across the GB electricity sector to celebrate the successes of the previous year, and look ahead to the future developments.

Power Responsive is a stakeholder-led programme, facilitated by National Grid, to stimulate increased participation in the different forms of flexible technology such as DSR and storage. It brings together industry and energy users, to work together in a co-ordinated way. Key priorities are to raise awareness of demand side flexibility opportunities, remove barriers to entry, and evolve future flexibility markets.

Introduction and summary

Power Responsive hosted its fourth annual event – the **Power Responsive Summer Reception** – on 26 June 2018. The event brought together over 250 people – including industrial and commercial (I&C) energy users, storage developers, small-scale generators, suppliers and aggregators, finance providers, energy experts and policy makers.

The Summer Reception kicked off with an afternoon Flexibility Forum, to deliver fresh messages and clarity to demand side flexibility stakeholders, create engaging debate, and work towards action/solutions to unlock flexibility.

This was followed by an evening drinks reception, raising awareness of the work of Power Responsive over three years, celebrating the progress in demand side flexibility, and outlining priorities for Year 4.



Flexibility Forum overview

Cathy McClay (National Grid) opened the event, highlighting the growth in the Power Responsive programme since its launch in 2015. Over this time we've seen a fantastic increase in our stakeholder base, from 80 delegates at the first annual event in 2015, to 350 delegates registering for the second year in a row.

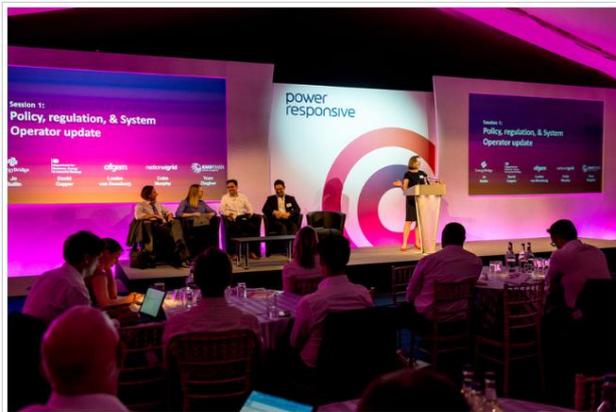
Reflecting on the last 12 months, Cathy highlighted that:

- Since the launch of Power Responsive, we've seen demand side flexibility evolve to incorporate electricity storage and shift from being perceived as a crisis response to a business-as-usual proposition.
- In the last year, Power Responsive membership has grown by 650 members to >2000, from >1000 organisations.
- And continually, over the last year, more than 30% of tenders received for National Grid's balancing services have been from demand side providers. Some months this has exceeded 50%.
- We've seen numbers of industry initiatives aimed at improving access to markets across transmission and distribution – BEIS and Ofgem's Smart Systems and Flexibility Plan, Ofgem's regulatory sandbox, National Grid's reform of balancing services and the Energy Networks Association's (ENA) Open Networks project, the Association for Decentralised Energy's (ADE) Code of Conduct for Aggregators.

There is still progress to be made in maintaining confidence during a time of significant change in the industry, and so the Summer Reception strives to provide delegates with further clarity on developments for demand side flexibility, and present the opportunity to share views with industry experts.

Session 1: Policy, regulation and System Operator update

Policy maker, regulator and System Operator perspectives – highlighting steps taken over the past year to move demand side markets forward and create accessible opportunities for all parties.



Jo Butlin (EnergyBridge) chaired the session in which BEIS, Ofgem and National Grid set out the steps they had taken over the past year to enable demand side flexibility and their proposed next steps.

David Capper (BEIS) summarised the progress towards achieving the actions outlined in BEIS and Ofgem's Smart Systems and Flexibility Plan, highlighting that 8 of the 29 actions are now complete. Components of the Industrial Strategy Challenge Fund were addressed:

- **Faraday Challenge** (£246m over 4 years) to help the UK lead the world in the design, development and manufacture of batteries for electric vehicles.
- **Prospering from the energy revolution** will develop world-leading local smart energy systems that deliver cheaper and cleaner energy across power, heating and transport, while creating high value jobs and export capabilities.

The UK has led the world in decoupling growth from emissions – we should be proud of achievements over the last 12 months, but not complacent.

Louise van Rensburg (Ofgem) set out Ofgem's aim of ensuring a regulatory framework that drives innovation, supports the transformation to a low carbon energy system and delivers the sustainable, resilient, and affordable services that all consumers need. The audience were encouraged to read Ofgem's guidance for generators on the co-location of storage with renewables generation, which was published on 22nd June, and to engage with their two storage consultations:

- Enabling the competitive deployment of storage in a flexible energy system: changes to the electricity distribution licence.
- Clarifying the regulatory framework for storage: licensing.

Louise expressed Ofgem's interest in the delivery of the ADE's Code of Conduct for aggregators in order to build trust in this area, and highlighted the legal separation of the Electricity System Operator.

Whole electricity system approaches were touched upon; Ofgem want network operators across transmission and distribution to be talking about the most effective solutions and considering the role of DSR. This will be promoted by including the requirement to think across the whole system in to the licence conditions of network operators.

Louise concluded with a summary that challenges are being addressed through a number of changes, which should ultimately bring opportunities, and if stakeholders feel this is not the case, Ofgem would like to hear this feedback.

Colm Murphy (National Grid) – ESO Forward Plan – National Grid Electricity System Operator (ESO) is embarking on a journey to become a legally separate entity within the National Grid Group, which will enable the ESO to play a more effective role in facilitating industry change.

The first ESO Forward Plan was launched in March 2018. This sets out priorities for the next year and highlights how the ESO will generate value for consumers and measure its performance under a new regulatory framework. There are four roles that will deliver this vision: Managing system balancing and operability; facilitating competitive markets; supporting competition in networks; and facilitating whole system outcomes. The document outlines over 70 deliverables across seven principles, which fall under one of the four roles. An external ESO Performance Panel, convened by Ofgem, will assess performance on a six-monthly basis.

Product Roadmaps – reform of balancing services

Colm covered a number of commitments to improve accessibility of markets, increase market diversity and improve transparency of our requirements and actions in order to help stakeholders understand the state of play and make informed decisions.

This will deliver consumer value through:

- Reducing barriers to entry and increasing numbers of service providers in markets
- Increasing market liquidity and driving down costs

Following on from the System Needs and Product Strategy document, published in summer 2017, National Grid ESO has published a series of Product Roadmaps – these are roadmaps of actions and commitment specific to each balancing service.



Frequency response and reserve – this Product Roadmap was published in December 2017. From May 2018 National Grid has rolled out the use of 4-hourly blocks and seasonal windows in the procurement of FFR. This will improve transparency of market price and requirements, and therefore enhance competition. For faster acting frequency response (<1 second), National Grid consulted on service design in March via technical workshops in May to gather further feedback from the parties looking to participate in these services to help shape the design. And for simplification of contracts – the team are currently consulting on simplified Standard Contract Terms for FFR to aid clarity. STOR and Fast Reserve will follow.

Restoration – this Product Roadmap was published in May 2018, and details National Grid ESO’s approach to re-energising the network in the unlikely event of a black out, and commitments to remove barriers to entry to allow improved market access to a broader range of potential participants.

Reactive Power – this Product Roadmaps was also published in May 2018, and provides greater clarity on service requirements and plans to work more closely with industry partners to improve the shorter-term market for reactive power.

Colm emphasised that the Product Roadmaps are a ‘call to action’. The ESO is keen to know what you think of the actions they’re taking and whether they address the challenges you’re facing in entering the market.

Yoav Zingher (Kiwi Power) joined the panel to represent the perspective of demand side providers.

Panel discussion

There was a question on the timings of developments presented by BEIS, Ofgem and National Grid. Many actions within BEIS and Ofgem's Smart Systems and Flexibility Plan should be complete by 2020, with some potentially taking longer due to progression of legislation. Two Ofgem storage documents are due to be published this summer, and National Grid ESO's legal separation will be in place by April 2019. The requirement for DNOs to consider non-build alternatives to network reinforcement is already in place within the current regulatory framework.

Who should and shouldn't be licenced? The panel discussed that the ADE's Code of Conduct for aggregators is an important development and that it would be sensible to revisit on a regular basis whether the Code goes far enough.

Panellist covered the projects exploring flexibility in communities and the capacity of smaller generators. Centrica's Local Energy Market (LEM) project was highlighted as exploring new solutions across transmission and distribution at a local level, as was National Grid and UK Power Network's Power Potential project, which is exploring reactive power from distributed energy resources on the south east coast of England. It was suggested that while current markets may work for larger demand customers, more work is required to understand and unlock flexibility from smaller sources.

Acknowledgement was given to progress under National Grid's reform of Balancing Services, and there was enthusiasm to maintain momentum.

Q&A – additional questions from the Forum (answers supplied by various panellists)

No new power stations in the Capacity Market - is this good?

There have been many smaller new build capacity market units which have gained agreements. The CM has delivered cost efficient capacity with the lowest clearing prices in the recent auctions in 2018. It is technology neutral and so does not pick winners; it is a mechanism of price discovery based only on the amount of capacity bid vs amount of capacity required. The policy for and parameters of the capacity auctions are set by government with the aim of ensuring the most economic security of supply.

Other views from the panel suggest there are opportunities to support innovation.

The upcoming five year review being conducted by BEIS and Ofgem will be looking at whether the capacity market has achieved its original objectives. There will be changes to the framework based on input from stakeholders across the sector. The Delivery Body suggests engaging in that process to ensure your views are considered in any changes to the framework.

You have done a great job stimulating supply of demand response. Market price has therefore collapsed. How will the companies in this room stay in business?

We are glad that our work to increase competition in our markets by lowering barriers to entry and standardising the available products has been recognised. However, in order to create a functioning market with a stable market price, competition needs to be supported by more frequent market opportunities. To this end, we will be trialling a weekly cleared price auction for our frequency response products later in the year.

National Grid services are becoming more transparent but it took a while. How do you make sure that new local markets will be easily accessible right from the beginning?

This is an important consideration, and we are ensuring that the learning we have gained through changing our own markets is being fed into the work being undertaken by the ENA's Open Networks project.

30-50% of tenders are from non-BM providers. How does this translate to MWs procured and value given out? How much of the 48% non-BM DSR would come from non-renewable generators e.g. Diesel generators?

We recently published breakdowns of our various services by participant technology type and market size in the Power Responsive Annual Report for 2017: <http://powerresponsive.com/updates/>

What percentage of balancing services are truly DSR (as opposed to embedded generation). Should anything more be done to boost DSR?

We recently published breakdowns of our various services by participant technology type and market size in the Power Responsive Annual Report for 2017: <http://powerresponsive.com/updates/> In terms of reducing barriers to market entry for non-generation DSR, the upcoming weekly auction trial aims to address one of the main issues of forecasting availability by moving procurement as close to service delivery as currently practical.

Is mostly buying reserve from non-BM generators a sign that the energy market is failing?

The makeup of energy market participants is changing for a number of reasons, such as the shift in technology types driven by carbon reduction goals, and we need to ensure that our balancing services markets do not preclude any type of provider from participating if they meet the minimum technical criteria. Our aim is always to minimise the costs of our actions to consumers.

What volume of Frequency Response will be procured in each of the business-as-usual FFR and new FFR week ahead market (Dec-18)?

We will be communicating this information through the FFR market information report in due course.

Will 1MW remain as minimum size bid for FFR assets and why?

We believe that, at present, 1MW strikes the right balance between lowering barriers to smaller parties whilst minimising the administrative burden on the SO.

DNOs secured a large volume in last FFR tender with assets funded by a price control when market participants are struggling to stack revenues.

Ofgem reviewed the participation of the ENW CLASS innovation project in the FFR market prior to its participation; as part of our licence, we cannot exclude providers based on their technology type.

What were the key implications of the Reactive Power Roadmap for flexibility providers?

We are working to create new market-based solutions that enable providers to offer reactive power for voltage control. Initially, we will improve transparency of information and review the methods we currently use to procure reactive power at transmission. Our Power Potential NIC project with UK Power Networks is exploring how distributed flexibility providers can participate in a new set of arrangements via technical and commercial trials throughout 2019 in the South East, which will inform new market arrangements.

Session 2: Whole electricity system opportunities for demand side flexibility

Considering the opportunities for demand side flexibility across transmission and distribution networks, the importance of coordination and ensuring propositions are accessible to and shaped by those looking to participation in services.

Cathy McClay (National Grid) chaired the session in which the ENA, National Grid ESO, UK Power Networks and ICON shared their views on the development of commercial solutions to network constraints, whether it is necessary to distinguish between transmission and distribution from a provider perspective, and how the parallels between different networks can be taken advantage of.

Randolph Brazier (Energy Networks Association) gave a recap of the ENA's Open Networks Project and it's objectives to:

1. Develop improved T-D processes around connections, planning, shared TSO/DSO services and operation.
2. Assess the gaps between the experience our customers currently receive and what they would like, and identify any further changes to close the gaps within the context of 'level playing field' and common T & D approach.
3. Develop a more detailed view of the required transition from DNO to DSO including the impacts on existing organisation capability.
4. Consider the charging requirements of enduring electricity transmission/distribution systems.

The project is capturing future views of the whole electricity system using the Smart Grid Architecture Model (SGAM), which is a visual representation of a smart grid and the interaction between different market actors.

Five 'worlds' are being considered, covering options for different roles of and interactions between market actors, and the effectiveness of each world will be considered against a set of criteria that stakeholders will help to define. This exercise will help to identify any 'quick wins' that could be rolled out, for example any practices which are seen as beneficial across all five worlds.

Andy Wainwright (National Grid) raised the question of how we make opportunities accessible for those parties who don't see the distinction between transmission and distribution networks and services. Facilitating whole system outcomes is recognised by stakeholders as a priority area under the next regulatory framework and the audience were encouraged to engage on work in this area to help shape future approaches.

Sotiris Georgiopoulos (UK Power Networks) gave an overview of UK Power Networks' Flexibility Tender, through which demand side flexibility is helping to address network constraints, and some of the learning points. These include; the value of having to make contracts non-exclusive, how participation could be maximised by increasing lead time for providers, and providing longer contracts that deliver certainty. This feedback will inform UK Power Network's Flexibility Roadmap and a second round of tenders will be launched soon to meet requirements out to 2023.

Georgina Penfold (ICON) encouraged the industry to think more broadly about the interpretation of 'whole system' – to an end-user this means much more than transmission and distribution. The impacts of 'Beast from the East' earlier this year highlighted the vulnerabilities in flexible purchasing and the cost implications are yet to fully filter through for consumers on purchase-in-advance contracts. End-users are investigating storage and actively engaging in peak lopping and load shifting. They are really engaged right now and eager for education on the DSO transition, as well as other projects and initiatives, including: Elexon's white paper on opening up access to the Balancing Mechanism, Centrica's Local Energy Market (LEM) and National Grid's reform of balancing services.

Panel discussion

How is the ENA's Open Networks Project working with the industry and maintaining the appropriate pace? An open invite was offered to the audience for people who are not already represented on the project's Advisory Group, which aims to ensure that the views of market actors across the industry are represented, and webinars and consultations related to project deliverables were highlighted (more details in the Session 2 slide deck).



The Open Networks Project has received feedback that the industry can find it challenging to keep up with the pace of change so the group has recently consolidated its work to make it more transparent to stakeholders. It was highlighted that GB is seen internationally as leading on the transmission-distribution interface and the smart grid transition, which is a significant achievement. The Open Networks Project has focused effort to ensure the upcoming Future Worlds consultation is accessible to all audiences in order to maximise participation.

How will Distribution Network/System Operators and Transmission System Operators balance the need to access flexibility with connections for generation in the same constrained areas?
Regional Development Programmes (RDPs) are underway between National Grid SO and three DNOs – UK Power Networks, Western Power Distribution and Scottish Power Energy Networks – tackling whole electricity system issues on a collaborative basis to realise innovative new ways of working. This includes promoting efficient management of DER connections. Under one RDP, National Grid and UK Power Networks have unlocked 500 MW of capacity on the distribution network. National Grid is looking to roll this approach out more widely and welcomes feedback.

Q&A – additional questions from the Forum (answers supplied by various panellists)

As more capacity is connected at distribution level, is there an argument for cost socialisation of reinforcement, as there is at transmission level?

Currently, distribution network connectees pay for their connection and any reinforcement associated with one voltage above that. Any reinforcement requirements above that get socialised, which is what we call “residual network charges”. Work is currently underway to assess how residual network charges should be set and recovered as part of the Significant Code Review (SCR) project led by Ofgem. More information can be found [here](#).

How long until the blockers to assets contracting for TSO and DSO services in tandem are removed? Players in Frequency Response and the Capacity Market are already on the way to providing services to DNOs. The Open Networks Project is looking at the different routes to procurement for this, and there are 5 options that we will be consulting on at the end of July. ‘Stackability’ of services across different markets will be critical going forward to increase liquidity and improve price.

Who has the final say if network competition leads to different costs and benefits to different parties? Is it ESO’s role to resolve this conflict?

At present we have an established process for major investment decisions - the Network Options Assessment. The final say in this process is by Ofgem.

What are the ESO's plans to ensure that new decentralised flexibility accessing the Balancing Mechanism will not experience asset bias within the control room?

The ESO welcomes all forms of service provider and is required to be transparent and non-discriminatory in its decision-making. Part of this is ensuring a level playing field.

Relaxation of ROCOF has provided free capability to DNOs / ESO that should be marketed. Will Grid Code change back when whole system market is available?

Loss of Mains protection changes will remove an inefficiency that consumers are currently paying for. Some value has already been delivered and completion of the work will deliver this in full.

Session 3: Industry updates – a look ahead to industry change impacting demand side flexibility

This session covered two topics that will deliver change for demand side stakeholders, providing an update on the latest developments and the opportunity to seek clarification as we look ahead to the coming year.

Brendan Coyne (The Energyst) chaired independent sessions covering wider access to the Balancing Mechanism and an update on Ofgem’s Targeted Charging Review.

Chris Fox (National Grid SO) presented on work related to wider access to the Balancing Mechanism (BM). The combined effect of an increasing proportion of flexibility not being accessible through the BM and our short-term variable reserve requirements increasing mean that from an operability perspective the current BM arrangements are not sustainable. There is also the potential to unlock economic benefits from wider BM participation – several studies have reported significant consumer benefits ranging from £110-500m p.a. by 2020. From the perspective of a provider, accessing the BM provides an additional stackable revenue stream which, when set against the challenging commercial environment embedded providers now find themselves, will be increasingly important to their commercial viability.

The SO recognises it has a key part to play in supporting the industry through the transition to the smart and flexible energy system of the future. Part of this process has been publishing a series of product roadmaps. There has been a focus on improving the information shared with industry, simplifying our balancing services and removing barriers by making our products more market based. The product roadmaps also set out the direction for the implementation of EU standardised products, which will give market participants increased access to pan-European markets. Wider BM Access is the next step on this journey.

National Grid ESO wants the GB Balancing Mechanism to be open to all without significant barriers to entry, ensuring it is competitive and robust enough to continue to be a core ESO tool for managing the system in balancing timescales. They also want to ensure that the BM contributes to the aim of creating an investable market for all as set out in the System Needs and Product Strategy document last year.

There are two broad areas of focus for wider access to the BM:

1. Delivering Equal Access
 - Improving existing routes to market for suppliers wishing to actively participate in the BM with aggregated portfolios.
 - Through National Grid ESO's work on facilitating open participation in project TERRE, which is the first of several EU balancing platforms envisaged under the EU balancing guideline, the ESO has created a route into the BM for embedded parties who want access independently from suppliers.
2. Delivering Equal Treatment
 - Ensuring a level playing field by linking equal treatment (such as through P354 removing non-BM spill) with equal access to markets.

This is all being pulled together into a Wider BM Access Roadmap which will set the challenges associated with Wider BM Access and the activities National Grid ESO is planning to overcome them for both existing and new routes between now and December 2019.

Andy Burgess (Ofgem) presented on Ofgem's priorities for the energy transition, an overview of Charging Futures and an update on new network access and charging arrangements.

Q&A – additional questions from the Forum

What's the time-frame of project TERRE? Is this being factored in for the whole system approach? Project TERRE is due to fully go-live by December 2019. As part of TERRE processes there are steps to enable TSOs to take into account conditions on regional distribution networks.

UK carbon price support makes marginal cost of run higher for GB plant. Is there a risk of TERRE being biased to mainland Europe providers?

Whilst measures have been taken to ensure that providers will participate in TERRE on a level playing field, some differences between national markets do exist. The TERRE (LIBRA) algorithm will activate units based on what is the most economically efficient, and all units will be paid the same marginal price (unless congestion creates different price zones).

Do we need legislative changes to make TERRE happen?

No. Implementation of TERRE is already enabled at a legislative level through the European Balancing Guideline. However, there are a number of changes to GB Codes which are required to enable this (BSC modification P344, Grid Code modification GC0097, CUSC modifications CMP295,296,297)

Will all coarse energy balancing actions be taken through TERRE or will BM still be used for this? Whilst we anticipate that TERRE will provide an additional route to address our balancing needs in the most cost-effective way for the end consumer, we will be retaining the GB Balancing Mechanism to ensure that GB's balancing needs are met adequately.

Have National Grid identified the savings available in the BM if they have access to truly flexible capacity which is only there to provide balancing services?

Several studies have investigated the economic benefits of increasing participation in the BM. While these studies vary widely in the consumer benefits they report (£110-500m per annum by 2020), they all nonetheless point to significant benefits resulting from increased liquidity and competition in the BM (Sources: "Understanding the Balancing Challenge", Imperial College and NERA, August 2012 "An analysis of electricity system flexibility for GB", Carbon Trust and Imperial College, November 2016, "An assessment of economic value of demand side participation in the BM and evaluation of options to improve access", Charles Rivers Associates April 2017)

With greater BM participation is the aim to reverse the growing practice of Net Imbalance Volumes (NIV) chasing?

This is not the primary aim of increasing BM participation. Wider access to the BM brings a number of benefits to the GB market. It enables us to have the appropriate tools in place to manage system operability, maintain a level playing field between participants and deliver value to the end consumer through a competitive and efficient market.

How does the approval of P354 (ABSVD on reserves) sit with the ability of providers to stack revenues?

P354 will ensure equal treatment between BM and non-BM providers of balancing services by ensuring that delivered balancing services volumes are neutralised in the relevant imbalance account. However, equal treatment and equal access to markets go hand in hand, and removing barriers to entry to the BM will provide additional revenue streams for current non-BM providers.

The BM is already open to distributed generation if structured properly. Is greater automation needed to make calling small units more likely?

Whilst the BM is already open to distributed generation, stakeholders have identified a number of barriers to entry under current arrangements. Greater automation alone would not solve all of these barriers. Our wider access roadmap is due to be published later in July 2018. This sets out how we plan to facilitate increased wider access to the BM by working to remove structural barriers to entry for market participants.

What about reducing gate closure or moving to 15 minute settlement to align with the rest of Europe (i.e. EEX market coupling area)?

The TERRE gate closure time for submission of bids will be 60 minutes for an interim period, before moving to 55 minutes. A cost benefit analysis has concluded that the benefit of GB moving to a 15 minute settlement period is strongly negative.

Will an increase in BM capacity reduce National Grid's STOR capacity holding requirement?

STOR requirements are unlikely to be reduced in the short-term, however, utilisation of STOR may be reduced due to the impact of closer to real-time markets such as TERRE.

Drinks reception – a celebration of demand side flexibility achievements

*Following our afternoon Flexibility Forum, guests gathered to hear speeches from **Fintan Slye** (Director of UK System Operator, National Grid), **Jonathan Brearley** (Executive Director of Systems and Networks) and **Laura Sandys** (Challenging Ideas).*

Electricity system of the future will be radically different. Demand side flexibility, and whole electricity system coordination, is vital in enabling smart, low-carbon system. It's clear there is great enthusiasm to unlock demand side flexibility, and we've seen industry, policy and regulatory steps to help achieve

this.

The speakers reflected on the pace of change in the industry; the role of flexibility in the future energy system; and the importance of have the appropriate price signals, frameworks and collaboration in place to enable this.

Guests were introduced to the demand side flexibility Success Stories by video – six case stories demonstrating achievements that have unlocked flexibility since the launch of Power Responsive in 2015, shortlisted by an external panel from Sustainability First, EnergyBridge, the Association for Decentralised Energy and the Major Energy Users Council.

All case studies submitted to the Power Responsive team through this process were great examples of progress over the last three years, contributing to raising awareness, building confidence and informing future flexibility solutions.



Thank you for your involvement

We are grateful for the participation of our speakers and chairs, would like to thank those who have assisted us in inviting their members and stakeholders to the Summer Reception.

Thank you to those who exhibited at the event:

- Ameresco
- Charging Futures
- Cornwall Insight
- EDF Energy
- Energy Pool
- ENGIE
- Environment Agency
- Flexitricity
- Major Energy Users Council
- Open Energi
- Power Potential NIC project
- REstore
- SmartestEnergy
- UK Power Networks
- Western Power Distribution
- National Grid teams covering:
 - *Account Management for balancing services*
 - *Capacity Market*
 - *Enhanced Frequency Control Capability NIC project*
 - *Platform for Ancillary Services (PAS)*

Flexibility Forum Slides

Please find links below to our presenter slides.

- [Session 1: Policy, regulation and System Operator update](#)
- [Session 2: Whole electricity system opportunities for demand side flexibility](#)
- [Session 3: Industry updates – a look ahead to industry change impacting demand side flexibility](#)