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Demand side flexibility: The state of play

A Utility Week report,
created in association with CGI

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Introduction

As demand side flexibility creeps from the peripheries to take centre stage in the operation of a net-zero power system, Utility Week asks why recognised barriers to market development are taking so long to break down and unveils a major new initiative to help boost momentum.

The introduction of the Demand Flexibility Service - a dedicated flexibility service for consumers with the appetite and ability to turn down their power usage in response to prompts - in the winter of 2022/23 - was hailed by many as a 'tipping point' in the development of energy flexibility in GB, helping to shift it from niche concept to national headline material.

Around 1.6 million households and businesses signed up to National Grid Electricity System Operator's (ESO) DFS last winter, shifting 3,300MWh of energy demand over the course of a series test events and proving distributed flexibility has a meaningful role in fulfilling system needs.

This winter the ESO predicts the level of flexible capacity to be made available via the DFS to triple to 1GW. This represents promising progress given the ESO will be increasingly reliant on demand-side flexibility to balance a system powered purely by zero-carbon generation by 2035, while also seeking to minimise the costs of decarbonisation through an ongoing affordability crisis.

To help support a cost-effective energy transition the ESO is planning to have a minimum of 4GW of flexibility available from residential and industrial and commercial customers by 2050 - this is based on conservative forecasts from its Future Energy Scenarios (FES) work. As much as 13GW could become available under its more optimistic 'Consumer Transformation' scenario.

Indeed, the ESO is already basing its planning for the network on an assumption that flexibility will be reducing peak demand by 15% by 2035. So, while recent progress on activating the demand side potential of consumers should be celebrated, momentum must be sustained and boosted if the ESO's expectations of between 1.5-7GW by 2035 are to be met - with serious implications for future system operating costs.

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Barriers to progress

The energy industry faces an uphill battle in increasing the level of participation in flexibility markets from small-scale distributed assets and residential customers.

These barriers include delays in the arrival of market-wide half-hourly settlement (MHHS), restrictive system codes and market rules, outdated IT systems and challenges building revenue cases for market participation due to a lack of clarity on how flexibility markets will operate. These challenges are linked to persistent questions over the requirement for some kind of market facilitator to help address challenges and govern a smoothly operating flexibility marketplace.



In its Future of Distributed Flexibility call for input, these barriers were identified by the regulator, Ofgem, who grouped them - and others - into four key underlying market failures: imperfect information, limited oligopsony market coordination, a structural lack of trust, and market-specific issues.

Ofgem is trying to address a number of these failures and underlying challenges for flexibility market participants through the creation of a common digital energy infrastructure or Flexibility Digital Infrastructure (FDI). It hopes this will improve market transparency and coordination and its work has been broadly welcomed by industry as a positive step. However, there are concerns over the timeline for implementation.

Indeed, questions are being asked about how to balance a desire to achieve consensus on the right market arrangements with the need to drive change forwards and hit targets for cost-effective system decarbonisation. Even with Ofgem taking a mandate to address market failures, can the necessary momentum be created across the market to deliver required changes?

In this report, produced by Utility Week in association with CGI, we explore these questions with leading industry commentators. Their reflections are grouped into three main areas:

- **How to build on the foundations of the DFS**
- **An appropriate timeline for delivery of FDI**
- **Appropriate action on commercial barriers**

A new Flexibility Forum

This report marks the beginning of a major new initiative from Utility Week, designed to support momentum and ambition in tackling barriers to development of vibrant energy flexibility markets across Britain.

Our Flexibility Forum, delivered with strategic partnership from CGI, will bring together leading minds in the development of energy flexibility and create a platform for unbiased sharing of opinions and ideas on necessary action to address market failures and challenges.

The first meeting of Utility Week's Flexibility Forum will take place in January 2024 with confirmed senior participation from varied and influential market players.

This January meeting will set the tone for an extended series of activity and content to be delivered by Utility Week, in association with our strategic partner CGI, over the course of 2024 and beyond.

Activities will include topical briefing sessions, industry debates and more.

Commenting on the creation of the Utility Week Flexibility Forum, CGI's vice president digital utilities, Richard Hampshire says: "Ofgem's Call for Input on the Future of Distributed Flexibility has the opportunity to build on the insights from innovation projects such as the TEF projects (TRANSITION, EFFS and FUSION) funded through their own Network Innovation Competition, as well as experience from other markets. By using its reach across the sector to create the Flexibility Forum and secure the participation of senior actors from across the entire electricity value chain, Utility Week has created a platform to surface and explore the challenges in establishing fair, well-functioning markets for flexibility services - markets that enable whole-system price discovery and, ultimately, empower consumers."

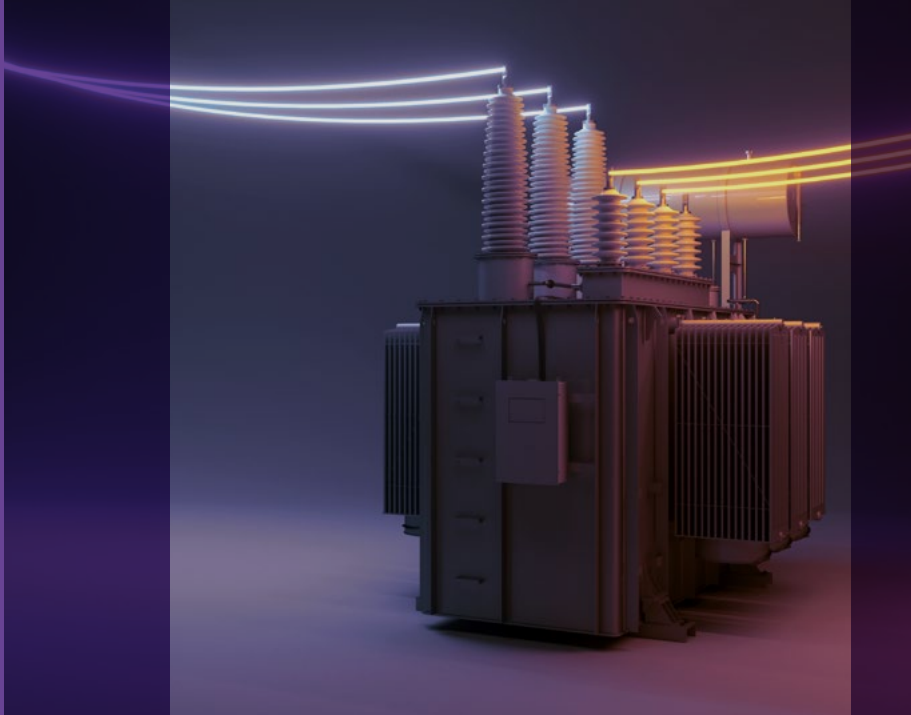
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Building on DFS foundations



The energy crisis sparked by the Ukrainian War helped create the circumstances for bringing the DFS to life and showcasing a small part of the potential that demand-side flexibility has to offer. For this reason, 2023 has been a “special year” in the development of energy flexibility says Yujia Du, distributed flexibility strategy manager at the ESO.

The first iteration of the DFS has realised around 200MW of flexibility from domestic consumers – a group that was previously completely untapped in terms of its flexibility potential. But while consumer engagement in the first season of the DFS should “absolutely be celebrated”, says Marzia Zafar, deputy director of digitalisation and innovation at Ofgem, she adds that the volumes of flexibility it delivered are “not even close” to representing a tipping point for the market.

Zafar – previously policy director at the smart energy platform Kaluza – points out that of the 1.6 million participants in the initial DFS, around 50% were the customers of just one supplier, and represent only a small percentage

“ [2023 could be a tipping point] - if we don't let all the energy that has come into this market over the last couple of years just dissipate, which it could do and there's a risk of it doing.”

Elizabeth Allkins, head of energy strategy, Ovo



of its entire customer base, indicating the majority of the market is still unengaged.

“I don’t think we are even close; we have not even got the low hanging fruit yet. The tipping point for me would be a couple of million behind-the-meter devices connected to some kind of flexibility platform, which I don’t think is the case yet.”

Other informed minds agree with Zafar’s assessment, with some emphasising the need for more sophisticated and higher value services which exploit automation technologies more ambitiously.

Alastair Martin, chief strategy officer and founder at flexibility aggregator Flexitricity, says the DFS is “not a tipping point but is an opener in a sector which has had very little involvement.” He adds: “It is not very sophisticated or potentially very accurate.”

Martin says the lack of automation in the service, coupled with the ESO’s outdated IT systems, means the flexibility procured via the DFS was a day ahead of demand, limiting its ability to be called upon when actually needed. Although the ESO is heading in the right direction for this year’s iteration, there is still a long way to go before small-scale flexibility can be called upon in real time, he says.

Martin also believes the DFS has stimulated the “wrong type” of flexibility. “The very small stuff that DFS activated is not necessarily what we want. The stuff people will do in receipt of a text...we need it to be larger things like EVs.”

“The tipping point for me would be a couple of million behind-the-meter devices connected to some kind of flexibility platform, which I don’t think is the case yet.”

Marzia Zafar, deputy director of digitalisation and innovation, **Ofgem**



While Martin believes automation of larger assets such as electric vehicles (EVs), heat pumps and domestic batteries should be the focus, the service was designed around energy suppliers who wanted the opportunity to engage with their customers on the topic.

Other experts, however, are more optimistic about the legacy that the introduction of DFS will bestow on demand-side flexibility development.

Elizabeth Allkins, head of energy strategy at energy supplier Ovo, believes 2023 has the potential to be remembered as a tipping point in the story of demand side flexibility. But only if industry grasps the nettle and throws itself into the resolution of barriers to progress. She also cautions that delays to key enabling factors for demand-side flexibility growth – most prominently the introduction of MHHS – could put the brakes on the momentum DFS has started.

“[2023 could be a tipping point] - if we don’t let all the energy that has come into this market over the last couple of years just dissipate, which it could do and there’s a risk of it doing.”

For Allkins, MHHS, which has been delayed until potentially 2027, presents a “hard barrier” to the take-off of flexibility services for distributed assets. “I think the DFS is a good example of where being a bit creative has allowed the ESO to get around that challenge. However, there is a lot of complexity that comes from the approach that they’ve taken and in order for something like that to really scale and be efficient and really run at low cost to consumers we need MHHS.”

Another hard stop is access for smaller assets such as EVs and heat pumps to local flexibility markets run by the new Distribution System Operators, and also the ESO’s balancing mechanism. Allkins says the practicalities of aggregating and bidding

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make it incredibly difficult to monetise small-scale flexibility in the short-term and means flexibility cannot scale beyond proof-point.

The ESO's Du agrees that the reformation of its markets is one of the biggest barriers to growth of distributed flexibility and she insists the ESO is working hard to "make sure our markets are appropriately designed and evolved to really accommodate new technology types and both our technical and commercial requirements are fit for purpose."

And the ESO is not acting alone to pursue these changes. Zafar acknowledges that technical proofs of concept for demand-side flexibility are well-ahead of changes to market codes and structures which recognise the full spectrum of their value to the energy system and consumers. To put this imbalance right, she says Ofgem is in the process of doing an internal inventory of all the codes and regulatory blockers that need to be fixed to allow a level playing field. A plan of action following this assessment is due to be published in early 2024.

Viewpoint

"Beyond the obvious benefits to the system during the events, DFS delivered two important insights.

"Firstly, relatively modest levels of financial reward motivate people to act and manage their demand. Secondly, the participation of consumer energy resources (CERs), in aggregate, can make a material contribution to meeting electricity system needs.

"It's also clear from the contributors' comments that the areas requiring action are understood. These include clarity on the governance arrangements that will enable CERs to compete equitably to provide flexibility services and for customers to realise fair value. Additionally, automation technologies will underpin the greater participation required for the market to pass the 'tipping point'.



Richard Hampshire
Vice president digital utilities
CGI UK



Time for delivery of FDI



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While Ofgem forges ahead with an examination of industry codes and regulatory arrangements to assess their limiting effects on demand-side flexibility it also has other major questions to address. Who should be appointed to act as a neutral market facilitator for flexibility? What should the responsibilities of such an entity be? And what should a Flexibility Digital Infrastructure (FDI) look like?

Answering these questions will help address the Tower of Babel which has been created in the industry through the ad hoc introduction and adoption of different rules, standards and processes to allow for the immediate needs of market pioneers, but which are now severely impacting the accessibility of flexibility markets to a new generation of participants.

Ofgem is hoping a newly defined FDI will especially address three of the four market failures it has identified - imperfect information, limited oligopsony market co-ordination, and a structural lack of trust.

Earlier this year it consulted on three potential archetypes for an FDI. A “thin” archetype would be a directory that lists market operators and flexibility providers. The “medium” archetype would be an exchange platform that hosts multiple

markets. The “thick” archetype would be a central platform that contains multiple markets, undertaking every step of their process and co-optimising across them.

Ofgem’s Marzia Zafar says that, at the very least, the FDI will be some form of asset register so that the market will be able to identify what is coming into the system. One consideration is whether the use of such a register should be mandated with many in the industry in favour.

Ofgem is hoping that a proactive party in the industry will then take the initiative and build a “Deliveroo-style” app for flexibility opportunities, rather being forced to develop and implement something of this nature itself.

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Flexitricity's Alastair Martin says most voices in the industry are in favour of a medium solution. "If Ofgem can keep the ambition to the practical level, then pushing forward with a form of the medium paradigm could move the dial in a way that is achievable and establish some processes that are a workable compromise between transformative and radical on the one hand, and practical and deliverable on the other," he says.

However, concerns have been raised over the time such a solution would take to implement, and over whether Ofgem's involvement would result in a hiatus in work that is already underway. The Association for Decentralised Energy (ADE), which represents flexibility aggregators, responded to Ofgem's plans by saying the regulator would need to show "strong leadership" if the FDI was to be in place by 2027, when other important programmes of work – including MHHS – are due to complete.

Ofgem is due to consult again on its plan in the spring – a step which in itself postpones any real action. One expert commentator reflects: "It is likely to take Ofgem at least three years, but more likely five, to get all of the digital infrastructure necessary to support the flexibility market in place. So losing another 12 months to consultations before starting the process is only going to increase the challenge and risk."

But Zafar says the consultation process is essential. "We have to also bring everybody with us, if we do it on our own then there will be a line of protest saying Ofgem is doing things on its own without consulting stakeholders, this stuff just takes time unfortunately. Anything that we do will take months to design and bring forwards."

Like other frustrated parties in industry, Ovo's Elizabeth Allkins believes Ofgem could be moving faster on key issues such as the network charging code review. But she also acknowledges that Ofgem is tackling difficult problems which will need some thought to solve.

Notwithstanding this, she adds that one area which could be easily improved is internal alignment. "It's definitely something for Ofgem to do to get more aligned within itself on where it sees the future of domestic flexibility – what's the North Star that they are aiming for? – then we can be moving quickly on these incremental decisions in the context of that."

The onus is not all on Ofgem though. As an organisation with a key role to play in unblocking the flexibility market, the ESO's Du says her organisation is very aware of the need to increase its own pace. "We are looking at how we can improve the way that we make decisions in terms of pace and working with other organisations to be more agile in the way we design products and make decisions around policies."

Viewpoint

"In its Call for Input, Ofgem recognised the need for urgency, stating that, 'an organic solution might take 5-10 years to develop', putting delivery of a decarbonised power system at risk.

"The good news is that, as a sector, we are not starting from a blank sheet of paper. The investment made through various Ofgem, BEIS and now DESNZ innovation funds has already delivered an evidential base that can inform decisions and accelerate progress.

"But, even with strong intervention, there is a critical path to developing fit-for-purpose market arrangements. Time is of the essence and Utility Week's Flexibility Forum can play a vital role in supporting Ofgem deliver the necessary consensus."



Richard Hampshire
Vice president digital utilities
CGI UK

Asset registration

Ofgem has suggested that the FDI will, as a minimum, provide some kind of asset register function for GB flexibility markets – and industry has called for mandated asset registration. This supports the longstanding recognition that an ever smarter energy system, with ubiquitous intelligent devices and assets capable of turning demand up or down in response to signals, must come with a comprehensive approach to registration of those assets.

Back in 2019, coordination of asset registration was a key recommendation of the Energy Data Taskforce in its seminal report A strategy for a modern digitised energy system. The Taskforce said there was a clear need for a strategic approach to coordinated, simple and user-friendly registration of energy assets, which would support compliance and boost the accuracy of system data. This, it said, is a fundamental for a system in which demand-side participation in system operations is expected to become the norm.

Two years after the Taskforce made its recommendations, a £65m Flexibility Innovation Programme from government saw the birth of the Automatic Asset Registration (AAR) Programme, a competition to help generate solutions for the automated registration of energy assets, addressing the failings of what is still a patchy and predominantly manual process.

An AAR solution developed via the above programme is expected to progress into pilot testing in 2024.

The market facilitator

Shining the light back on the regulator, another thing Ofgem needs to make a decision on is who will take on the role of the market facilitator, which will lead, coordinate and monitor the development of local and national flexibility markets.

Ofgem will need to make the casting vote as opinions in industry are split between which of the two contenders in the ring – Future System Operator and Elexon – should win out.

Showing her hand, Zafar comments: “Wouldn’t it be nice if the system operator was the champion of small-scale flexibility? Somebody has to convince us that this championing of small-scale flexibility has to be done by somebody else.”

Unsurprisingly, the ESO’s Yujia Du is also pro-FSO as a solution to the market facilitator questions and insists the role would not affect its integrity. “The integrity of the market facilitator role is really important. We want to make sure that an independent organisation like the FSO can make impartial decisions across the ESO and DSO markets in an informed way, and in a way that ultimately delivers consumer benefits.”

However, some in the industry are concerned about how much independence between the two roles can be achieved, how much the FSO can feasibly take on.

Ben Godfrey, director of the distribution system operator function at National Grid Electricity Distribution (NGED) comments: “We have seen that the ESO naturally has a tendency to think from a centralised, keeping the lights on perspective and its really important as DSOs that we get a fair access to the market.

“We are concerned that if the ESO was the market facilitator that there wouldn’t be enough cultural change to be able to enact the independence, but it would be possible with the right level of governance.”

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Action on commercial barriers

Once appointed, two of the market facilitator's key roles will be determining which market would take precedence if an asset is called upon by two different markets at the same time, and also creating stacking rules. Understanding how the different markets will interact is one of the biggest challenges facing DSOs who are trying to put together an attractive revenue case for participation in their local flexibility markets.



NGED's Ben Godfrey says the value of deferred network reinforcement should only be the "cherry on the cake" for providers of flexibility, with the "cake" being built up by different markets stacking together.

He adds that NGED is moving away from just thinking about stack-ability, and is now looking at split-ability, jump-ability and co-ordination of services. It currently falls to the ESO to determine if assets cannot co-deliver to different markets for technical reasons, or commercial ones. "If it's just a commercial reason then that's really not good enough. Pulling apart these rules is quite difficult for the ESO to do and they do have a really important job maintaining the security of the system," says Godfrey.

"But I was disappointed at the ESO for not allowing DSO services to be stackable with the DFS – they were seeking participation from domestic customers which is at a low-voltage level. Those assets have to be harvestable by the DSOs. It's critical that we work together as we are both going to need access to those assets. We as DSOs have made all our services stackable and we really implore the ESO to do the same."

Flexitricity's Martin agrees that the lack of agreed interactions between the ESO and DSOs is the big outstanding issue for enabling an efficient system to develop. He adds that individual DSOs have made really good progress, but networks could



find themselves with primacy rules that are "good enough" thrust upon them due to their inaction as a whole.

"The Open Networks programme has had plenty of opportunity to resolve that problem well in advance of the creation of the FSO and to establish a good model that would have created the precedent. They had the chance to do that and they have not done it. The Open Networks programme needs a very hard push to actually get these loose ends tied up."

To build a strong revenue case, flexibility providers will need to be aware and understand the different markets and opportunities available to them. Zafar says that a lack of customer awareness is one of the biggest unanswered questions from Ofgem's point of view, and it would like to be receiving more answers from energy suppliers about how this is going to be tackled.

"When we did the call for evidence on the customer journey, we asked whose responsibility it is to tell the consumer? Almost all energy suppliers said: "don't worry about it, we've got it, clean up your own house," But they didn't tell us how."

She continues: "We are investing billions of pounds in building a flexibility market but we have no idea if the 27 million EVs forecasted by 2035 will be 27GW of flexible load or if that equates to 27GW of additional demand that we have to meet. We are building the system around the belief that somebody will create a solution that hopefully won't see customers constantly checking prices and switching on and off appliances."

The choice of energy suppliers to design the DFS service around email and text prompts will not have allayed the regulator's fears. But Zafar adds that she doesn't think Ofgem should be intervening in what the customer journey should be, although it should have more of an idea of what the solutions in the pipeline are.

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Viewpoint

Allkins welcomes the new level of engagement energy retailers are seeing from Ofgem but says Ovo is bringing forward new propositions, and what it needs help with is removing the barriers. "We don't need [policymakers] to innovate in the market for us, what we need is for them to deliver the landscape to allow us to do that."

"Like smart meters, we need more policy and more direction from government to say that actually smart meters are really critical to the energy transition and we need stronger incentives for customers to take part in that."

The next step on the journey towards removing these barriers is a major consultation due to be published by Ofgem in the spring of 2024 over its plans for the FDI and also the contenders in the race for the market facilitator role.

In parallel, the creation of Utility Week's Flexibility Forum will ensure sustained coverage and informed debate over the best and most pragmatic options for ensuring we build momentum in the development of demand side flexibility opportunities and the realisation of its value to the energy system.



"Whilst much of the discourse remains rightly about the coordination of ESO/FSO and DSO use of flexibility, the impacts on other market actors must also be considered. What of the impacts on electricity retailers' balancing positions?"

"The contributors to this paper expressed the need for urgency in the design and facilitation of flexibility markets, which must consider what an increasingly distributed electricity system will look like post-2030. What roles will smart local energy systems play? What of the opportunity for peer-to-peer trading? Or, how might future reviews of electricity market arrangements impact on requirements?"

"As far as practical, decisions on design should enable flexibility providers to offer innovative new services to grow their revenues and encourage new buyers to enter the markets."



Richard Hampshire
Vice president digital utilities
CGI UK

Conclusions



**Demand side flexibility:
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Summary comments and conclusion from **Richard Hampshire**, vice president digital utilities, **CGI UK**

In its 2019 Future Insights Paper on Flexibility Platforms in electricity markets, Ofgem provided a useful frame to consider the functions, or “tasks”, required to effectively facilitate markets for flexibility. With its call for input on the Future of Distributed Flexibility the discussion has started to move from the ‘why’ and the ‘what’ to begin considering the ‘how’ and the ‘when’.

The identification of the four market failures and the potential for three of those failure to be addressed through provision of an enabling digital infrastructure, the FDI, that provides greater visibility of and access to information across system actors; addresses barriers to market access; and, improves trust; is an important step forward in delivering the vision set out in the Smart Systems and Flexibility Plan. That is, markets that reward participation of flexibility.

Ofgem’s Call for Input identifies that no single system actor has the functional and legal ability, legitimacy, or appetite to step up and take on the role of neutral flexibility market facilitator. Work needs to be done to achieve a consensus on what functions or “tasks” need to be delivered by a digital common, such as the FDI, in the customers’ interests. Typically, these need to be the tasks where the costs need to be socialised for the wider societal benefit of accelerating the creation of flexibility markets and delivering a net zero power system. Addressing barriers to competitive markets for flexibility services will enable market actors to offer innovative new products and services and give customers meaningful choices in how, and when, they consume energy. Who knows, with such an enabling digital infrastructure in place, maybe we’ll see a range of “Deliveroo-style” apps for flexibility services competing for customers’ business.

We mustn’t get locked into thinking that the role of a Neutral Market Facilitator and an FDI is limited to facilitating the markets for flexibility. Addressing the first identified failure of “imperfect information” is vitally important to system operators’ ability to keep the lights on. With the changing dynamics of the system and the projected growth in active use of demand side flexibility, system operators will need visibility of what is happening on their infrastructures if they are to be able to take operational decisions effectively.

Ultimately, the key message from this report is that the industry supports the need for a market facilitator and for a Flexibility Digital Infrastructure but we need to move at pace to define roles, responsibilities and requirements if we are to deliver a net zero power system within the targeted timeframe.

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