September 2019

Power to Participate

A specification for community energy to participate in a flexible energy system

regen
transforming energy

Friends Provident Foundation

Regen is a not-for-profit centre of energy expertise and market insight whose mission is to transform the world's energy systems for a zero carbon future.

Regen offers independent expert advice and market insight on all aspects of sustainable energy delivery. We use our technical expertise, industry research and policy knowledge to support a range of public and private sector organisations to make the most of their clean energy opportunities.

Friends Provident Foundation is an independent charity that makes grants and uses its endowment towards a fair, resilient and sustainable economic system that serves people and planet, connecting, funding, supporting and investing in new thinking to shape a future economy that works for all.

They are a catalyst for wider change, making an impact through continuous experimentation and shared learning, whilst investing in great social enterprises and using their money in line with their values.

This work is part of a collective action to highlight how important community energy is in delivering the changes we need to revolutionise our energy system. You can find out more by visiting Community Energy England's website[1], the work by Green Alliance, *Community Energy 2.0*[2], or the publication *Our six steps to delivering flexibility* by the Energy Networks Association.[3]

Contents

Our electricity system is changing. Centralised fossil fuel plants are being replaced by distributed renewable energy generation. Demand has been falling as we have got more efficient, but it is forecast to grow as we start to use electric vehicles and switch to electric heating.

Emerging information and communication technologies and the fall in the price of batteries mean that rather than simply building more generation and network assets we can make the most of flexibility in how we generate, store and use power to manage the electricity system more dynamically and efficiently. Markets are being established by national and distribution electricity system operators to value flexibility.

In an increasingly decentralised energy system community and local energy projects could play a major role in reducing demand and providing distributed, flexible low carbon assets all around the country. Understanding and participating in the purchase and provision of flexibility could also be a stepping-stone to developing local energy markets where communities can invest in, operate and benefit from their own energy assets.

We believe markets for providing flexibility to the electricity system should be open to community and local energy organisations. The organisations can access a wide range of local energy assets and bring a unique set of social and economic advantages to the table.

There are, however, significant barriers to community and local stakeholders engaging in flexibility services.

- **System operators** are required to be technology neutral and focus on reducing customer bills. Community and local organisations want to **use flexibility to enable more** low carbon generation to connect – contributing to addressing the climate crisis[4].
- Providing flexibility services is complex and prices paid are currently low, making investment to provide such services very challenging.

The aim of this document is to help address these barriers, in particular to:

1. provide insight to local and community energy organisations that want to explore new the opportunities flexibility services offer
2. provide a specification of the approach flexibility service purchasers should take to encourage the widest participation

This document has been written as part of *Power to Participate*[5], a Friends Provident Foundation funded project that is exploring how community energy organisations could be enabled to participate in emerging flexibility markets, as a key step towards a democratic and decarbonised energy system. Through this and other projects, Regen has engaged with dozens of community energy groups and most of the GB distribution network operators , discussing flexibility services in detail.

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Part 1

For community energy organisations: Markets for local energy assets

New community energy business models

Community energy groups in the UK have used incentive schemes such as the Feed in Tariff to implement renewable energy projects and earn an income. The majority of community energy projects are either wind or solar PV generation. Since 2015, there have been new planning barriers to onshore wind projects in England and in April 2019, the Feed in Tariff, the primary source of support for community energy, was closed to new projects.

These changes have radically altered the types of project community energy groups can develop and has forced them to explore a wider range of income streams, as reported in the most recent state of the sector report published by Community Energy England[6] and the Visions for the future of community energy in the UK report published by UKERC[7].

Despite these major changes to the community energy sector, and a significant reduction in new community energy groups forming, many existing community energy groups are exploring new business models and revenue streams to continue their journey towards local energy markets, such as battery storage and electric vehicle charging.

Community energy groups have been exploring these new business models for some time. This is leading many groups to look at more marginal, and risky, revenue streams that must be stacked together to create a viable business model. With Distribution System Operators (DSOs) now actively purchasing flexibility in specific geographic areas, there are now additional, albeit moderate, revenue streams that could potentially be accessed and added to 'the stack'.

The prices being paid for providing flexibility to DSOs or the National Grid Electricity System Operator (ESO) are low, but when stacked with other sources of income could help make projects financially viable.

However, to engage with flexibility markets community energy groups will need support from DSOs and the National Grid ESO to make participation easier and potential revenue prices clearer.

> **We want to connect more low carbon generation but can't see how flexibility helps us do this now.**
>
> Community energy participant

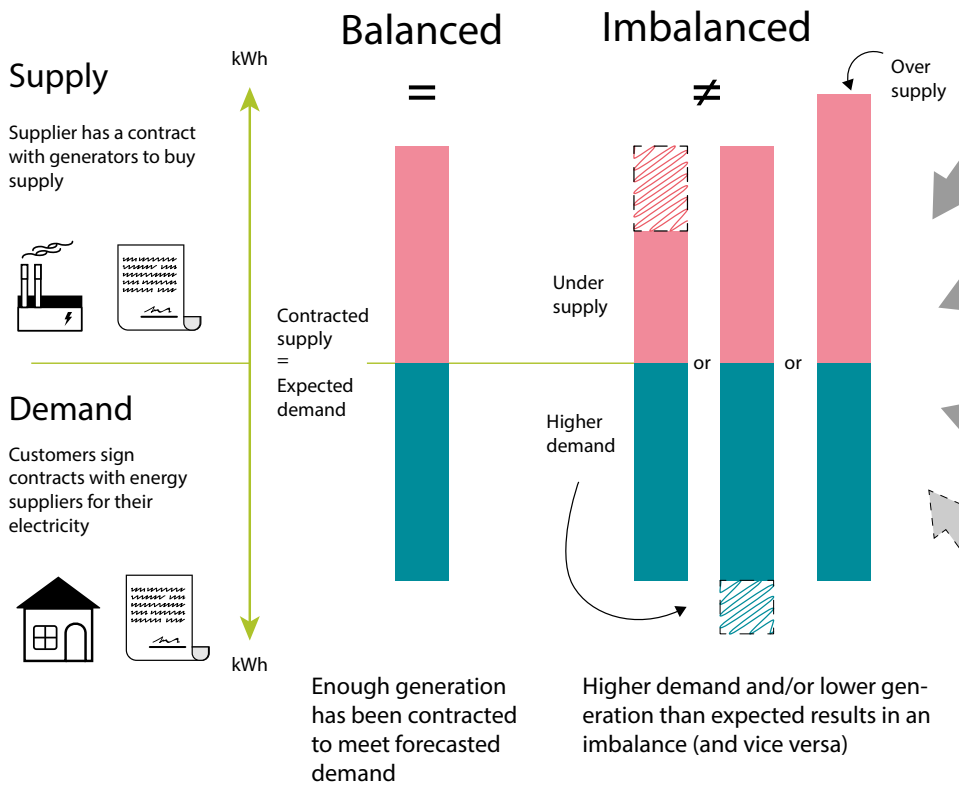
Why do we need flexibility in our national electricity system?

Electricity must meet a demand as it is generated. This means that for every second of every day, the electricity demand in the UK must be accounted for by an equivalent amount of generation or imported supply. Of course, our demand for electricity is not constant and varies every second. A certain amount of balancing the supply and demand has always been required, but with an increasing share of renewably generated electricity and changing patterns of demand, more flexibility will be needed in the future to keep the system balanced.

As intermediaries between the system operator and us as end consumers, energy suppliers keep track of the demand/ supply balance for their customer base and report this back to the system operator.

System balancing and operability:

Every supplier, reporting their kWh position every half an hour to National Grid



nationalgridESO Balancing services:

- Reserve services
- Response services
- Balancing mechanism
- Restoration services

Most of the variation can be predicted and accounted for by the energy suppliers who are matching the demand of their customers with the generation they have bought. There will always be things that happen to mean supply and demand are slightly out of balance, e.g. a power station needing unplanned maintenance, or demand being unexpectedly high. Or similarly, when solar or wind output is higher than was forecast and demand is below expected generation. It is the responsibility of National Grid ESO to ensure supply and demand nationally are balanced and they do this by buying flexibility: the ability to ask generators to turn up or down, or some large demand customers to turn up or down. There are several markets, and commercial services that National Grid ESO run to achieve this, using different 'ramp up' periods and offering different payments. It is up to National Grid ESO to try and balance the system for the lowest cost, using the range of flexibility services at its disposal.

The flexibility services that National Grid ESO buy to keep the UK system in balance form part of what is known as **Balancing Services**:

Short Term Operating Reserve (STOR)	STOR is standby generation, ready to feed the system at four hours' notice. Each unit will be providing at least 3 MW for two hours when required.
BM Start up	On-the-day access to additional generation. This service is only open to Balancing Mechanism participants (Owners of assets like gas power stations or big batteries that are already registered in the balancing mechanism to provide other services. You can register a qualifying BM unit through Elexon, via a 25-page application form[8].
Frequency response services	The frequency of our electricity system changes with the mix of generation and demand and must be kept within certain limits. National Grid ESO buys frequency response services that operate automatically to keep system frequency in check. There are two main types of frequency response products that NGESO procure: Firm frequency response and Enhanced Frequency Response (see table on page 18) .
Demand turn up (DTU)	Encourage large energy users and generators to increase demand or reduce generation at times of high renewable output and low national demand. The need for DTU is increasing year on year, but the volumes being bought have been relatively small with suppliers blaming long notice periods and the offline notice period as barriers to participation. In 2018, just 5 providers were contracted to provide 1,465 MWh at an average of £65.33/MWh.
Fast reserve	Large scale delivery of extra generation – at least 25 MW/minute, available within 2 mins of the command signal and sustained for a minimum of 15 mins.

Note: the above is not an exhaustive list of all services that National Grid ESO procure. For a comprehensive list see visit www.nationalgrideso.com

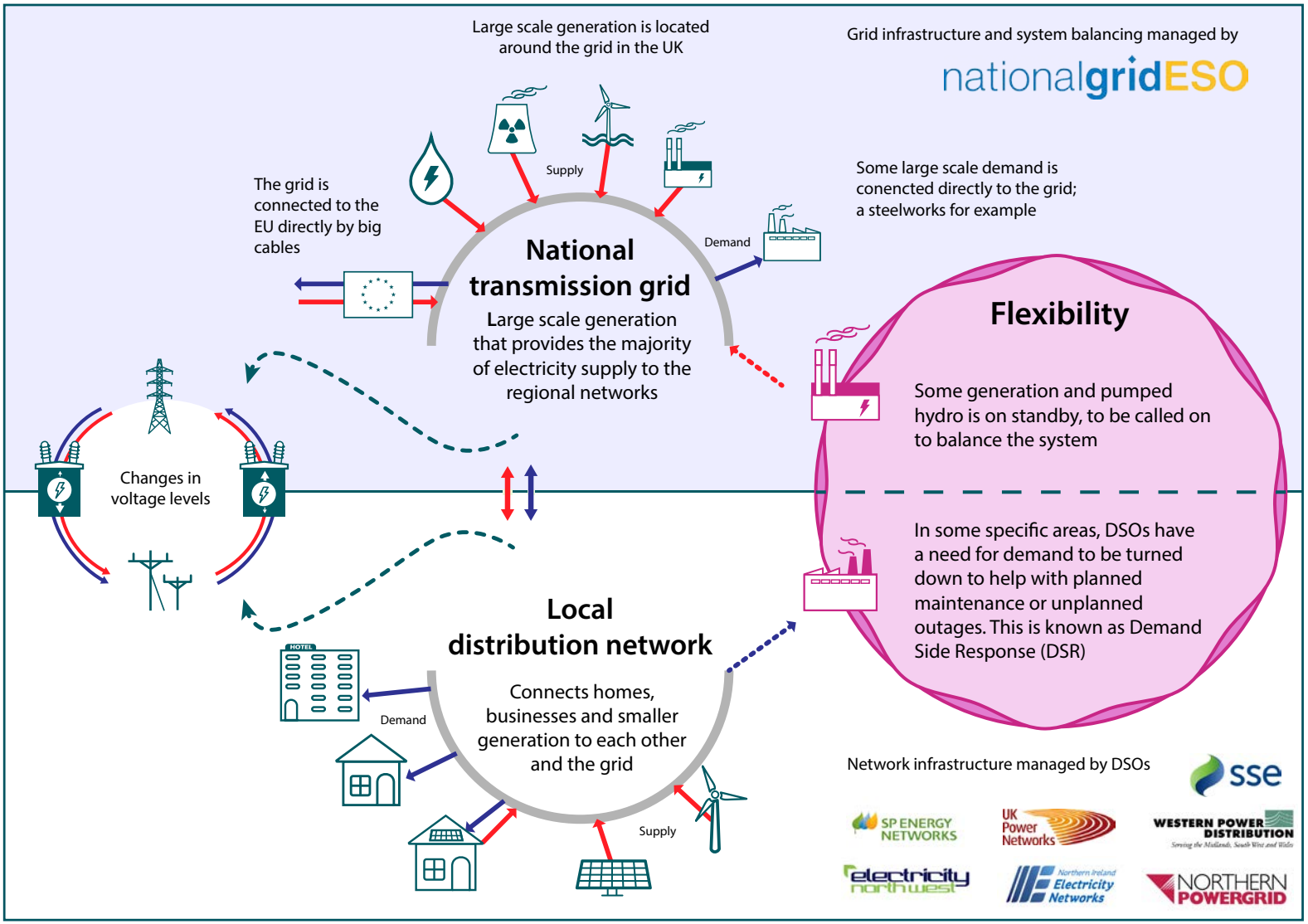
These balancing services run alongside the **Capacity Market** which aims to ensure we have enough capacity to meet peak demand by paying for extra generation and Demand Side Response (DSR) to be available, even when they are rarely called to operate. This market is jointly managed by National Grid ESO (in their separate role as Electricity Market Reform Delivery Body) and BEIS.

Other services bought and managed by National Grid ESO to manage the system within its technical limits include:

Reactive Power Services	Reactive power is an unwanted by-product of running our electricity system, in essence an unusable feature that must be minimised. There are two types of reactive power management services: Enhanced reactive power services (ERPS), and Obligatory Reactive Power Services (ORPS). ORPS is a requirement on all large-scale transmission connected generators to help control reactive power. ERPS is an additional service that can be delivered if there is extra capacity to do so.
System Security Services	A range of services that covers things like 'Black start', i.e. helping restart the national transmission system after a major outage

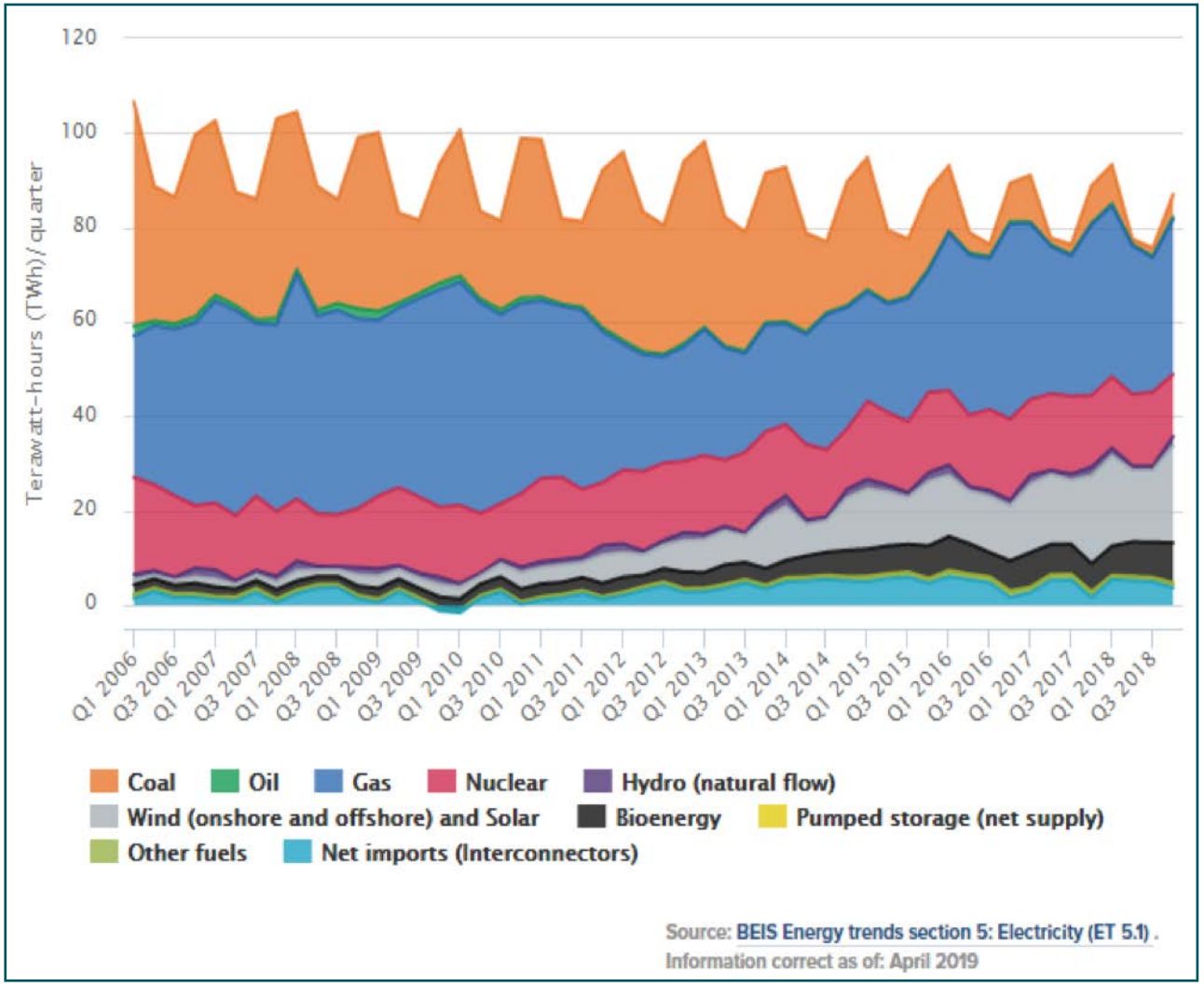
Why do we need more flexibility in the local system?

DSOs are contracting for the ability to ask customers to turn down their demand in some specific geographic areas at certain times. This type of flexibility is used to help DSOs manage planned or unplanned maintenance of the network, or to help constrained parts of the network to defer reinforcement, saving money for energy bill payers.

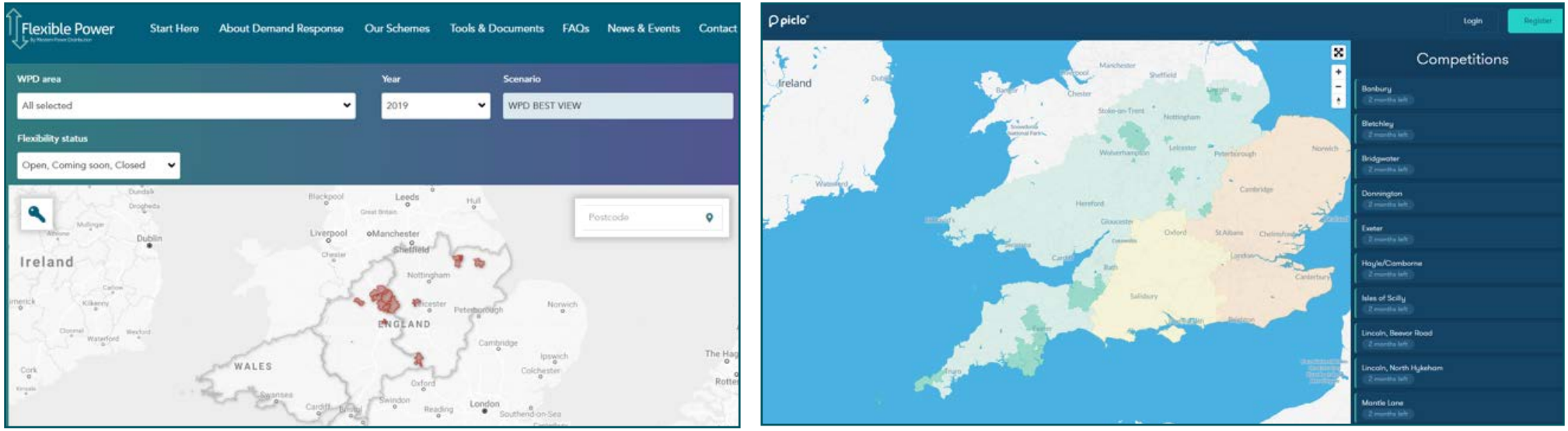


Since 2010, there has been a significant shift in how the UK electricity demand is met. Coal has been largely displaced by an increase in wind and solar, bioenergy and gas peaking generation. However, the increase in more variable sources of electricity means that there is more need for flexible generation to balance the system. As the proportion of variable renewables continues to grow, so will the need for more storage and cost-effective flexibility.

It isn't just the generation and demand balancing mechanism that needs more flexibility. There are a number of places in the UK where the electricity network is operating without much spare capacity or is constrained due to planned or unplanned maintenance. DSOs are now inviting customers in specific areas who can be flexible with their electricity generation or demand to apply. In constrained areas, if the supply and demand can be managed in this way, it can mean investment in network reinforcement can be deferred, potentially up to several years, saving bill payers money.



Source: BEIS Energy trends section 5: Electricity (ET 5.1) .
Information correct as of: April 2019



Online platforms used by DSOs to list the locations they are buying flexibility services

All the GB DSOs publicise their flexibility needs on the same online platform, **www.piclo.energy**, although Western Power Distribution publishes their flexibility opportunities on their own website too, **www.flexiblepower.co.uk**.

Any organisation with a Companies House number can setup an account on Piclo and upload details of their assets that could be used for flexibility. The Piclo platform then matches those assets with any live flexibility opportunities, and provides more information about the competitions.

The need for flexibility creates opportunity for community energy groups

As the need for flexibility increases, it is becoming evident that industrial and commercial sources will not be sufficient to provide it. The value of flexibility is not yet fully realised and the market is still evolving. Community energy organisations are well placed to engage domestic customers, and may already be working on projects that could also be used to provide flexibility and earn additional revenue. However, as the value of providing flexibility is currently quite low, it must be seen as a secondary revenue stream.

Flexibility services are about having some or all of your assets available to respond to a call to operate from a DSO or National Grid ESO, for specific periods of time, and receiving a payment in return.

Currently, flexibility is procured to either balance the system or address local issues on the network rather than to facilitate more renewable energy connections: but that may not always be the case and some DSOs have indicated that a more flexible and smarter system could in future be used to enable more distributed generation to connect.

Flexibility is seen by some community energy organisations as an opportunity to upskill and work towards local energy trading. The detailed understanding of energy flows at a local level, as well as metering and settlement processes necessary to engage in flexibility markets, are the same skills that would be needed to engage in a local energy market, so flexibility could be viewed as a step towards local supply. The platforms and processes used to trade flexibility services could be used for peer to peer trading and other forms of local supply in future, if regulation were to enable this.

What sort of flexibility can communities engage with?

- **Mostly, communities will be looking at local flexibility opportunities with their DSO (rather than the national balancing services), as they typically have lower minimum technical requirements and entry thresholds**
- **Reactive power services are less of an opportunity as they are mostly delivered by large demand sites with rotating machinery, or power factor correction equipment**
- **Black start services are for very big, mostly transmission connected fossil fuel plants**
- **Providing Fast Reserve is unlikely to be an opportunity for communities, as this has very high entry thresholds and stringent minimum technical requirements**
- **Firm Frequency Response (FFR) is one of the most valuable balancing services on a £/MWh basis, but has a minimum requirement of 1 MW and a range of response times from less than 10s to 30s and is normally met by switching on a generation asset or battery. The marketplace for FFR is also very competitive.**
- **Enhanced Frequency Response (EFR) was similar to FFR but the service had to be delivered much faster, within 1s and sustained for 15 mins. The only tender event for EFR was held in July 2016 and there are no plans to hold another auction.**
- **The amount of Demand Turn Up (as bought by National Grid ESO for national balancing purposes) in the last three years has fallen substantially, with only 1,465 MWh bought in 2018. In 2016 it was 10,800 MWh. In 2018 there were only 5 providers of DTU. There won't be any procurements of DTU in 2019.**
- **The Capacity Market is still holding capacity auctions for next year and four years' time, but is not legally allowed to make capacity payments, due to ongoing legal action in the European courts, started in December 2018. The UK government is expecting to resolve this as soon as possible, continuing to run the capacity market as normal, short of making payments until the 'standstill' period has finished. In fact, there was an auction as recently as summer 2019 to buy capacity for winter 2020.**

The role of aggregation

Flexibility can be provided by a single asset, or many assets bundled together. An aggregator is an organisation that bundles lots of assets, such as:

- smaller generators and batteries
- industrial loads like supermarket freezer units, water pumps and compressors
- domestic flexible loads like heat pumps, immersion heaters and EV chargers

Aggregators build these portfolios and use them to offer a significant aggregated flexible load to a procurer of flexibility like National Grid ESO or a DSO.

Most flexibility is contracted in the hundreds or even thousands of kW, far more than a typical household or small business is able to release. But if lots of households or small businesses have their demand (and/or generation) bundled together by a control system, this aggregated flexibility can be big enough to win contracts. Aggregators may be a way for community energy organisations to access flexibility market revenue streams without having to build large assets or engage directly with the complexities of bidding and contracting.

Aggregators are able to take part in most aspects of the electricity market, including the balancing mechanism and DSO flexibility opportunities, but requirements on minimum scale still apply. The entry thresholds to local flexibility markets are notably lower than those of the capacity market. One DSO has specified no minimum threshold on their flexibility opportunities, with another lowering the threshold from 200 kW to 100 kW.

Different aggregators have different models for generating revenue and passing some of that value on to the homes and businesses that provide the assets. Most of these are commercial companies, but there are different models emerging of how 'bundles' of aggregated demand / generation could access these markets.[9]

Based on some of the early DSO flexibility opportunities that have emerged recently, domestic level flexibility could be worth around £50 a year per household. However, the more demand assets a household has, and can be flexible with, the greater the value. With more homes switching to electric vehicles and electric heating, and installing PV and batteries, there could be more value (around £100 a year per household) available to households through aggregation. Community energy organisations could play a critical role in encouraging home and business owners to understand how flexibility works and could benefit them, as well as recruiting them to participate.

What sort of value do flexibility services have?

Providing flexibility services to either DSOs or National Grid ESO is a source of secondary income. In general, most flexibility services have two types of payment that are made to providers, an 'arming' or availability fee (paid for the amount of time the asset is available for), and a 'utilisation fee', i.e. an extra payment if that asset is actually used/called upon to deliver a service.

Local flexibility services

All six GB DSOs are signed up to the Piclo platform where they list their flexibility requirements. Each DSO has a different way of describing the flexibility they need, and the price they expect to pay. Some DSOs do not publish any information on the amount they expect to pay for flexibility services, preferring to allow the market to come forward with prices. This means the available information from DSOs on their flexibility requirements varies between licence areas.

What is clear from the data published by the DSOs, is that there is very little consistency in approach, making it difficult for the market to come up with a clear response. The tables below summarise the published information on the flexibility needs of each DSO, for their Constraint Managed Zones (CMZs).

Western Power Distribution			
	Illustrative payments		
Type of service	**Arming**	**Availability**	**Utilisation**
Secure	£125 / MWh	N/A	£175 / MWh
Dynamic	N/A	£5 / MWh	£300 / MWh
Restore	N/A	N/A	£600 / MWh
Current estimated range of revenues for CMZs with a flexibility need / yr £6,270 (1 MW) - £282,336 (47 MW) The flexibility need for each of WPD's CMZs are in this range somewhere.			
Minimum duration of providing the service per event	2 hrs	**Minimum response time**	15 mins
Minimum technical requirements	Minute by minute metering		
More information on the WPD Flexibility Service **www.flexiblepower.co.uk**			

The figures and values shown are indicative only and whilst appropriate at the tine of writing, are subject to change or withdrawal at any time.

UK Power Networks			
Type of service Active power Demand Turn Down Generation Turn Up	**Illustrative payments** **2019 auction results: 18.1 MW of flexibility contracts bought by UKPN, worth £450,000**		
Current estimated range of revenues for CMZs with a flexibility need / yr £9,000 - £250,000 (Flexibility need for each CMZ is in this range somewhere)			
Minimum duration of providing the service per event	30 mins	**Minimum response time**	30 mins
Minimum technical requirements	Minute by minute metering		
Minimum insurance level	Public liability of £5 million		
	Employers liability of £5 million		
Minimum size of asset that can bid for a flexibility service	50 kW, but this can be aggregated from smaller assets		
More information on the UKPN Flexibility Service **www.ukpowernetworks.co.uk/internet/en/have-your-say/listening-to-our-connections-customers/flexibility-services.HTML**			

Scottish and Southern Energy Networks			
Type of service CMZ Prevent CMZ Prepare CMZ Respond CMZ Restore	**Illustrative payments** **Combination of an availability and utilisation payment, with a typical payment being around £300 / MWh**		
Current estimated range of revenues for CMZs with a flexibility need / yr £300 / MWh			
Minimum duration of providing the service per event	Unknown	**Minimum response time**	Unknown
More information on the Scottish and Southern Energy Flexibility Service **www.ssen.co.uk/SmarterElectricity/Flex**			

Northern Powergrid			
Type of service	**Illustrative payments** **Nothing published on illustrative payments** **Northern Powergrid invited the market to bid**		
Current estimated range of revenues for CMZs with a flexibility need / yr Unknown			
Minimum duration of providing the service per event	Unknown	**Minimum response time**	Unknown
Minimum technical requirements	200 kW minimum, made from assets of no smaller than 100 kW, minute by minute metering		
More information on the NPG Flexibility Service **www.newpower.info/2018/12/northern-powergrid-details-201920-flexibility-needs**			

Electricity Northwest			
	Illustrative payments		
Type of service Restore Sustain Continuous	**Bidder must state an availability and utilisation price**		
Current estimated range of revenues for CMZs with a flexibility need / yr Unknown			
Minimum duration of providing the service per event	Provided on Piclo	**Minimum response time**	Provided on Piclo
Minimum technical requirements	200 kW minimum, made from assets of no smaller than 100kW, minute by minute metering		
More information on the ENW Flexibility Service **www.enwl.co.uk/get-connected/network-information/flexible-services**			

SP Energy Networks			
	Illustrative payments		
Type of service Post Fault Post Fault or Planned Outage Post Fault during Planned Outage	**Nothing published on illustrative payments, but details of the area requirements published on the SPEN website**		
Current estimated range of revenues for CMZs with a flexibility need / yr Unknown			
Minimum duration of providing the service per event	Provided on Piclo	**Minimum response time**	Provided on Piclo
Minimum technical requirements	None published - details provided via Piclo		
More information on the SPEN Flexibility Service **www.spenergynetworks.co.uk/pages/flexibility.aspx**			

National flexibility services

National Grid ESO are responsible for ensuring the UK electricity system is balanced using the most cost-effective services. They are also required to ensure the system operates within safe limits and has the ability to cope with system 'stress' events or major outages.

	Illustrative (typical) project primary income stream	Flexibility services (potential secondary revenue stream options)							
		Fast reserve (Firm or optional)	Short Term Operating Reserve (STOR)	Demand Turn Up	Capacity Market	Firm Frequency Response			Enhanced Frequency Response
	Selling generation (e.g. a PPA)					Primary	Secondary	High	
Illustrative typical revenue, assuming a 1 MW asset	£50/MWh	£8/MW/hr – £13/MW/hr	£1/MW/hr - £10/MW/hr	£60/MWh	£0.8/MWh	£13/MW/hr	£3/MW/hr	£0.3/MW/hr	£12/MW/hr
Minimum scale (if not using an aggregator)		25 MW	3 MW (this can be steady generation or demand reduction)	1 MW	500 kW	1 MW	1 MW	1 MW	1 MW
Minimum duration		15 mins	2 hrs	3-5 hrs	4 hrs	>20 secs	>30 mins	Indefinitely	
Minimum response time		2 mins	4 hrs	Notification 6 hrs ahead	<4 hrs	<10 secs	<30 secs	<10 secs	<1 sec
Able to use an aggregator to access?		Yes	Yes	Yes (from 100 kW sites)	Yes	Yes	Yes	Yes	Yes
How to participate		**Go to www.nationalgrideso.com/balancing-services and pick the relevant service. Each service has instructions on minimum requirements and how to apply**							

Note: Illustrative typical revenue figures are based on figures published by National Grid ESO. These are indicative and a combination of typical 'availability' prices and 'utilisation' prices seen in recent years.

Example scenarios

As we have discussed, demand side flexibility is the ability to change how your electrical asset is operating to benefit a distribution or system operator. Using distributed assets to respond to imbalance in the system and to maintain system stability, is going to be needed more as the energy system decarbonises and uses more variable renewables.

But with so many different flexibility services used to balance the system, how do flexibility providers work out what revenue streams to target and when?

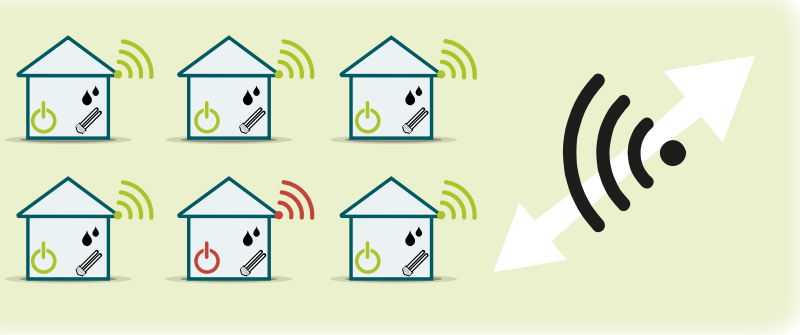
Community energy groups tend to have a few areas of focus, and some areas that they are far less active in – there are currently no community owned gas peaking plants for example.

We have produced three example scenarios that reflect the most common types of projects communities are exploring and illustrated the ball-park revenue streams that flexibility *could* provide.

Scenario 1 – Using domestic immersion heaters to provide flex services

EXAMPLE: A community energy group in a WPD Constraint Managed Zone, where they are procuring flexibility has a project which gives them automated control over 600 immersion heaters in homes. Each heater is 3 kW.

The heaters can only be switched on or off to provide flexibility. If a signal is given to switch them off, then of course they need to have been 'on' first. Inevitably, some of the heaters would not be in the state they need to be at the start of the provision. To ensure there are enough heaters ready to respond, only a proportion of the total pool of heaters is included in the flexibility service. For this example, 400 of the 600 heaters are guaranteed to be able to respond. giving a 1.2 MW response.



Could this project access NGESO flexibility markets?

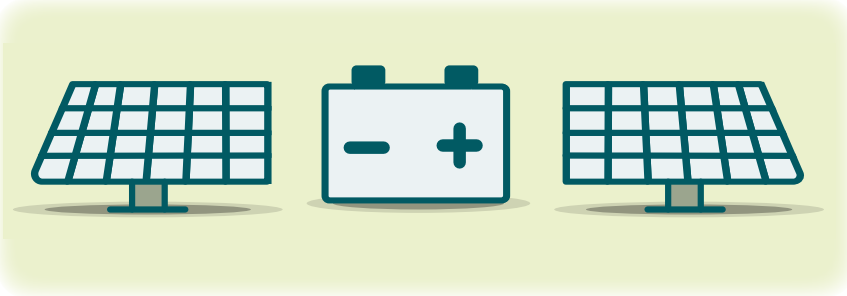
Revenue stream administered by:	**National Grid ESO**				**National Grid ESO and BEIS**
	Demand Turn Up	**Frequency Response**	**STOR**	**Fast reserve**	**Capacity market**
Does the scenario meet minimum technical requirements?	No DTU being procured in 2019 and too small. Smallest aggregated unit must be >100 kW.	Provided the contracted demand turn up could be met, yes. Around £730/yr.	No, too small, 3 MW minimum	No, too small, 25 MW minimum	Yes, provided the baseline proves there would normally be load in that timeslot that you are able to turn down.
Illustrative potential annual revenues	No DTU is being procured for the foreseeable future, but if DTU was procured again, it could get £65/MWh, for up to around 30 hrs a year based on the most recent prices. Around £1950/yr for 1 MW DTU	This will depend on how many blocks of 4 hours the project can provide services for. But 1 MW would get £0.5/MWh. So one block a day would deliver: Around £730/yr			For 1 MW to be available 1 hour a day, based on current clearing price of £.077/MWh and average availability payments. Around £300/yr

Could this project access local flexibility markets?

Local flex in the example location administered by:	**Western Power Distribution**
Does the scenario meet minimum technical requirements?	Yes, provided there is minute by minute metering
Illustrative potential annual revenues	Priced from £0.5/MWh and varies according to precise location, but with 1 MW you could expect £1000 - £8000 /yr.

Scenario 2 – 5 MW solar farm with a 1 MW battery

EXAMPLE: A community energy group in a UKPN flexibility zone owns a 5 MW solar farm and a 1 MW (2 MWh) battery. Most of the solar output (80%) is sold via Power Purchase Agreement (PPA), with the remainder used to charge the battery ready for providing flexibility services.



Could this project access NGESO flexibility markets?

Revenue stream administered by:	National Grid ESO				National Grid ESO and BEIS
	Demand Turn Up	**Frequency Response**	**STOR**	**Fast reserve**	**Capacity market**
Does the scenario meet minimum technical requirements?	No DTU being procured in 2019 and too small. Smallest aggregated unit must be >100 kW.	Provided the contracted demand turn up could be met, yes. Around £730/yr.	No, too small 3 MW minimum	No, too small, 25 MW minimum	Yes, provided the baseline proves there would normally be load in that timeslot that you are able to turn down.
Illustrative potential annual revenues	No DTU is being procured for the foreseeable future, but if DTU was procured again, it could get £65/MWh, for up to around 30 hrs a year based on the most recent prices. Around £1950/yr for 1 MW DTU.	This will depend on how many blocks of 4 hours the project can provide services for. But 1 MW would get £0.5/MWh. Around £730/yr.			For 1 MW to be available 1 hour a day, based on current clearing price of £.077/MWh and average availability payments. Around £300/yr.

Could this project access local flexibility markets?

Local flex in the example location administered by:	UKPN
Does the scenario meet minimum technical requirements?	Yes, provided there is minute by minute metering
Illustrative potential annual revenues	Varies according to which CMZ the project is in, but with 1 MW you could expect at least £9,000 /yr

Scenario 3 – Aggregated domestic solar and batteries

EXAMPLE: A community energy group in one of SSENs social constraint managed zones is able to influence and access the operation of 500 domestic batteries, that benefit from rooftop solar. Each battery is able deliver 5 kW continuously for 2 hours. It is expected that at least 50% of the batteries will be available to deliver flexibility services, giving a flexible load of 1.25 MW for up to 2 hrs per event.

Could this project access NGESO flexibility markets?

Revenue stream administered by:	National Grid ESO				National Grid ESO and BEIS
	Demand Turn Up	**Frequency Response**	**STOR**	**Fast reserve**	**Capacity market**
Does the scenario meet minimum technical requirements?	No DTU being procured in 2019 and too small. Smallest aggregated unit must be >100 kW.	Provided the contracted demand turn up could be met, yes. Around £730/yr.	No, too small 3 MW minimum.	No, too small; 50 MW minimum.	Yes, provided the baseline proves there would normally be load in that timeslot that you are able to turn down.
Illustrative potential annual revenues	No DTU is being procured for the foreseeable future, but if DTU was procured again, it could get £65/MWh, for up to around 30 hrs a year based on the most recent prices. Around £1950/yr for 1 MW DTU.	This will depend on how many blocks of 4 hours the project can provide services for. But 1 MW would get £0.5/MWh. Around £730/yr.			For 1 MW to be available 1 hour a day, based on current clearing price of £.077/MWh and average availability payments. Around £300/yr.

Could this project access local flexibility markets?

Local flex in the example location administered by:	**Scottish and Southern Electricity Networks**
Does the scenario meet minimum technical requirements?	Yes, provided there is minute by minute metering.
Illustrative potential annual revenues	Estimated revenue for providing flexibility services to SSEN are £300/MWh, based on information from their website.

2

Part 2

For System Operators: Supporting community participation in flexibility services

Why are community energy groups interested in flexibility?

Communities are typically interested in flex for a variety of reasons:

1. As a potential source of revenue to support new business models
2. They want to reduce demand in their local area through energy efficiency
3. Community energy groups want to connect more low carbon energy generation and see flexibility as a way to unlock more network capacity in the future

One of the key interests community energy organisations have is how greater flexibility could unlock greater deployment of low carbon energy generation. Currently, flexibility services are only used to manage demand peaks, maintenance downtime and outages rather than being used to bypass constraints put on generation or enable more renewable generation to be connected. Community energy groups are not likely to be motivated by helping DSOs defer investment in network upgrades.

Whilst the industry is some way off using flexibility actively to unlock more generation, it is clear that more distributed renewable energy generation is required to meet future needs. If this can be done by using network capacity more efficiently rather than installing or upgrading infrastructure, this could be a far cheaper solution for consumers. Communities are widely expected to play a significant role in providing this flexibility, unlocking investment in network infrastructure in the process.

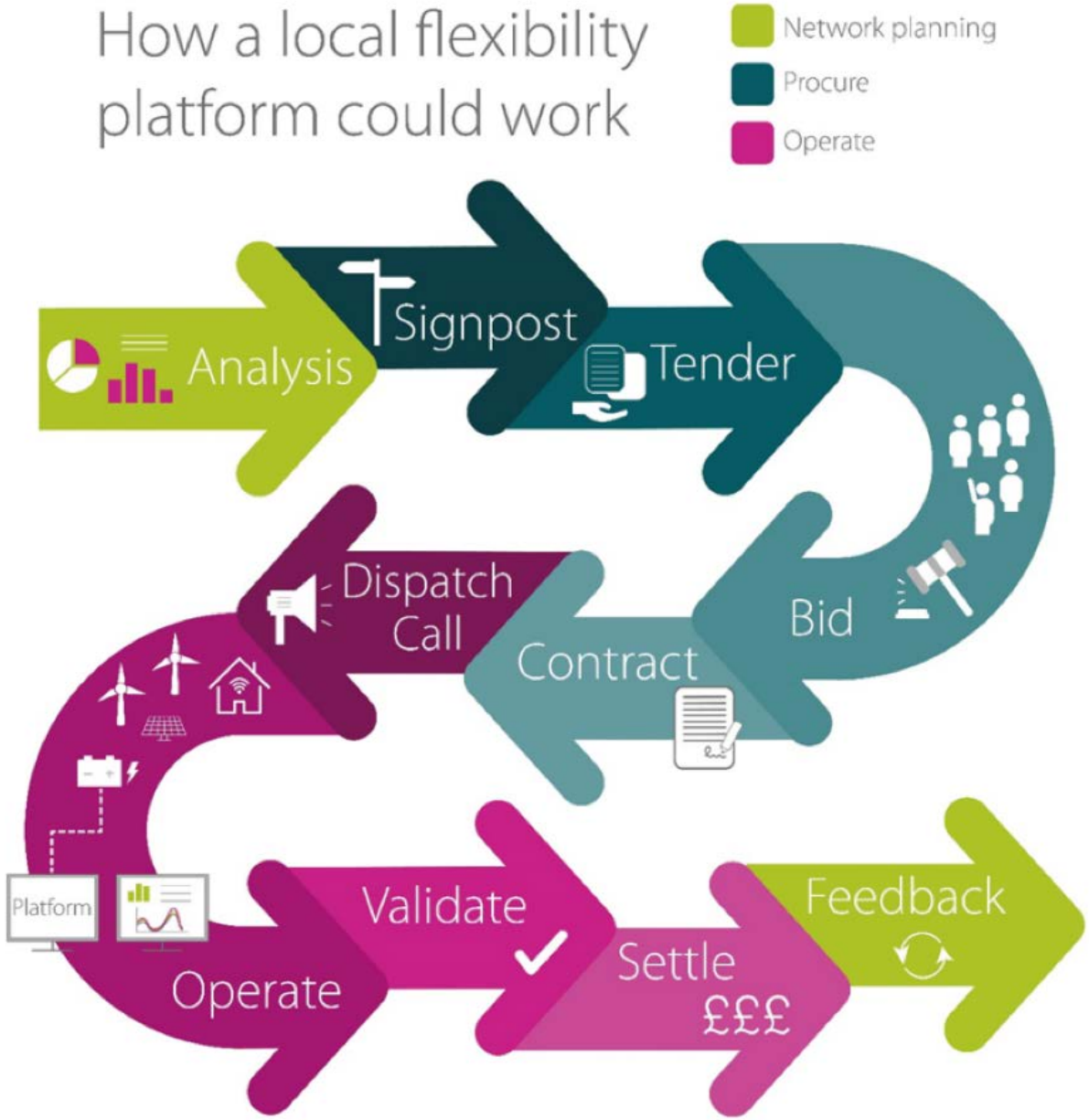
It is possible that at some point in the future, the platforms and tools that are being developed now for purchasing flexibility services could be used for peer to peer trading and local supply, if regulations were to change. Community energy groups see flexibility as way to upskill and position themselves for those future markets.

What value do community energy groups bring when providing flexibility?

The first barrier to encouraging communities to participate in flexibility is making people aware that these opportunities exist. Many communities are aware that DSOs and National Grid ESO are seeking to buy flexibility but are often quickly lost in the jargon, technical detail, and procurement rules. In reality, many of the opportunities are not going to be suitable for new community energy projects, but if community energy projects are to play a role in future services, they must be accommodated fully and encouraged now.

Community energy groups are able to bring more value than just the amount of kWh's of flexibility they can deliver. Community energy groups are:

- Trusted by their local communities to work in their best interests
- Able to build local networks: community energy groups are able to bring many different types of stakeholders together to get projects off the ground: particularly useful for projects that could be seen as contentious
- Education and behaviour change: Community energy groups are well placed to help drive the concept of demand reduction or time-shifting existing demand, and encouraging the uptake of new tariffs or models.
- Local knowledge: Community energy groups know who the large demand customers are in their area, where potential sites for new assets and projects are and what types of project could be successful in their communities
- Local investment: Community energy groups are skilled at bringing together investment and funding from a range of sources, often including private capital.
- Awareness raising: Community energy groups play a unique role in letting their local communities know *why* particular projects are happening in their areas, and how they are tackling climate change, improving services or lowering bills.



DSOs are at the forefront of procuring flexibility services from an open market, using platforms that try to encourage a diverse range of flexibility providers to engage.

However, despite there being open and clear platforms for finding flexibility contracts, many smaller organisations are still not aware, or engaging fully with the process.

Following consultation with community energy organisations, we have outlined some key barriers in the existing procurement methods that are hindering their ability to bid.

Web platforms such as Piclo provide a powerful way for community energy groups to access the market, but simply listing opportunities is not enough.

Community energy and flexibility services: a specification for encouraging participation

What are the barriers preventing communities from participating in flexibility markets?	How should buyers of flexibility services address them?
1 **Awareness:** People aren't generally aware that these opportunities exist	• Undertake greater promotion of opportunities through existing community networks and intermediaries, e.g. Community Energy England (CEE), Regen etc. Understanding the best ways to disseminate existing tools and information to a stakeholder group that will not be familiar with most of the procurement or technical jargon

2 **Skills:** Community Energy Group members are not necessarily energy system experts and won't always know why flexibility is needed, or why it is relevant to them	• Undertake capacity building work, including:
	  ◦ Face to face training events with trusted intermediaries
	  ◦ Accessible plain English guides to flexibility markets
	  ◦ Publish examples and case studies, using typical community energy types of project (see part 1 scenarios)

3 **Messaging:** The messaging about why flexibility is needed is not relevant to communities	• Change the messaging. Flexibility is pitched as helping DSOs avoid network reinforcement, to save bill payers money. Communities are interested in tackling climate change, connecting more low carbon generation, and earning revenue. To engage community energy groups, the messaging must explain how flexibility markets will unlock more revenue, help people save energy, and enable more low carbon capacity or local supply markets • Prioritise low carbon sources of flexibility and demand reduction delivered by organisations who provide additional social value (Welsh public bodies are procuring in this way using the wellbeing and future generations act) • Communicate clearly and simply how essential a smart flexible network is to a low carbon future • Make a clear position statement on carbon reduction and community energy and why you think it's essential communities are involved in local flexibility markets to achieve our zero carbon targets
4 **The playing field is not level.** Many community energy organisations are voluntary and only have limited time to explore new opportunities	• Recognise that a level playing does not mean treating everyone the same, communities need additional support to engage • Make the opportunities very clear and easy to identify, in short and easily digestible formats. Online postcode checkers are a great first step, as are income modellers and some DSOs have these already, but they are not widely known about • Be clear about the technical requirements of the flexibility services being bought, so communities don't waste time pursuing unsuitable opportunities • Offer training opportunities to community energy groups to help upskill communities to understand the changing energy system, e.g. apprenticeships, open days, webinars etc. • Encourage DSO staff members to engage directly with community energy groups, volunteering, using CSR time, joining boards etc. • Offer seed funding to help communities pay for volunteers/staff to engage in flexibility and create live examples that can be shared

What are the barriers preventing communities from participating in flexibility markets?	How should buyers of flexibility services address them?
5 Flexibility is **low value** and a secondary income stream. Community energy groups are struggling to find viable business models that flexibility could support	• DSOs should be aware that many community energy groups do not have a viable business model that includes flexibility. DSOs should provide online tools that help communities explore new energy generation, storage, and demand reduction ideas, rather than basing tools on information from existing assets • DSOs need to be transparent about how much money flexibility services are saving them in deferred reinforcement costs, and how this translates into payments being made to participants delivering flexibility. Currently, payments for flexibility are very different across different DSOs
6 **Risk:** Contract lengths are short (normally about 1 year). Even with the 'expectation' that contracts would be renewed annually for up to four years, this is too great a risk for community energy groups	• Contract lengths should be at least 4 years • Penalties or impact on payments for non-performance should be clearly articulated, as should the methodology for calculating the baseline.
7 **Notification timescales:** Few community energy groups have projects ready to enter into flexibility markets, i.e. with batteries and it takes months to build a business case and take an investment decision about whether to bid into a flexibility market. Notification of opportunities is currently far too short	• Early engagement. Start talking to active community energy groups and networks in CMZs at least 6 months ahead of tender periods opening
8 **Jargon:** DSOs still use overly complicated language and technical terminology to talk about these markets and services. This is fine for industry incumbents, but not potential new entrants	• Use plain English for all communications around flexibility opportunities. For example, the first stage for a community to provide a flexibility service is to register their interest on a DPS, respond to a PIN followed by a PQQ with details of their FU. These are acronyms well known by large organisations used to procurement frameworks, but not community energy groups • Don't use acronyms
9 **Procurement Process:** There are too many steps for community energy groups to participate	• Simplify procurement of flexibility services. Given that the value of providing flexibility services is currently low, an onerous procurement process will discourage participation • Do not arbitrarily require basic information that community energy groups are not able to provide. For example, some procurement pre-qualification questionnaires require a Companies House number before they can be submitted. Many community energy groups are registered community benefit societies (CBSs) or Community Interest Companies (CICs) and so will not have a Companies House number • Do not require high levels of professional indemnity and public liability insurance, that are challenging for community energy groups to acquire
10 **Additionality**	• DSOs should recognise the extra value that community energy groups bring, such as local area knowledge of high energy users, potential projects etc and how to engage them

What are the barriers preventing communities from participating in flexibility markets?	How should buyers of flexibility services address them?
11 **Not having access to all the facts**	• Publish as much supporting information as possible, including standard terms and conditions, requirements of being offered a contract (minimum insurance levels, corporate structure, payment terms etc) • Be clear on how the baselining process works as this is critical
12 **Metering:** Projects must have minute by minute metering	• DSOs should accept half-hourly (HH) data • There is an increasing expectation that homes will play a significant role in shifting demand and participating in flexibility services, and the vast majority of these homes will only have HH meters. Most DSOs require greater levels of detail, or minute by minute metering which is expensive and could prevent domestic properties taking part
13 **Consistency**	• All DSOs and aggregators need to agree a common approach to the equipment, contracts, and data requirements for participants in flexibility markets across GB

During the course of producing this report the level of ambition for the UK has grown, with a commitment to achieving nearly zero greenhouse gas emissions by 2050: the most ambitious target of all the major nations. The decarbonisation of our electricity system will play a critical role in achieving this milestone.

Increasing the flexibility of our energy system is a key component of enabling connection of lower carbon sources of energy. Indeed, Ofgem and the Department for Business, Energy & Industrial Strategy (BEIS) recently published an open letter[10] outlining their expectation that a smarter and more flexible energy system could save the UK £17-40 bn by 2050, with many of those benefits realised at distribution level.

That letter contained an annex which outlined a clear set of actions for networks and system operators to follow in pursuit of greater network flexibility. These actions reflect much of what we have presented in this document, and underlines how important *consistency, transparency* and *early access* to information is to encouraging wide participation in a new market.

It is clear that flexibility alone in its current forms will not facilitate the scale of change we need from our energy system and must be considered as subservient to demand reduction and renewable energy generation connection.

But it is a significant step in the right direction.

The challenge for regulators and system operators is to design procurements and services that will stimulate innovation and competition from a wider range of suppliers and provide a pathway for them to engage in future markets.

We believe that communities are playing an undervalued role in the energy system and have significant untapped potential to transform the sector. By applying this specification to future procurements and widening the supply chain, system operators and bill payers stand to benefit from communities playing their part.

Glossary

Aggregation: 'Bundling' smaller flexibility services into a portfolio, which can participate in programmes with entry thresholds that are too high (i.e. 1 MW), aggregators have market knowledge and often stack revenue.

Balancing: System balancing is about ensuring the supply and demand on the electricity system is equally matched and operating within technical limits, i.e. the right frequency.

Constraints: Congestion on the network that is area specific and approaching network capability. Local network constraints must be managed (demand-generation or generation-demand < network capabilities).

Demand Side Response (DSR): Intelligent energy use. It enables businesses and consumers to save on total energy costs by increasing, decreasing or shifting their electricity consumption at specific times in response to a signal. For example, charging an electric car using a smart charger that charges the car when it's best for the network and cheaper for the driver, or a supermarket turning off freezers from 5-6pm to avoid the evening peak.

DERs: Distributed Energy Resources, assets connected to the distribution network that could be called upon to provide flexibility services.

DNOs: Distribution Network Operators, the six regional companies licenced to distribute electricity within 14 defined licence areas across GB.

DSOs: Distribution System Operators, the evolving role of DNOs to "…operate and develop an active distribution system comprising networks, demand, generation and other DERs."

Electricity System Operator (ESO): Responsible for the day to day operation of the system and keeping the wider system in balance. In GB this role is part of National Grid, in this document we will refer to them as the ESO.

Flexibility: The ability of a power system to operate stably as demand and supply fluctuates, using a diverse range of actions provided by the system itself and its connected parties.

Flexibility services: Providing a Demand Side Response service by modifying generation and/or consumption patterns in reaction to an external signal for a financial reward (revenue).

kW: A kilowatt is a unit for measuring power that is equivalent to one thousand watts.

MW: A megawatt is a unit for measuring power that is equivalent to one million watts.

MWh: A megawatt hour is equal to 1,000 kilowatt hours (kWh). It is equal to 1,000 kilowatts of electricity used continuously for one hour.

Network capacity: The ability of a network to accommodate peaks in demand and/or generation. Spare capacity is the network capability to have more large-scale developments connected to major substations.

Network reinforcement: When we upgrade or install new equipment to make our network more secure and able to accommodate new generation and demand.

Ofgem: The UK energy regulator.

Revenue stacking: Using assets to access multiple incentive programmes, paid for services or contracts – i.e. national balancing and local flexibility services.

SO: System Operator, which in the UK is National Grid ESO.

1 www.communityenergyengland.org

2 www.green-alliance.org.uk/resources/Community_Energy_2.0.pdf

3 www.energynetworks.org/assets/files/ENA%20Flexibility%20Commitment%20Our%20Six%20Steps%20for%20Delivering%20Flexibility%20Services.pdf

4 communityenergyengland.org/files/document/317/1561208314_StateoftheSectorReport2019-FullReport.pdf

5 www.friendsprovidentfoundation.org/grants/projects/power-to-participate-regen-sw

6 communityenergyengland.org/files/document/169/1530262460_CEE_StateoftheSectorReportv.1.51.pdf

7 www.ukerc.ac.uk/publications/visions-for-the-future-of-community-energy.html

8 www.elexon.co.uk/csd/bscp15-bm-unit-registration

9 www.regen.co.uk/local-flexibility-markets-in-five-steps-part-three-the-role-of-a-local-flexibility-market

10 assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/817409/2019.07.16_BEIS-Ofgem_Joint_Letter.pdf