

Local flexibility markets

What are they and how can community energy organisations get involved?

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As our electricity system becomes more decentralised, renewable generation grows and demand for electric vehicles and electrified heat rises, the grid is increasingly under pressure. One solution to accommodate this strain is to be more flexible in how, when and where we generate and consume electricity. In the current market, value is predominantly placed on the amount of electricity a customer uses, but in future markets 'flexibility' will become a service or commodity that can be bought and sold.

Flexibility markets are likely to become more established in the next few years, with financial value, rules and technical systems currently being developed by regulators, stakeholders and industry. This guide aims to help small businesses and community energy organisations better understand opportunities and challenges, to enable them to influence the development of flexibility markets. We strongly believe these new markets should be open to local players, not just the existing incumbents, so that the value of our changing energy system can be shared, and community energy organisations can bring a unique set of social and economic advantages to the table.

Flexibility is not new, and national markets involve large power stations and large commercial electricity consumers changing demand at particular times. We define flexibility as ‘dynamically modifying generation and/or consumption patterns in response to an external signal for financial reward’. The local element refers to locally specific conditions on the low voltage network, at the scale of a suburb or substation.

As the system becomes more decentralised and decarbonised, the need for flexibility to help balance the network increases and more local flexibility must be found, involving smaller actors including households and local businesses.

Inevitably, with such small, decentralised consumers, intermediaries are needed to aggregate little bits of flexibility into much larger chunks that can be sold to energy system actors such as Distribution Network Operators (DNOs) and suppliers. These intermediaries are known as aggregators.

Though aggregators are common within national markets, local flexibility market aggregators are not. We believe trusted local businesses and community energy organisations are in a strong position to play this role, installing flexible loads, pioneering new energy services and engaging domestic customers. However, their success depends on achieving the necessary scale and possessing sufficient technical expertise and capacity, as well as wider infrastructure issues such as the roll out of smart meters and adoption of common open standards.

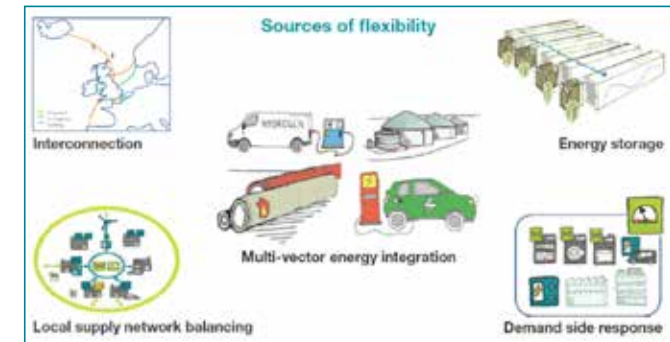
In this guide we explore the need for electricity system flexibility, review market development, highlight the case for open standards and outline our ECAS (Energy Community Aggregator Service) concept. The guide is co-authored by Carbon Co-op and Regen and funded by the BEIS Flexibility Markets Feasibility Study Competition in August 2018.

The need for flexibility

Our energy system is changing, demand for electricity is increasing with more electrified heat and transport, and more low carbon generation and batteries are being connected. Alongside this, emerging new technologies mean we can manage the network far more dynamically and efficiently.

The traditional approach to changing networks is to reinforce, upgrade and install power lines and substations. A smarter approach using the existing network more flexibly has the potential to be more cost-effective, unlocking new capacity from existing lines, and enabling more low carbon generation to connect.

Actors who require flexibility, primarily DNOs, but also Electricity System Operators (ESO) and energy suppliers, are increasingly interested in purchasing local flexibility. While the need for flexibility between these parties may often overlap, there are occasionally conflicts, for example, when suppliers look for generation turn-up whilst a DNO needs generation turn-down.



DSO transition

DNOs manage low-voltage networks in a fairly standard, passive manner. However, government has mandated a transition for all DNOs to become Distribution System Operators (DSOs), who will operate the grid in a far more flexible and dynamic way. Each DNO has published a strategy outlining their plan to become a DSO, and this transition is one of the biggest changes and opportunities in the sector.

Key themes of the DSO transition include:

- ▶ Enabling cheaper, quicker connections
- ▶ Level playing field for customers/neutral markets
- ▶ Increase use of Active Network Management
- ▶ Enable local flexibility services

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Domestic aggregator intermediaries

The amount of flexibility available in an individual home or business is small, so to enable the flexibility to be sold and used, it needs to be pooled together or 'aggregated' into greater quantities. Aggregators act as intermediaries who sit between many small electricity users and energy system actors who want to purchase flexibility.

Local flexibility schemes are only likely to be effective if they can offer large, automated loads (such as electric heating, batteries, and electric vehicles) for control. Margins are still likely to be low, and 'revenue stacking' of income from other flexibility markets (and potentially other business activities) will be essential for aggregators' commercial viability. Flexibility alone is not a business case for investment, as the returns will not justify investment in new assets or distributed energy resources (DERs) like electricity storage.



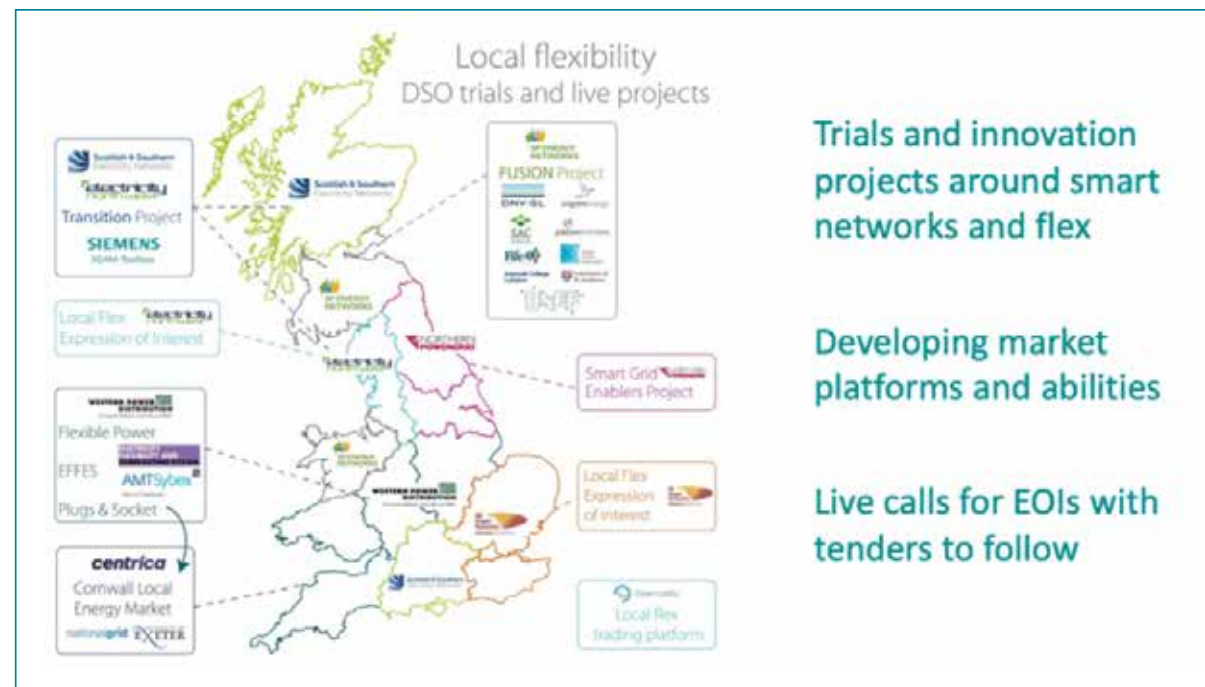
DNO flexibility procurement

Some DNO flexibility procurement trials have taken place, and some DNOs have started procuring local flexibility in specific areas as part of a phased rollout. However, none of these schemes are 'dynamic'; instead, they are relatively static with requirements advertised ahead of need. Each DNO is taking a slightly different approach to procuring flexibility, with variations on minimum thresholds, contract requirements, and metering and verification.

The trials for flexibility have helped inform our understanding of future local flexibility markets. For example, the Western Power Distribution (WPD) call for flexibility in specified areas indicates the price WPD will pay for flexibility, which varies depending on the type of service and location.

The value of flexibility

We won't know the value of providing local flexibility to a DNO until we have seen the market operating for a period of time. As other national markets open up to smaller actors and suppliers start buying flexibility, the value will be realised by stacking multiple revenue streams. WPD's recent call for flexibility places the value to be around £35 - 50k/MW/year as an indicative benchmark, depending on the flexibility service, location and DNO.



Trials and innovation projects around smart networks and flex

Developing market platforms and abilities

Live calls for EOIs with tenders to follow

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Key considerations for aggregators seeking to sell flexibility

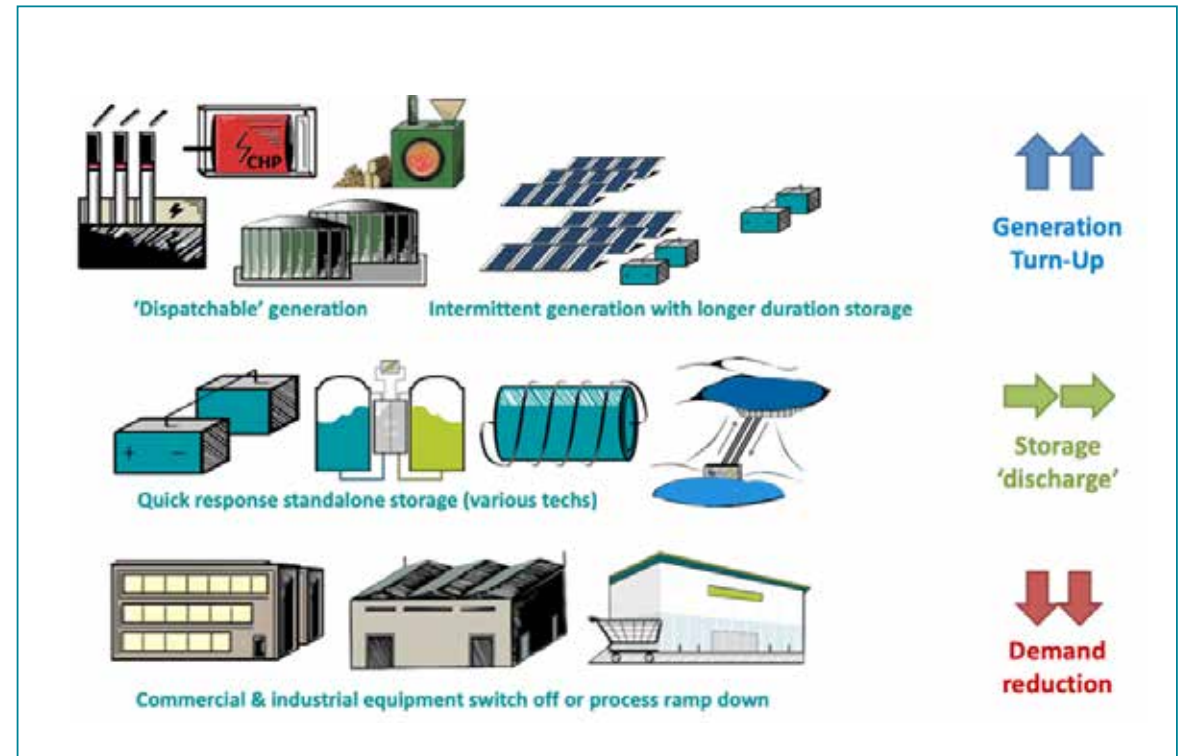
Demand is the driver: services are about managing demand. Aggregators may be asked to reduce their members' demand for electricity (like Economy 7 but more dynamic), turn up energy generation or discharge power they have stored.

Entry thresholds are notably lower than the capacity market. One DNO has specified no minimum threshold, with another lowering the threshold from 200 kW down to 100 kW, aggregation of smaller loads is also permitted.

Contract length is likely to be relatively short, around two to four years.

Non-response: if flexibility is not provided, aggregators are unlikely to pay a penalty, though there will be a reduction of payments.

Technology: purchases are agnostic on approach, but with 15 minutes notice and need to sustain for two hours for example, some technologies are better placed than others.



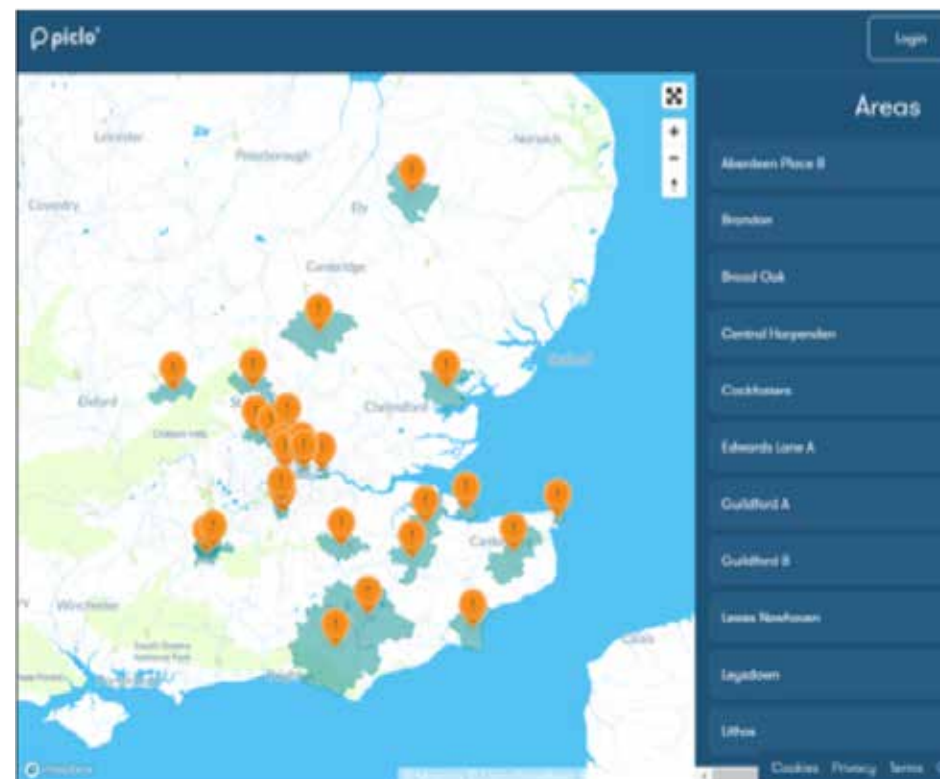
Technical considerations

Aggregators use 'platforms', cloud-based computer systems and associated business processes, to monitor and optimise flexibility assets. Providers of flexibility will also need high-quality metering. Technical systems for realising and controlling flexibility are complicated as they involve real-time control of different devices and need to be transparent and acceptable to everyone involved. Traditional control and monitoring systems are expensive, and flexible solutions are likely to be a combination of inexpensive internet-enabled hardware and standard domestic smart meters.

In order to accelerate the deployment of small-scale flexibility, open standards and interoperability need to be mandated by government, standards that enable appliances and Distributed Energy Resources (DERs) to easily interoperate with other systems, or 'talk to each other'.

Voluntary half-hourly settlement is now available, and some energy suppliers have begun offering dynamic, smart meter-enabled tariffs. However, risks stem from much publicised delays in the UK smart meter rollout.

The regulation of electricity markets is complex and different areas affect flexibility. Unlike some countries, aggregators in the UK do not require an Ofgem license; instead, aggregators have produced their own code of conduct which is voluntary rather than mandatory.



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Energy Community Aggregator Service

Community energy is sometimes seen as being at the bottom of the chain in terms of supplying system flexibility, but we believe communities should be positioned at the centre of the energy transition.

Community energy organisation can generally be typified as organisations involved in clean energy generation or demand reduction, 'not-for-profit' with surplus profits re-invested in the community.

Carbon Co-op and Regen have conceptualised the 'Energy Community Aggregator Service' (ECAS), an energy system intermediary that will play the role of an aggregator in local flexibility markets.

It would act as a federated body, enabling small, not-for-profit and sometimes voluntary community energy organisations to take advantage of local flexibility services via pooled technical expertise, capacity and workforce.

ECAS would operate aggregation and technical platforms and host information in the form of a data co-operative, effectively giving householders ownership of their own data and a share in any benefit from how that data is used.

A federated aggregator achieves both scale and a locally specific focus, and the community energy sector has a number of strengths that are valuable to the model.

Strengths, Weaknesses, Opportunities, Threats analysis for community energy

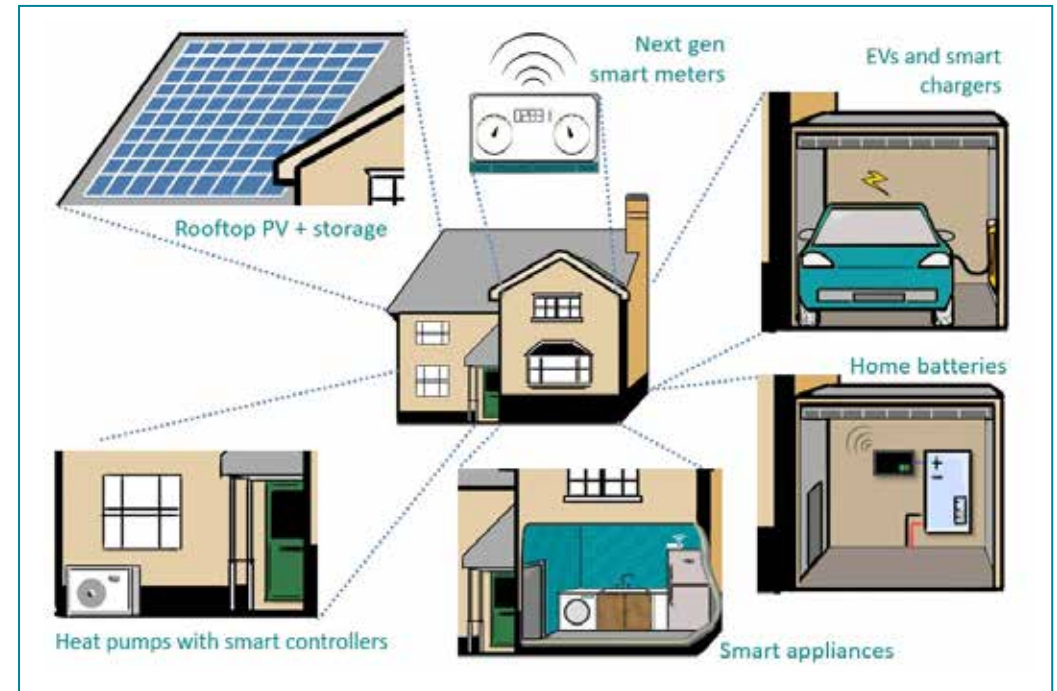
<p>Strengths</p> <ul style="list-style-type: none"> ▶ Existing organisational capacity ▶ Trusted local profile/brand that can bring people to market ▶ Access to local capital ▶ Own some generation ▶ Passionate, committed ▶ On the ground, local knowledge 	<p>Weaknesses</p> <ul style="list-style-type: none"> ▶ Relatively small sector ▶ Low level of technical knowledge ▶ Governance structures often precludes venture capitalist investment ▶ Often limited to specific local areas ▶ Slow to mobilise compared to commercial organisations
<p>Opportunities</p> <ul style="list-style-type: none"> ▶ A need to diversify ▶ Access to volunteers ▶ Policy alignment to Local Energy Markets ▶ Members are often early adopters with smart tech e.g. EVs, PV, heat pumps, home batteries etc. 	<p>Threats</p> <ul style="list-style-type: none"> ▶ Competition from private sector ▶ Regulatory requirements ▶ Inability to scale quickly

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Example flexibility schemes

It is sometimes hard to conceptualise what a local flexibility service delivered by an aggregator might look like, so here are some potential scenarios:

- ▶ A community energy organisation with large number of members in a suburb where the DSO requires flexibility. Using smart EV chargers installed by the group, ECAS offers flexibility to the DSO at peak times (for example 17:00 – 19:00), shifting charging to non-peak times.
- ▶ Housing associations with homes that have electric heating or heat pumps which can be controlled remotely could help vulnerable customers to participate and save money.
- ▶ Some household battery installers are looking at aggregating multiple household batteries to reduce use at peak times and discharge electricity when needed.
- ▶ Community energy organisations and local energy stakeholders with renewable energy generation and electricity storage (for example wind/solar or hydro with a battery) that can turn up generation and discharge the battery when needed.



Energy System Actor Relationships

Community energy organisations can be very diverse; some may wish to participate with ECAS and/or form other relationships with energy system actors. In general, developing, hosting and managing more of the technical aspects such as platforms enable community energy organisations to take more control and derive more income, but conversely, greater technical expertise and oversight is required. In some cases, trusted technical partners can be used to outsource such activity.

Relationships include:

- (A) Community/Domestic DERs ↔ ECAS ↔ DSO
- (B) Community/Domestic DERs ↔ ECAS ↔ Commercial Aggregator ↔ DSO
- (C) Community/Domestic DERs ↔ ECAS ↔ Market platform ↔ DSO
- (D) Community/Domestic DERs ↔ ECAS ↔ Commercial Aggregator ↔ Market platform ↔ DSO

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How communities and local energy stakeholders can engage now

If you are from a community energy organisation and interested in learning more about local flexibility markets and developing emerging flexibility services, now is the time to get involved, as local markets are defined and developed. Here are some of the practical things you can do:

- ▶ Develop capacity, skills and knowledge
- ▶ Build strategic relationships with partners including installers, technology providers, suppliers, local authorities etc.
- ▶ Continue engaging your local community and building trust ready for recruitment
- ▶ Form relationships with DNOs and contribute knowledge, experience and ideas
- ▶ Get involved in flexibility trials and pilots
- ▶ Subscribe for email updates on ECAS and ways to get involved as the concept develops further



Jargon Buster

Aggregation: ‘Bundling’ smaller loads into a portfolio, which can participate in programmes with entry thresholds that are too high (i.e. 1 MW).

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 Britain.

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

ECAS: Energy Community Aggregator Service, an energy system intermediary that could play the role of an aggregator in local flexibility markets.

Flexibility services: Modifying generation and/or consumption patterns in reaction to an external signal for a financial reward (revenue).

Revenue stacking: Using assets to access multiple incentive programmes, paid-for services or contracts – e.g. national balancing & local flex services.

SO/TSO/ESO/NETSO: UK System Operator (National Grid), look after the electricity transmission network and system in the UK, working with DNOs.

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