

Business Model Innovation in the Energy Sector

A dialogue with stakeholders

Loughborough University in London

Emerging models for P2P trading: microgrids and energy communities

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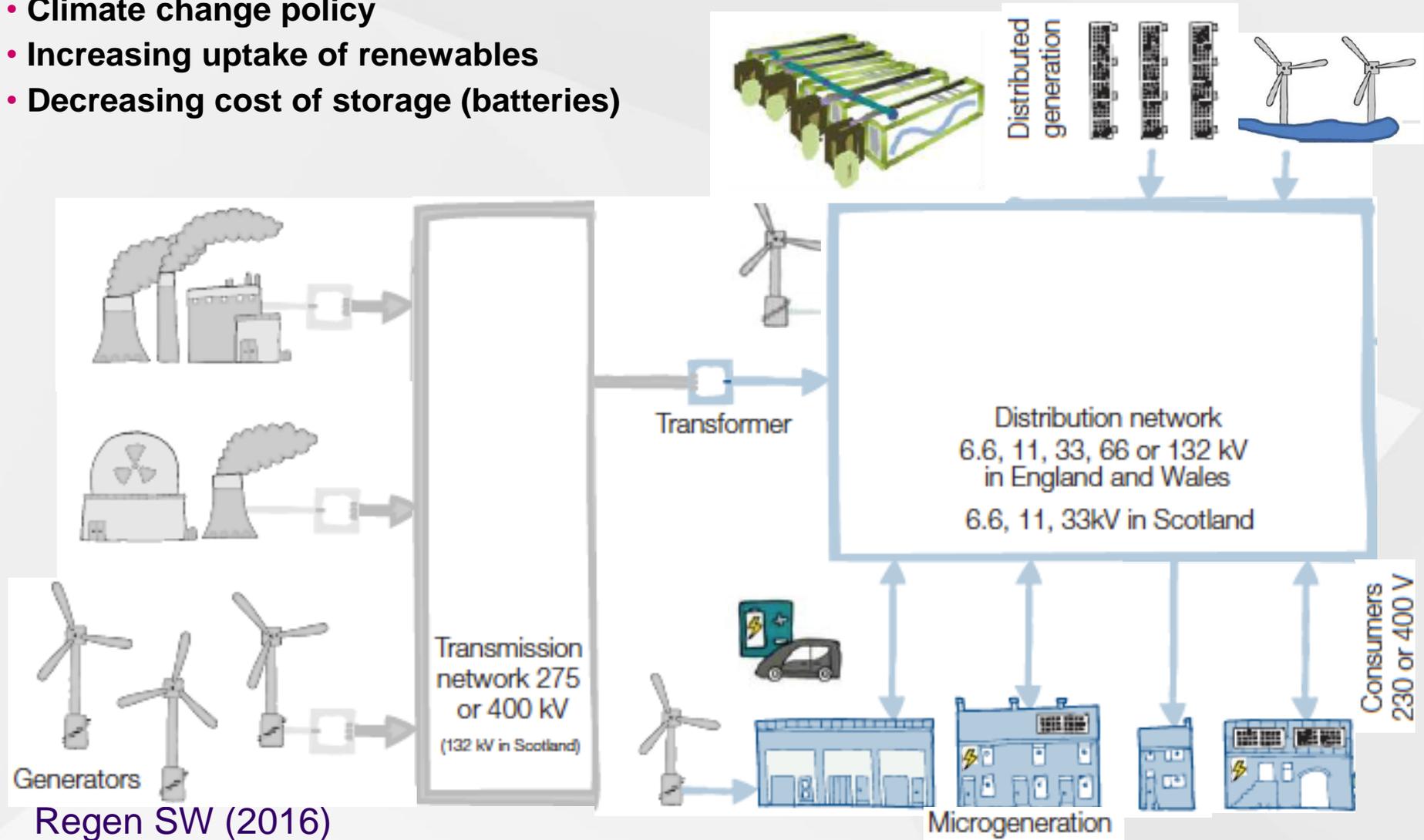
Traditional business models in the energy system at the local level

Traditional business models of local energy systems

Model	Value Proposition	Consumer	Ownership
Incumbent	<ul style="list-style-type: none"> • Consumers as passive recipients of energy (per kWh) • Vertically integrated 	<ul style="list-style-type: none"> • Domestic sector • Private sector • Public sector 	<ul style="list-style-type: none"> • British subsidiary • British merger • Foreign owner • Foreign subsidiary
Entrants	<ul style="list-style-type: none"> • Consumers as passive recipients of energy • Cheap fixed term tariffs • Competitive customer service 	<ul style="list-style-type: none"> • Domestic sector • Private sector • Public sector 	<ul style="list-style-type: none"> • British subsidiary • British merger • Foreign owner • Foreign subsidiary
DNO	<ul style="list-style-type: none"> • Distribute power from transmission network to consumers • Distribute gas via pipe network 	<ul style="list-style-type: none"> • Domestic sector • Private sector • Public sector 	<ul style="list-style-type: none"> • DNO owns infrastructure • Regulated monopoly
Sensible storage	<ul style="list-style-type: none"> • Water tanks and high-water-pressure heating suitable for large systems 	<ul style="list-style-type: none"> • Domestic sector • Private sector • Public sector 	<ul style="list-style-type: none"> • District heating suppliers • Consumers

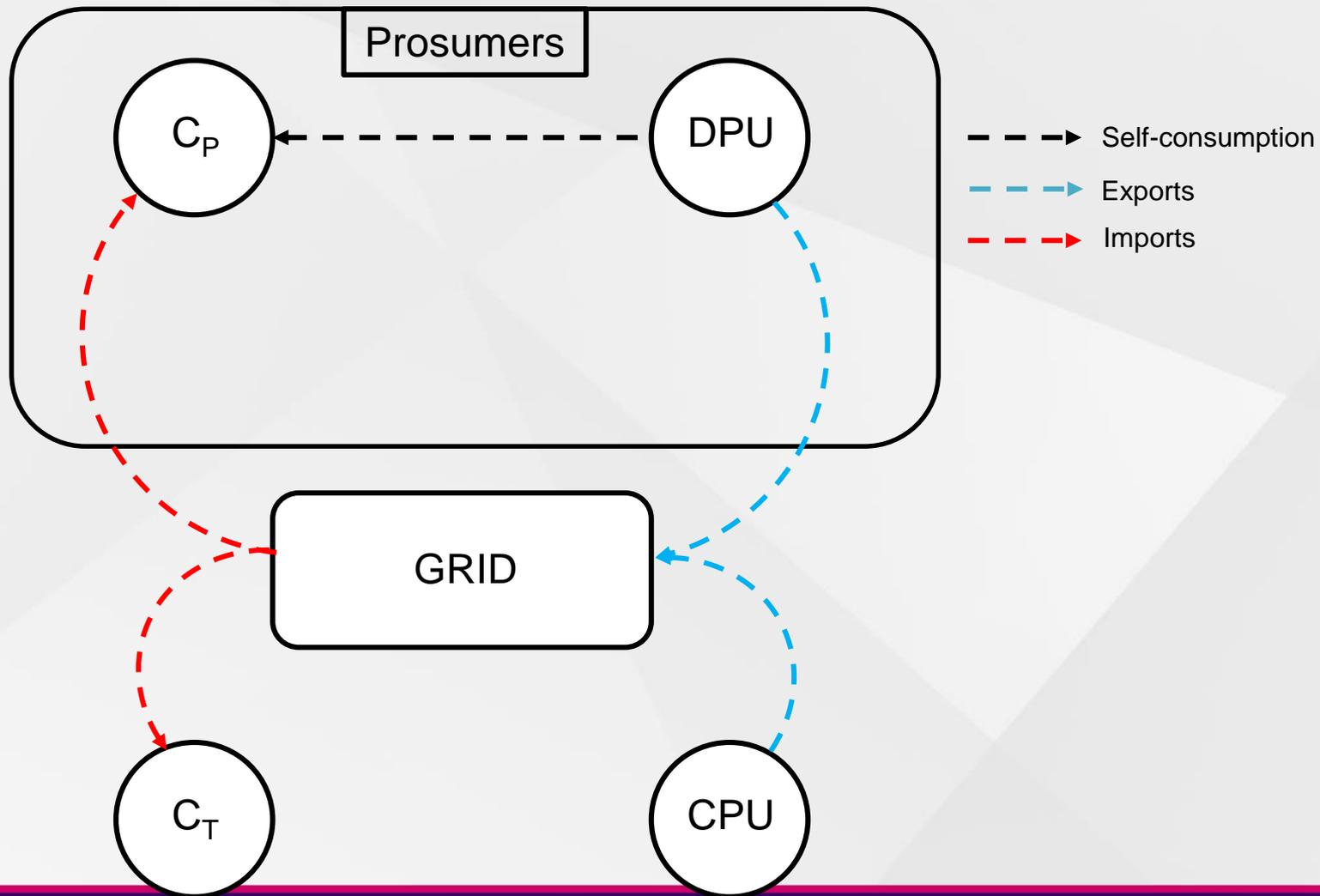
The non-traditional (decentralised) energy system

- Climate change policy
- Increasing uptake of renewables
- Decreasing cost of storage (batteries)

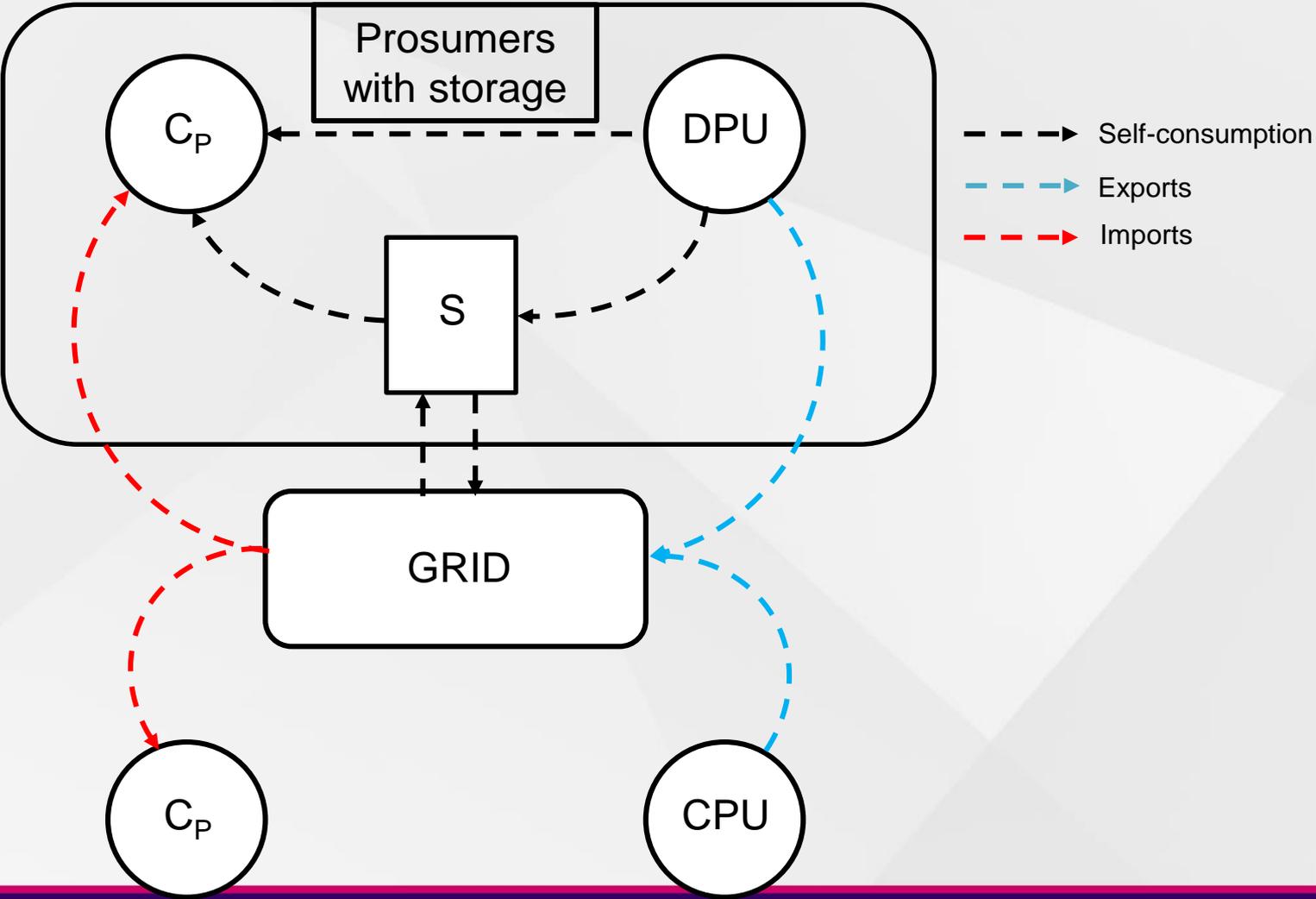


Regen SW (2016)

Non-traditional business models - Prosumer



Non-traditional business models – Prosumers with storage

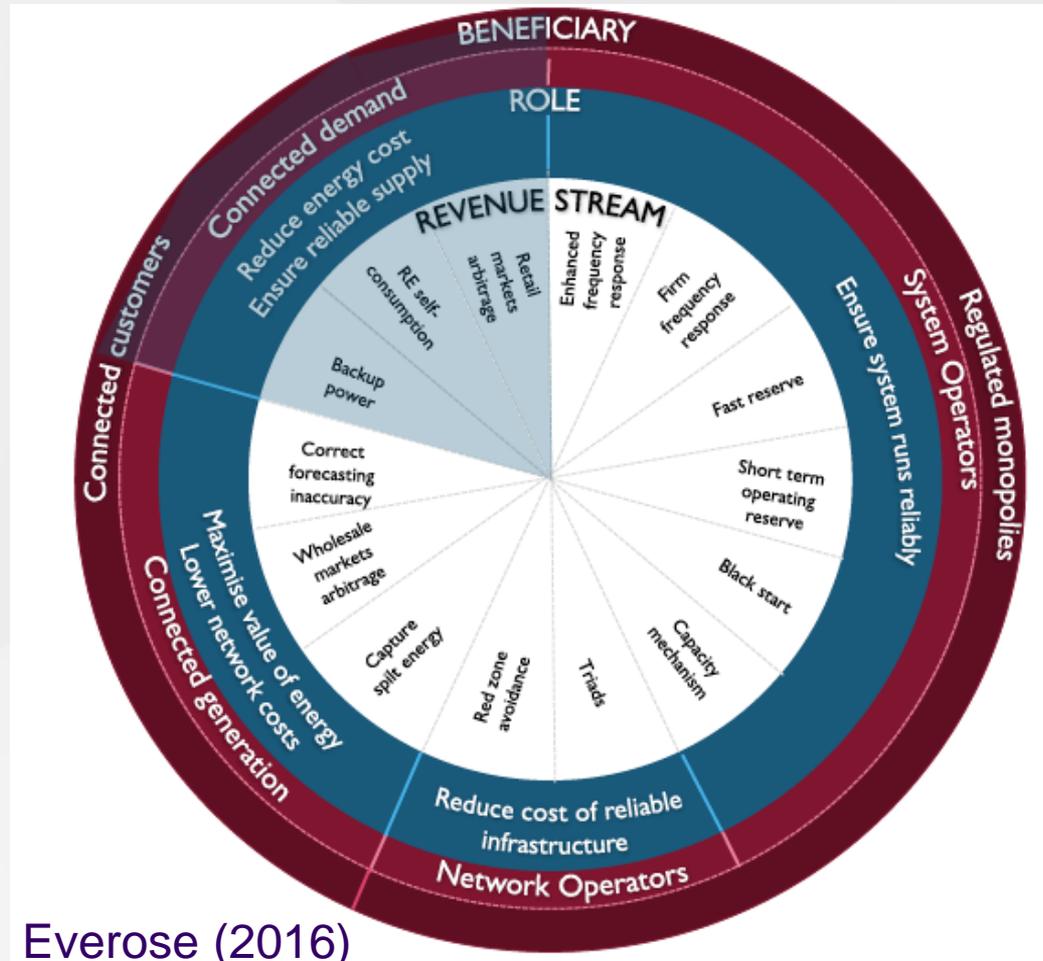


Business models in residential markets

New business models rely on firms operating in different markets and offering different services:

- **Distributed generation** and storage, which can shift peak consumption and avoid local congestion
- **Sector coupling** (heat, electricity, gas, different types of storage)
- **Wholesale trading** (day-ahead, reserve markets, capacity) and provision of ancillary services (FFR, EFR)
- Offering innovative **retail** products (e.g. dynamic pricing)
- Smart household **appliances** at consumer level
- Smart thermostats / speakers
- Providing peer-to-peer **trading** (via a platform)
- Provide value from **information** (data management)

Potential revenue streams in a decentralised energy system



Everose (2016)

Microgrids and trading platforms

- P2P platforms based on blockchain technology require less centralized coordination, and allow resale of flexibility
- Lack of regulatory guidance limits development of local markets (participation in markets, ownership and partnerships, licensing)
- Should they be considered as ‘utilities’ and subject to regulation?
 - They adopt a variety of business models and targeted different revenues streams
 - Traditional utilities in the US see microgrids as a way of offering new services
- Concerns about limitations of blockchain technology in the energy sector.

Energy Communities



- At local level they can have tasks of DSO and retailer/aggregator.
- They can create synergies between local and national systems.
- Defined, supported, monitored and regulated in different ways reflecting variety of emerging projects.
- Driven by financial motives but also preference for green/local, autonomy, democratisation, social capital creation.
- Challenges: financial viability (including eligibility for Govt support schemes and cost of connection), achieving efficient size and complex legal processes.

Brooklyn Microgrid (BMG)

- Created and run by the American company LO3 Energy in 2017
- “a virtual community energy market based on blockchain technology with a physical microgrid built in addition to the existing distribution grid”
- Currently 45 households
- Can operate in island mode



Verv (Green Running Ltd.)



Energy Services (Verv Home Hub)

- Monitors appliances at ultra-high sampling rate
- Real-time device recognition, reports on financial and emissions savings.

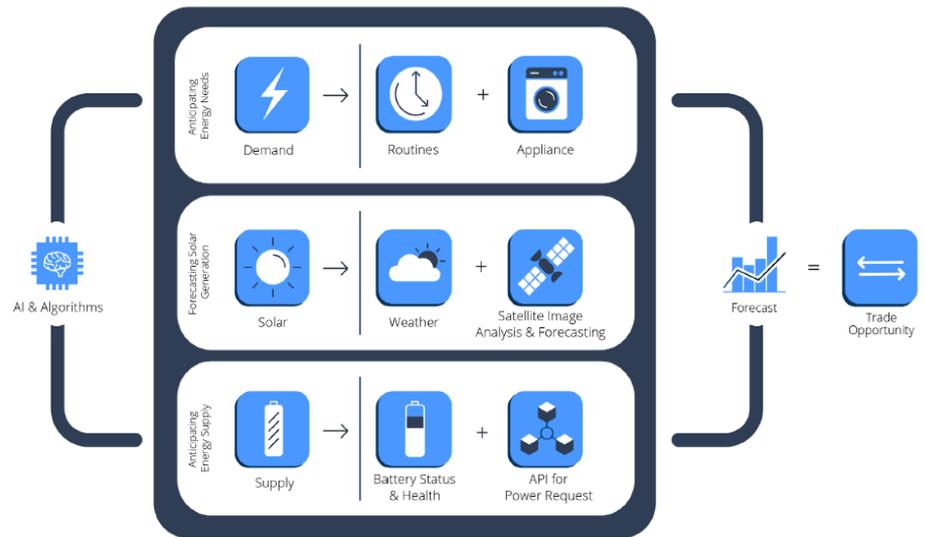
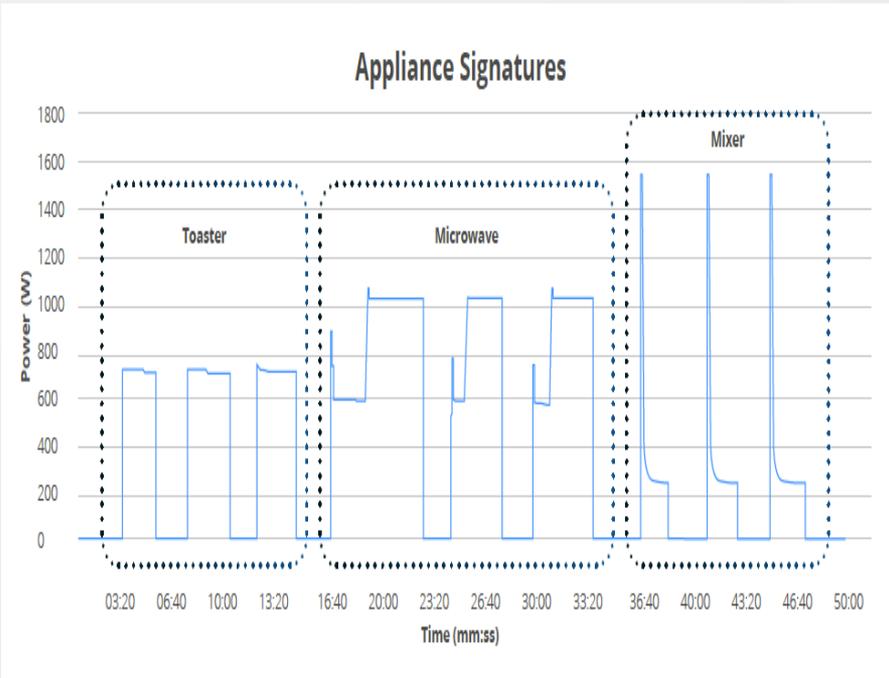
P2P blockchain-based trading platform (VTP)

- Ultra-high sampling rate of VHH allows for better D-S forecast. AI to support automated trading.
- Trading price between FiT rate, wholesale rate and retail price

Hackney Bannister House Estate project

- PV in tower blocks with 40 VHH and trading between flats. First UK blockchain energy trade took place in April 2018 (1kWh surplus electricity between two tower blocks)

Very home hub



The de Ceuvel microgrid (Amsterdam)



The de Ceuvel microgrid

- Private behind-the-meter smart grid (exempt from micro-grid regulation in order to trade BTM) funded in 2012.
- Comprises 16 office buildings (on boats) a café, a B&B and a greenhouse, aims to create a 'circular, resource-based economy'
- 36000 kWh produced by 150 solar panel provide energy for heating, services, exports and generation of tradeable tokens
- 'Jouliette' is P2P token which can be used only within the project.
- Transactions supported by blockchain technology. Unlike cryptocurrencies the tokens reflect the utilitarian value of electricity.
- Platform provided by smart energy services company Spectral.

Piclo (Open Utility)



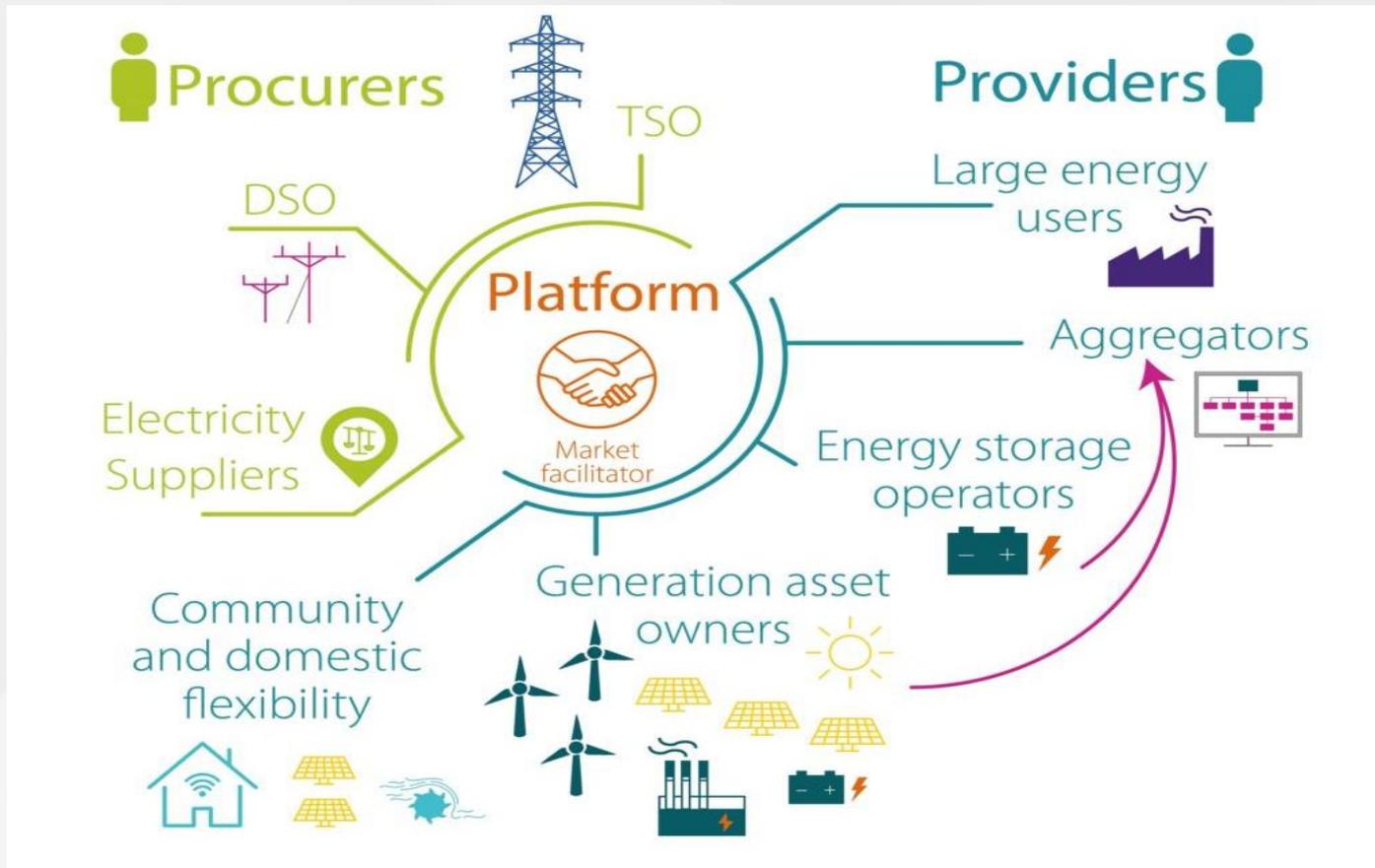
UK-wide trading platform (partners with Good Energy)

- Proprietary matching algorithms between businesses and suppliers
- Half hourly meter data, pricing and preferences (e.g. solar, wind etc.) used for matching direct from source
- Data visualisation and analytics.

The “online dating” energy trading platform (Piclo flex)

- DERs register assets on platform. DNO/DSO advertises service requirements. Providing visibility on both sides
- Simple open auction to match D-S. 5 out of 6 DNOs signed up, UKPN to source all flexibility requirements through Piclo Flex

Picco Flex – How it works



Piclo Flex Dashboard



East Manchester

This area has no competition set up yet

Status _____ -
Qualification close _____ -
Need type _____ Reinforcement deferral
Need _____ Generation turn up / Consumption
direction _____ turn down
Connection _____ 33 kV or below
Buyer _____ Electricity North West
Competition type _____

 Qualifying assets
None

<https://picloflex.com>

W20/21 - All week

3.9 MW, 2416 hours available

1 November 2020 Contract start	31 March 2021 Contract end	
06:00 - 22:00 Time required	 Days required	
- Est. utilisation events	- Est. utilisation duration / event	- Est. hours utilisation
3.9 MW Total need	0.25 MW Min. aggregate asset size	30 mins Min. run time

Conclusions and emerging issues

- Subsidies for grid export might conflict with incentives for P2P trade on platforms or within energy communities. How do we reward P2P trading and ensure security of supply at the aggregate level?
- How should trading platforms be defined? Do we need a unique definition of trading platforms? Is regulation needed?
- Blockchain technology has worked well in small scale communities but can it be applied more widely in the energy sector?
- Do energy communities have the necessary skills and expertise internally? How can they achieve financial viability and efficient size?

Thank You