WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Energy Network Innovation for Communities

Yiango Mavrocostanti

Innovation and Low Carbon Networks Engineer

11th of October 2017

Smarter Community Energy Innovation

Antenna 9A Beck Street Nottingham

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Outline

- Western Power Distribution – Who we are
- Traditional role of Distribution Network Operators
- Future role of DNO – Drivers for change and the challenges
- WPD's Innovation Strategy
- Innovation for communities projects
- Support for Community Energy

Our service territory and customer base

- WPD is a Distribution Network Operator (DNO)
- We distribute electricity to 7.8 million customers
- We operate 4 of 14 distribution licence areas in the UK

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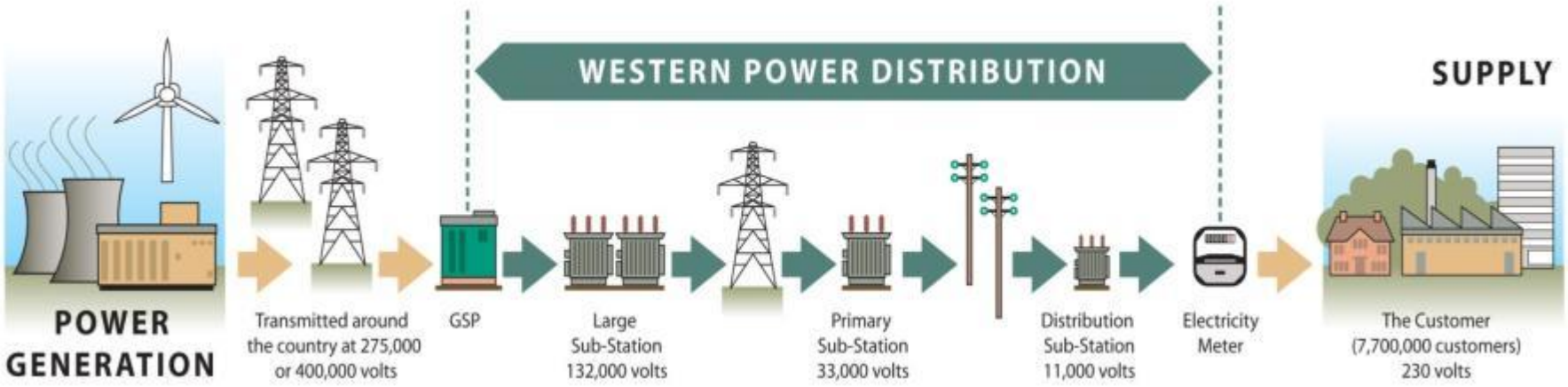
Traditional Role of the DNO



Key Activities

- Maintain the network
- Connect new customers
- Fix the network

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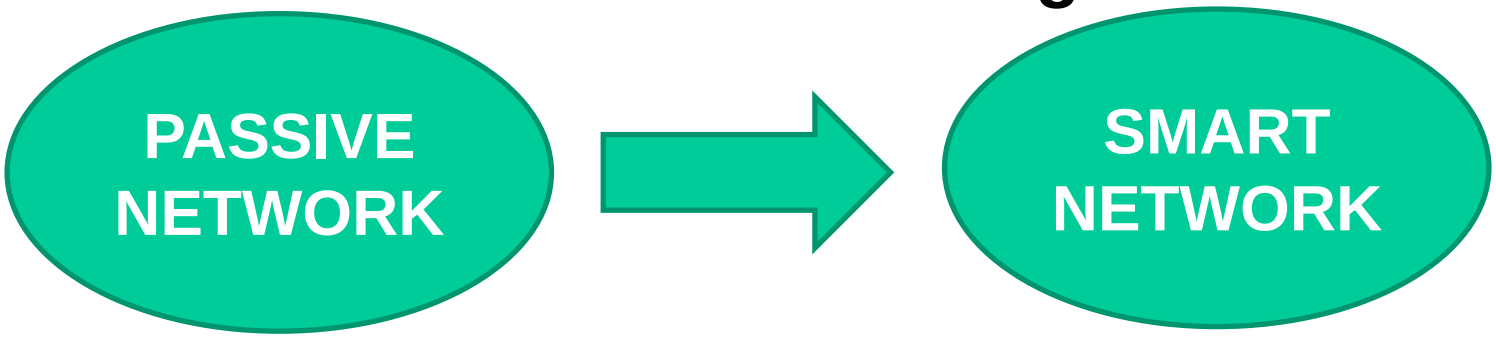
Network Changes - Drivers

- Climate change and international agreements on reducing carbon emissions
- EU and UK binding targets
- Rapid changes in GB generation
- Significant uncertainty over the pace of change
- Long lead time to build conventional capacity

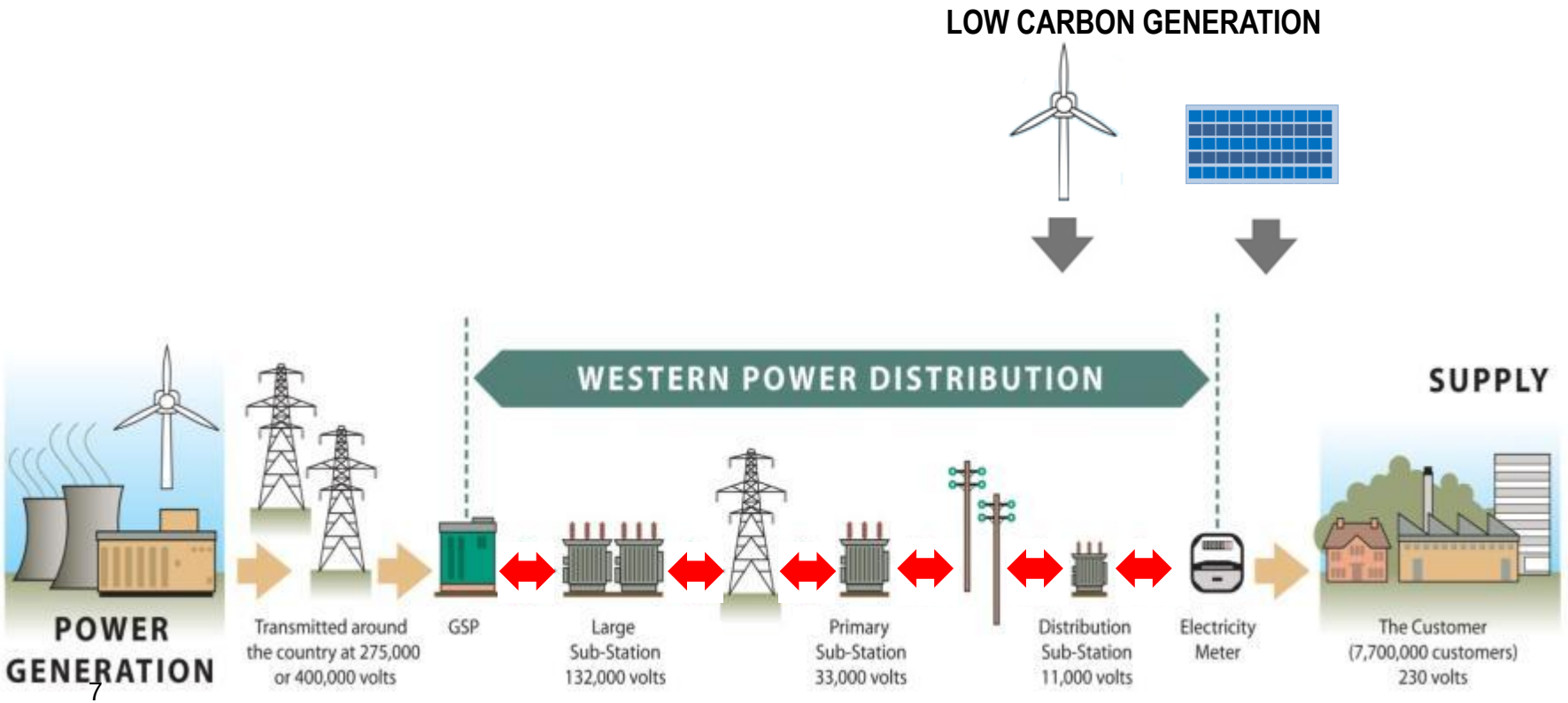
What needs to change?



- Historic and real time energy flows
- Forecasting future energy volumes across the network
- Active reconfiguring of the system as needed
- Commercial arrangements to contract DG, active demand and storage services
- National Grid Transmission System Operator (TSO) and DSO cooperation to reduce conflicts
- Simple platform for energy suppliers, generators/ storage, local community schemes and other market participants to trade in energy services

The challenge for our network

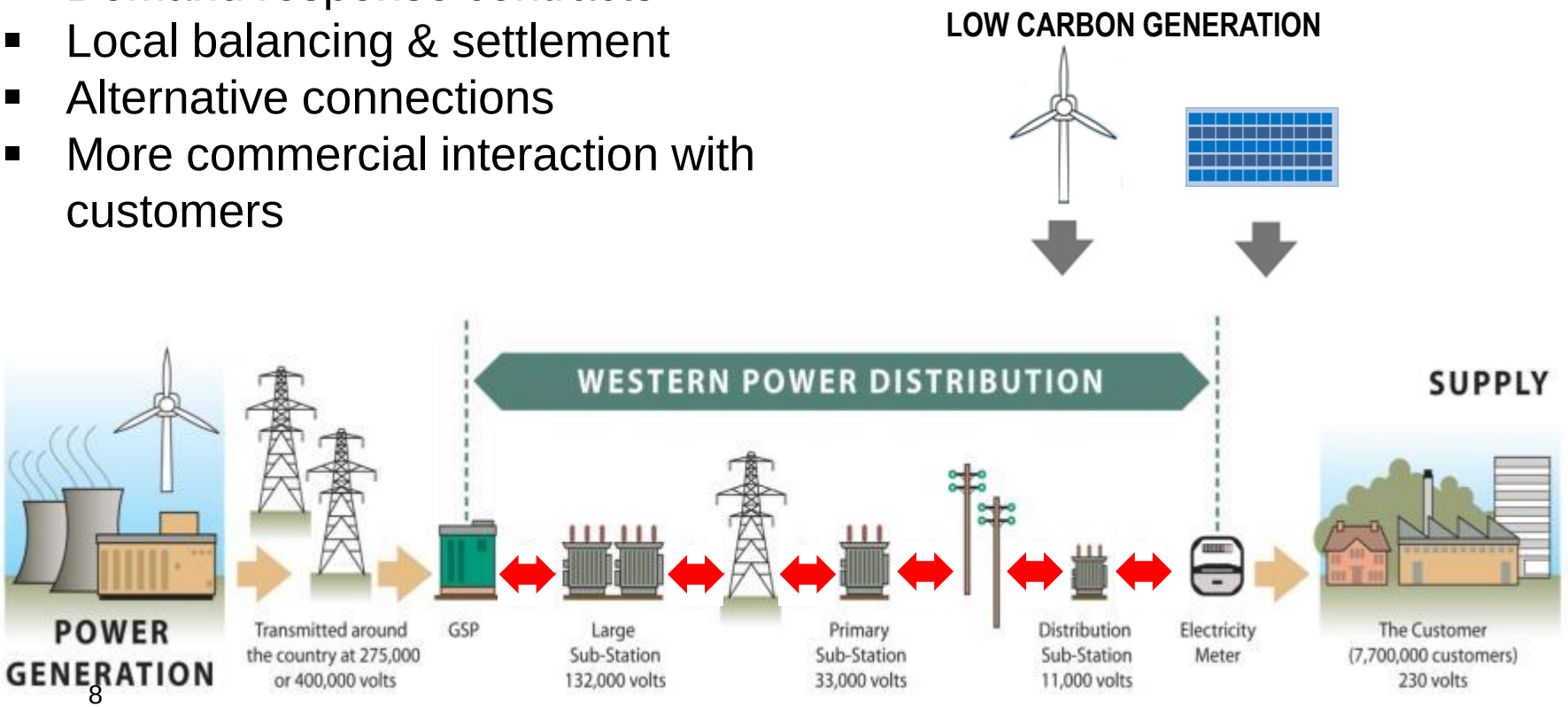
- Localised generation causes reverse power flows, voltage level changes, rapid variations in export / import
- Additional impact upstream on National Grid



The future role of the DNO

Key Activities

- Managing energy not power
- Demand response contracts
- Local balancing & settlement
- Alternative connections
- More commercial interaction with customers



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WESTERN POWER DISTRIBUTION PROTEUS NEW

WESTERN POWER DISTRIBUTION FLEXDGRID

WESTERN POWER DISTRIBUTION PLUGS AND SOCKETS

WESTERN POWER DISTRIBUTION SOLA BRISTOL

WESTERN POWER DISTRIBUTION LOW CARBON HUB

WESTERN POWER DISTRIBUTION OPEN LV NEW

WESTERN POWER DISTRIBUTION NETWORK EQUILIBRIUM

WESTERN POWER DISTRIBUTION SMART ENERGY ISLES

WESTERN POWER DISTRIBUTION NETWORK TEMPLATES

WESTERN POWER DISTRIBUTION FALCON

Future Networks Programme

Assets

- Telemetry
- Decision support
- Improved assets
- New assets
- Flexibility
- Automation
- Incident response

Customers

- New connections
- Upgrades
- Information
- Self Serve
- Products/Service
- Tariffs
- Communities

Operations

- Reliability
- Forecasting
- DSO
- DSR
- GBSO Interface
- Efficiency
- SHE and Security

Network and Customer Data

- **Airborne Inspections**
- **AIRSTART[1]**
- **Telecoms Templates**
- **Superconducting Cable**
- **SF6 Alternatives**
- **MVDC Test Lab**
- **Smart Energy Laboratory**
- **Statistical Ratings**
- **Primary Network Power Quality Analysis**
- **Hybrid Heat Pump Demonstration**
- **Hydrogen Heat & Fleet**
- **Carbon Tracing**
- **HV Voltage Control**
- **Solar Storage**
- **LV Connect and Manage**
- **Sunshine Tariff**
- **CarConnect**
- **Industrial & Commercial Storage**
- **DSO/SO Shared Services**
- **Project Sync**
- **Project Entire: Flexible Power**
- **Integrated Network Model**
- **Smart Meter Exploitation**
- **Distribution Operability Framework**
- **Data Analytics**
- **Voltage Level Assessment**
- **LV Connectivity**
- **Smart Systems and Heat[2]**

Note: 1 – Funded by Aerospace Technology Institution; Note 2 – Funded by the Energy Systems Catapult

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WPD Innovation Project Learning

- LV Templates – Energy profiling
- Low Carbon Hub – development of Alternative Connections/ ANM
- Low Carbon Hub – development of DG constraint panels
- FALCON – I&C DSR (with DG and Active Demand)
- FALCON – Energy Forecasting
- SoLa BRISTOL – domestic DSR and DSM (with batteries)
- Community Energy Action – Community based DSR
- ECHO – domestic DSR (smart plugs)
- Car Connect – Smart EV charging
- SYNC – I&C DSR (demand shifting to summer DG peak)
- ENTIRE – Demand side response
- Solar Storage (DG output smoothing and ancillary services using battery storage)
- Plugs and Sockets – EU funded project

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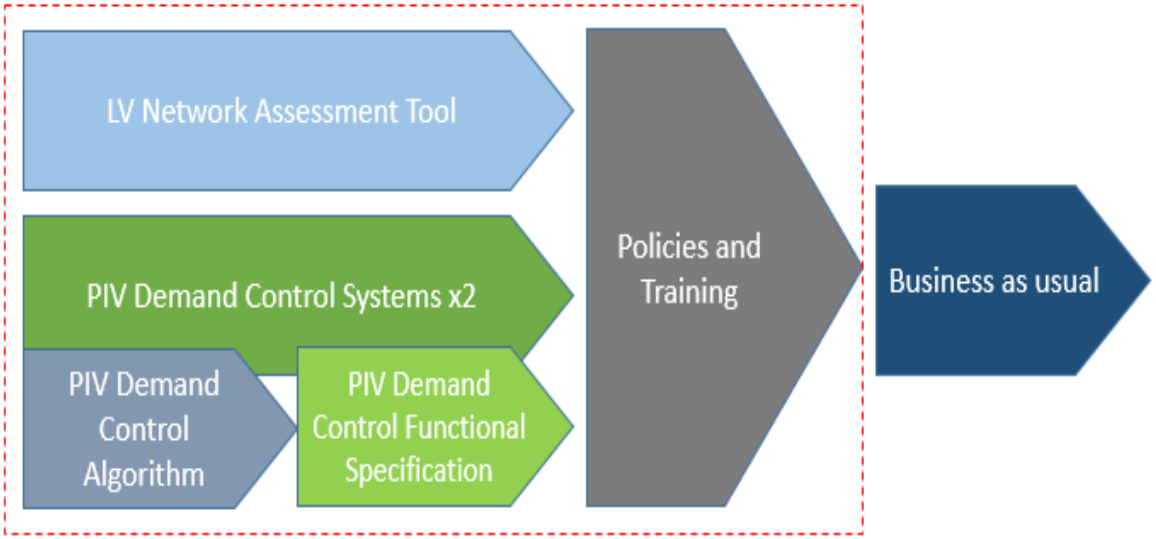
WPD Innovation for Communities

Electric Nation - CarConnect

- World's largest Plug-in Vehicle trial consisting of 500-700 vehicles
- Using a wide range of EV models and charging rates of up to 32A
- Developing all the tools required for Distribution Network Operators (DNOs) to manage EV uptake

- Modelling of EV network impacts and constraints
- Monitoring of real-time EV impact to defer reinforcement
- Mitigation of EV impact through Demand Side Response
- V2G test bed development



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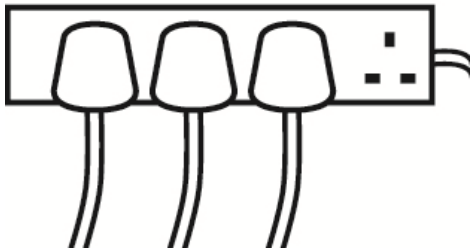
WPD Innovation for Communities

Plugs & Sockets / Cornwall Local Energy Market

Platform for trading flexibility services

Customers will alter electricity consumption or generation to benefit a third party.



DNO, SO, TO, Aggregators, Suppliers, Generators connect to the “Socket” via “Plugs”

- Notify flexibility services requirements
- Flexibility service trading
- Notify use of flexibility services
- More information at https://www.westernpower.co.uk/Connections/Generation/Community-Energy/Articles-and-case-studies.aspx

centrica

nationalgrid

UNIVERSITY OF EXETER

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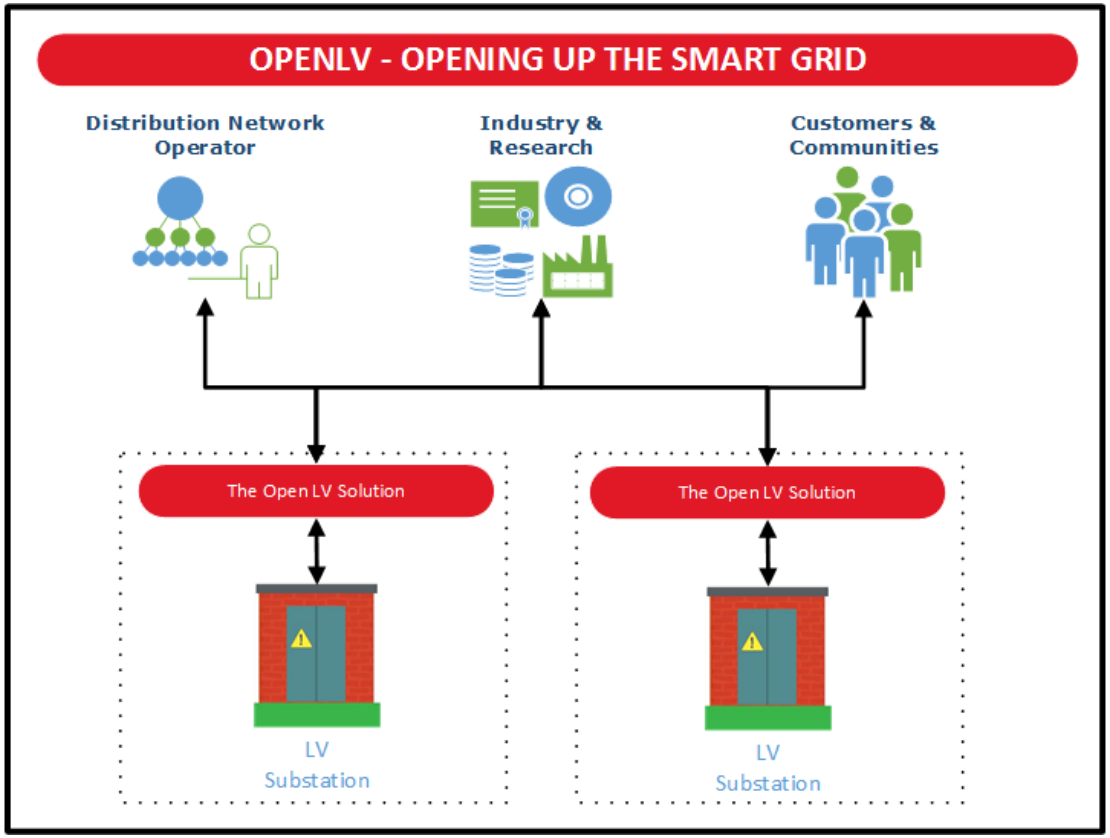
WPD Innovation for Communities
OpenLV



- OpenLV will deploy a workable open substation platform for both monitoring and control of the LV network.
- This platform will support the usage of a number of apps.

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WPD Innovation for Communities
OpenLV

- Through the apps it will provide community energy groups access to LV network data.

- Stimulate the Market to facilitate a common platform with low cost entry for a range of new App developers.

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WPD Innovation for Communities
OpenLV

Example Apps:

- What's My Community Demand
- LCT take-up monitoring & prediction
- Real Time Thermal Rating – Transformers and Cables
- DSR for managed EV charging
- Automated Voltage Management
- Distributed generation control
- Community Alerts to request reduction or increase in load
- Automated energy storage control

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WPD Innovation for Communities
OpenLV

- Submit app proposal by 16 October 2017.
- App development until July 2018.
- https://openlv.net/about/the-project/for-business-and-academia/

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Summary

- WPD – Traditional role of DNO and the industry changes
- WPD Innovation Team – Areas of focus
- Innovation for Communities
  - Electric Nation
  - Plugs and Sockets
  - OpenLV

Future Events

Electricity Network Innovation events

- London, 1 November: https://www.regensw.co.uk/Event/electricity-network-innovation-london
- Newcastle, 7 November: https://www.regensw.co.uk/Event/electricity-network-innovation-newcastle

Support for Community Energy

Connection Surgeries

- We have an annual schedule of Connection Surgeries
- Our Connection Surgeries allow customers to discuss face-to-face with one of our engineers, either the process of applying for a connection in general or specifics about a particular scheme

Connection surgeries

We operate the regional electricity network and provide new connections to homes, businesses and generation sites at voltages from 230 volts to 132,000 volts.

We understand that ahead of applying to us for a new connection and particularly for Generation Connections, our customers and Independent Connection Providers (ICPs) often have questions and want to understand more about the process, timescales, technical matters, consents/legal requirements and possible constraints of making a connection to the network in a particular area.

With this in mind we are running a series of Connection Surgeries where our engineers will be able to assist you.

The surgeries will run on the dates listed below and enable interested parties (like landowners, ICPs, developers and community groups) to make a 45 minute appointment with an engineer to discuss their requirements and the connection process, ahead of making an actual application for a connection to the network.

regensw
2016 edition

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QUESTIONS?

Smarter Community Energy Innovation
Nottingham – 11 October 2017

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transforming energy

Agenda

12:30	**Registration, lunch and networking**
13:30	**Welcome and introductions from chair**
14:00	**Community energy progress and possibilities** Emma Bridge, chief executive, Community Energy England
14:30	**Energy network innovation for communities** Yiango Mavrocostanti, innovation and low carbon networks engineer, Western Power Distribution
	Questions and answers
15:15	**Refreshment break and networking**
15:45	**Local supply and storage** Jodie Giles, senior project manager, Regen

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Agenda

16:15 **Stories from the front line** – community energy groups will share stories about innovative project they are doing, lessons learned and tips for others
Ben Aylott, Carbon Coop

Alan Simpson, MOZES board member and the Shadow Chancellor's advisor on sustainable economics

Questions and answers

17:00 **Networking tea and coffee**

17:30 **Close**

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Future events

WPD Smarter Community Energy Innovation - Examine the rapid transition to a smart, flexible energy system and how community energy groups can play a leading role in the change.
Cardiff – 18 October
Plymouth – 15 November

Electricity Network Innovation – Focus on getting community groups up to speed and actively engaged in energy network innovation, which can help communities tackle social and environmental challenges.
London – 1 November
Newcastle – 7 November

EWiRE A smart, decentralised system – Provide an opportunity to understand the market opportunities in energy storage and smarter energy markets as we move towards a more decentralised system.
London – 16 November

Renewable Futures and Green Energy Awards– Examine the strategies to adapt and create value in a rapidly changing market, ahead of a glittering awards ceremony, recognising and celebrating the achievements of the industry.
Bath – 28 November

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Renewable Futures and Green Energy Awards

The Assembly Rooms, Bath, 28 November 2017

Join our unique line-up of industry leaders to analyse the disruptive innovation shaking up the energy market and identify strategies to adapt and create value

Book here (or contact Hannah hstanley@regensw.co.uk)
https://www.regensw.co.uk/renewable-futures-and-green-energy-awards

Confirmed speakers so far:

SIEMENS ELECTRON origamienergy nationalgrid ofgem Foresight group

Sponsors:

Scottish & Southern Electricity Networks
THRIVE RENEWABLES
WALES&WEST UTILITIES
EDF ENERGY RENEWABLES
NATURESAVE INSURANCE
Pell Frischmann Consulting Engineers
Renewable Energy Connections

Local supply and storage

Jodie Giles, 11 Oct 2017

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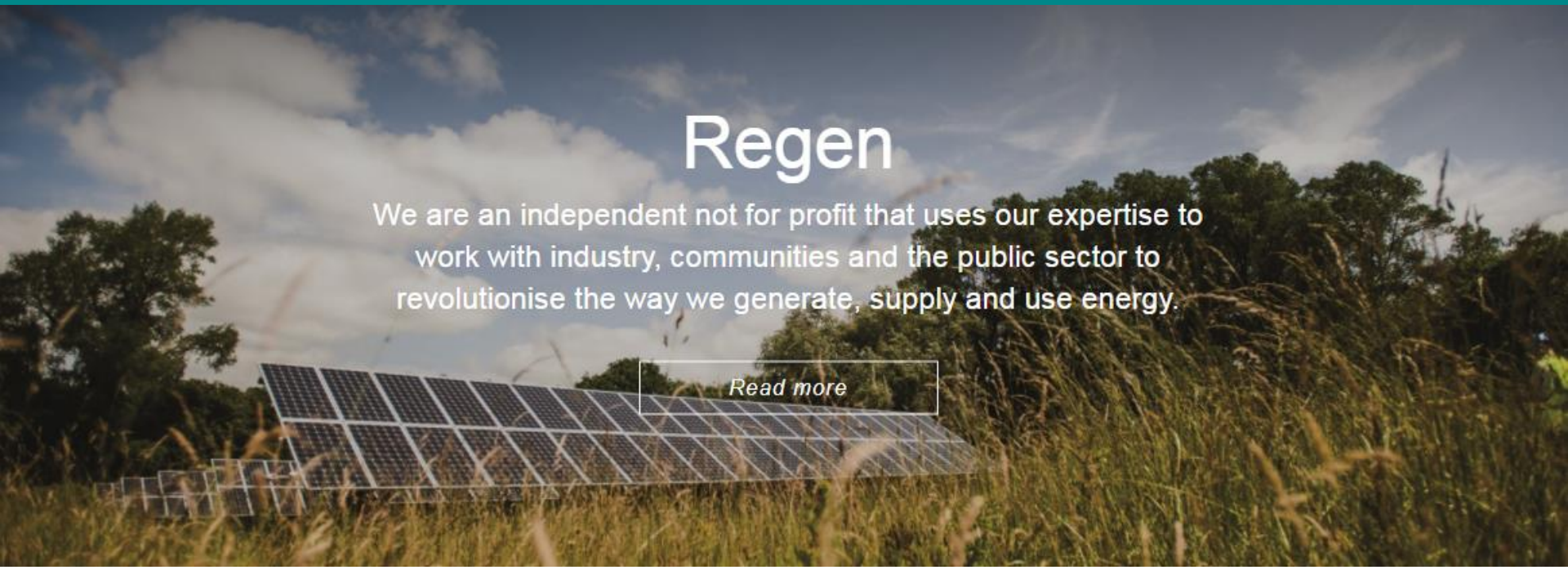
FRIENDS PROVIDENT Foundation

Esmée Fairbairn FOUNDATION

power to change

LOTTERY FUNDED

Who are Regen?



Financial modelling

Financial and economic modelling to assess opportunities and aid decision making

Advisory services

Bespoke consultancy and support services from strategy to delivery

Data analysis

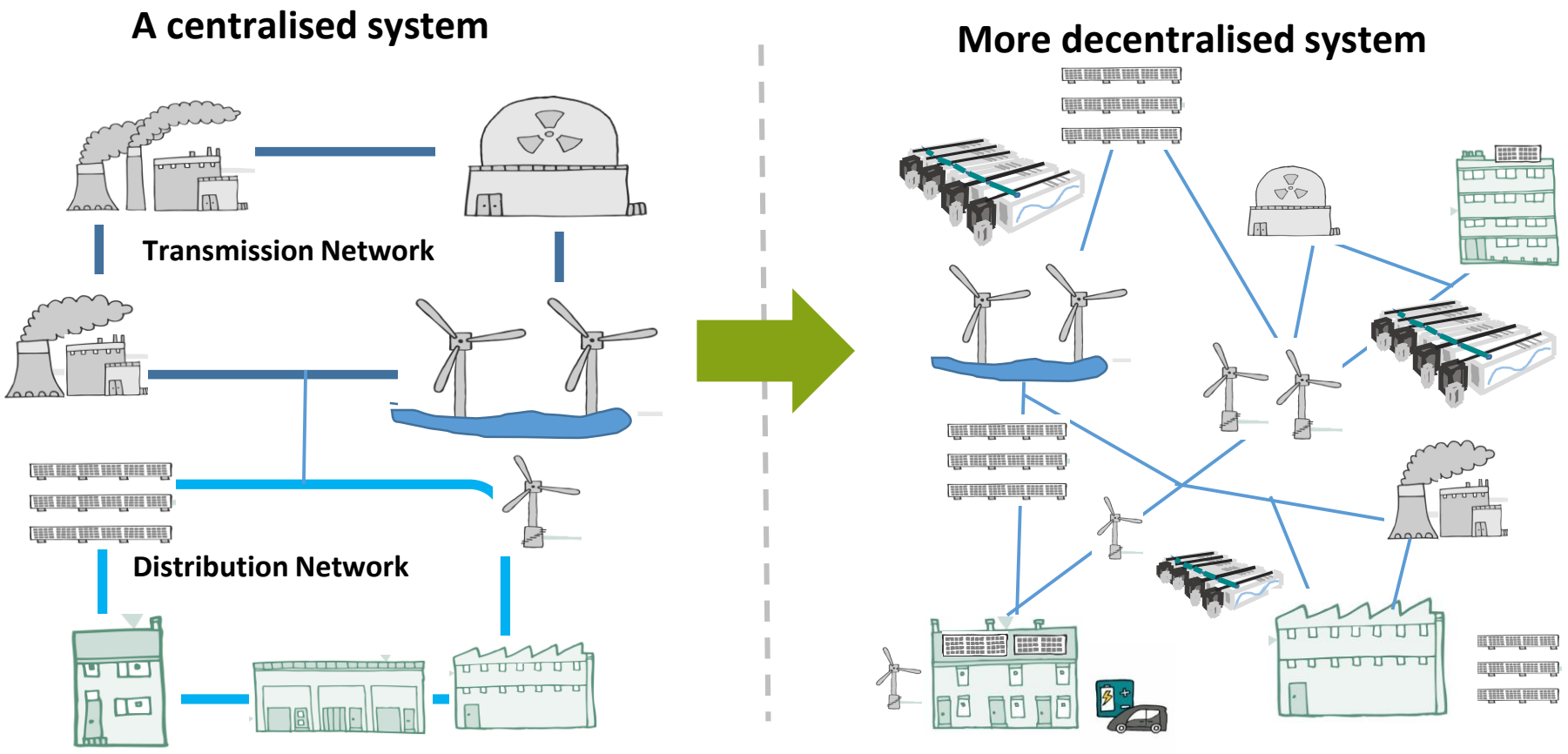
Market and technology analysis backed by full GIS capability

Future energy scenarios

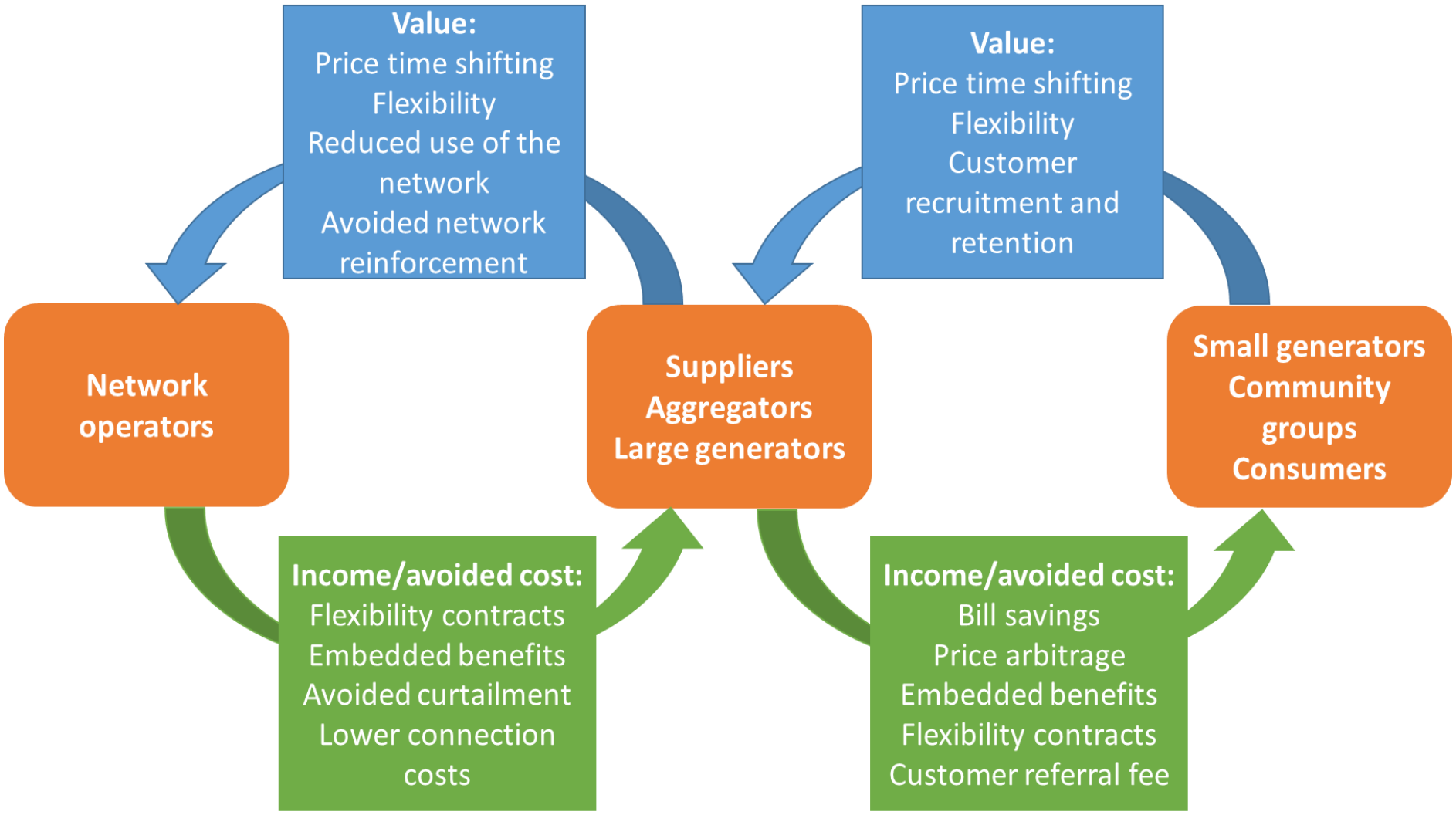
Applying real-life industry knowledge to understand future energy systems

member

Energy system changes

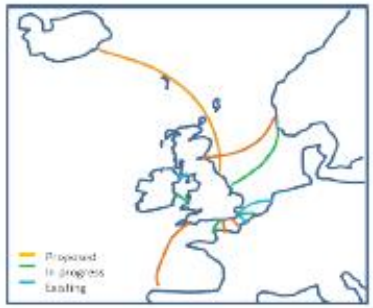


Accessing sources of value

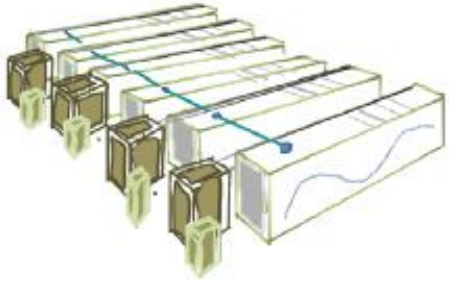


Flexibility

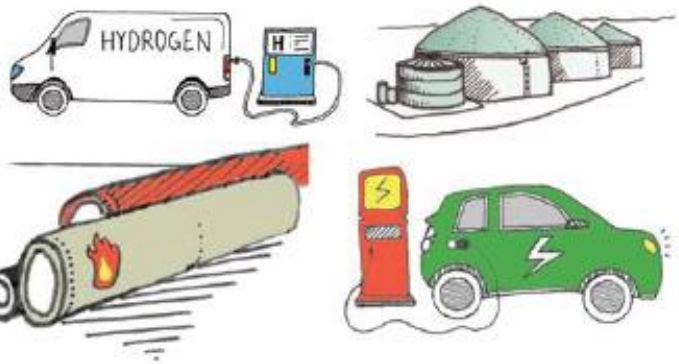
Sources of flexibility



Interconnection



Energy storage



Multi-vector energy integration

Local supply network balancing

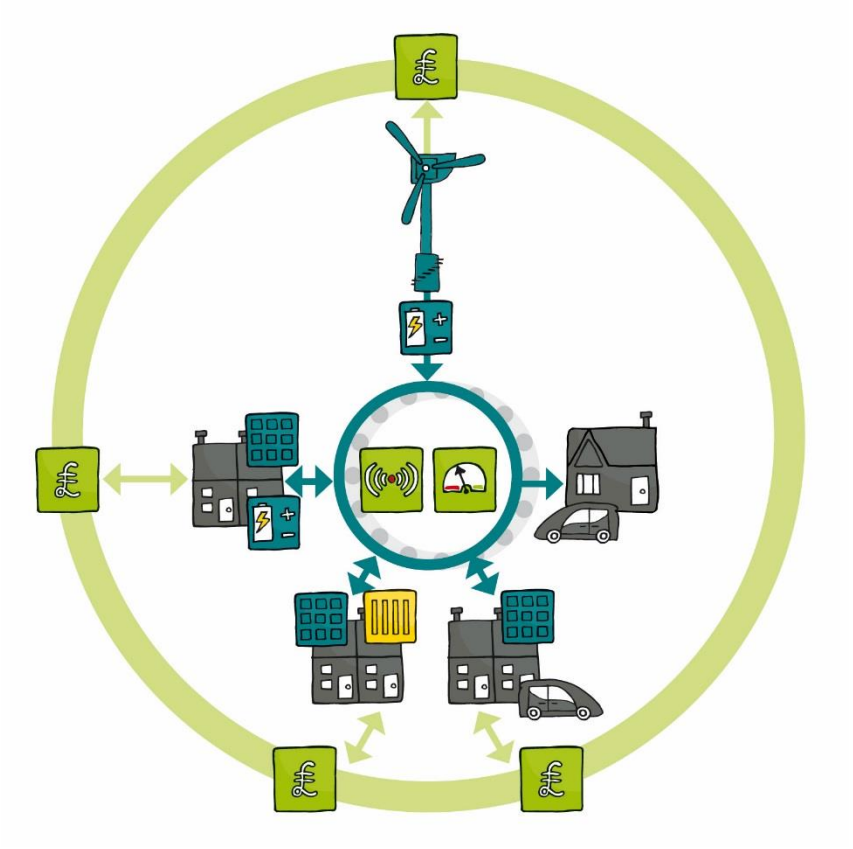
Demand side response

'The saving could be as large as **£8 billion** a year by 2030.'

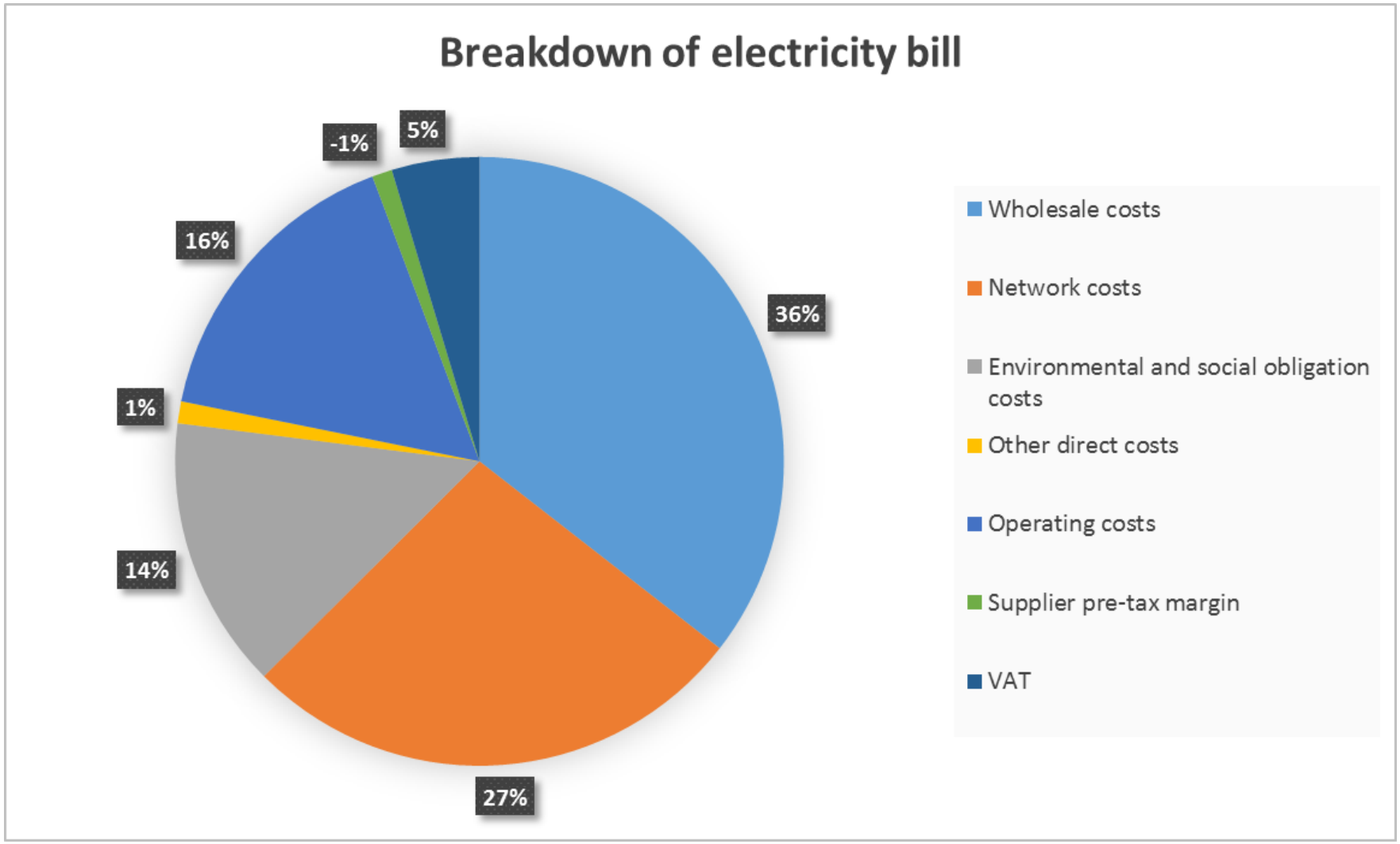
Lord Andrew Adonis, Chair, The National Infrastructure Commission

Benefits of local supply

- Enabling people to feel more connected to local generation when potential to link through a local tariff
- Negotiate tariff that meet local objectives e.g. reducing fuel poverty
- Trusted local supplier:
  - Enable engagement with harder to reach groups
  - Demand reduction through information
- Can help secure finance for community owned generation when can guarantee long-term PPA



Centralised markets



Development of a local supply model

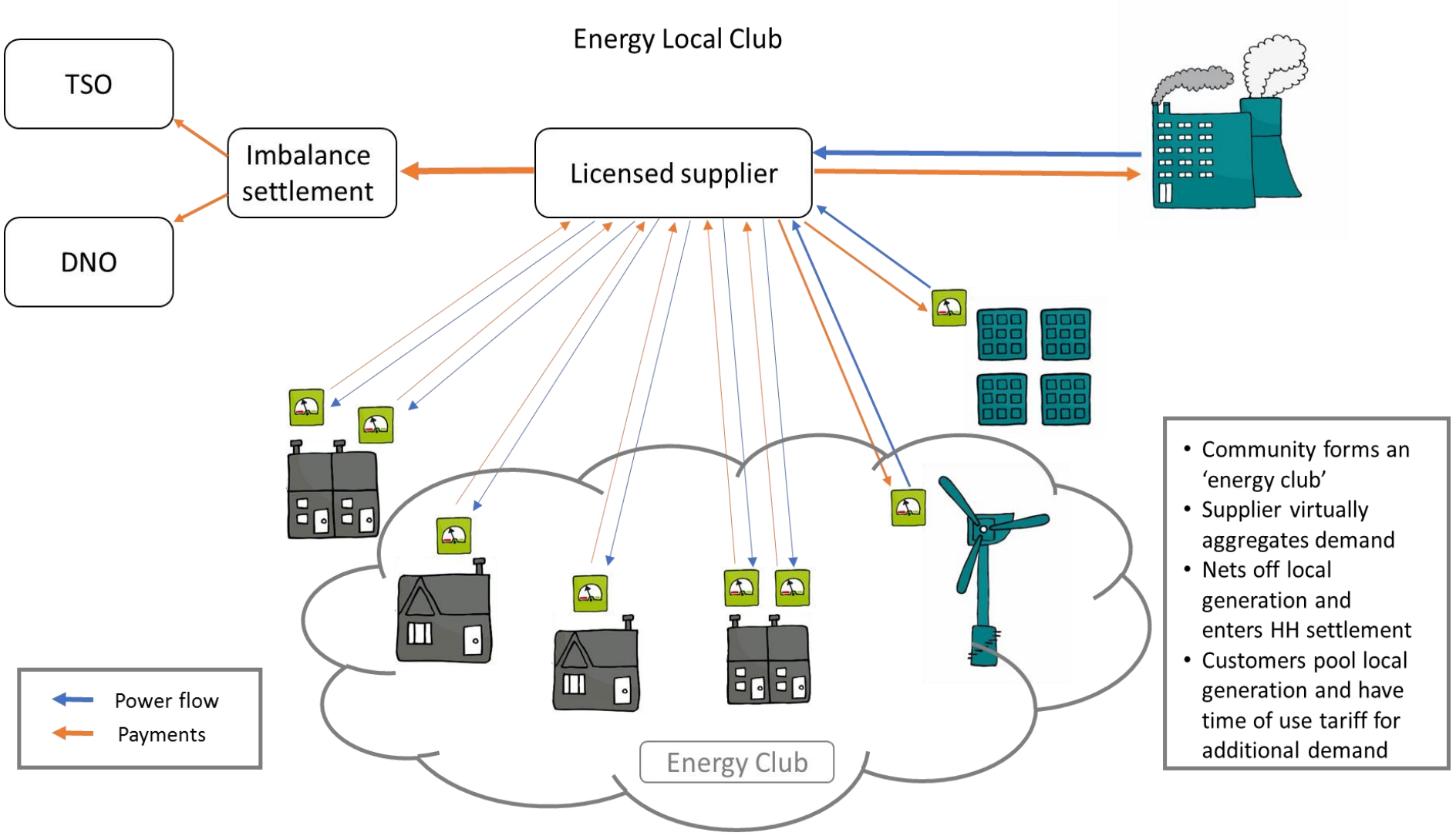
A model that is replicable, scalable, sustainable and has communities at its heart

- Accessible model for community energy groups
- Makes use of local electricity generation
- Benefits for local residents
- Accommodates technology and market changes
- Retains value
- Has potential to overcome any regulatory or commercial barriers
- Is financially viable and sustainable
- Is replicable across the UK
- Is attractive and protects consumers

Shortlist of models

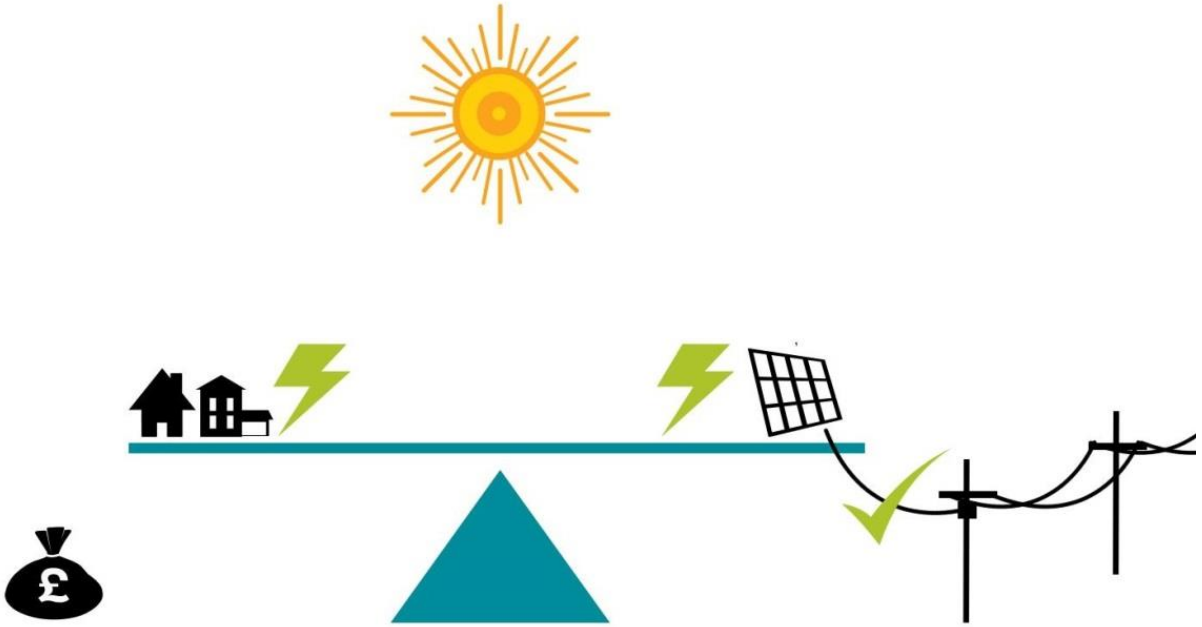
- Local energy clubs
- Generation tariff/local time of use tariff
- Automated matching
- Aggregator ESCO
- Microgeneration loan – e.g. BHESCO
- Licence exempt private network (microgrid)
- Network leasing (virtual private network)
- Trading platform/sleeving – e.g. Piclo
- Peer to peer

Energy Local Club



- Community forms an 'energy club'
- Supplier virtually aggregates demand
- Nets off local generation and enters HH settlement
- Customers pool local generation and have time of use tariff for additional demand

The Sunshine Tariff



Easton Energy and CEPRO simtricity

FRIENDS PROVIDENT Foundation

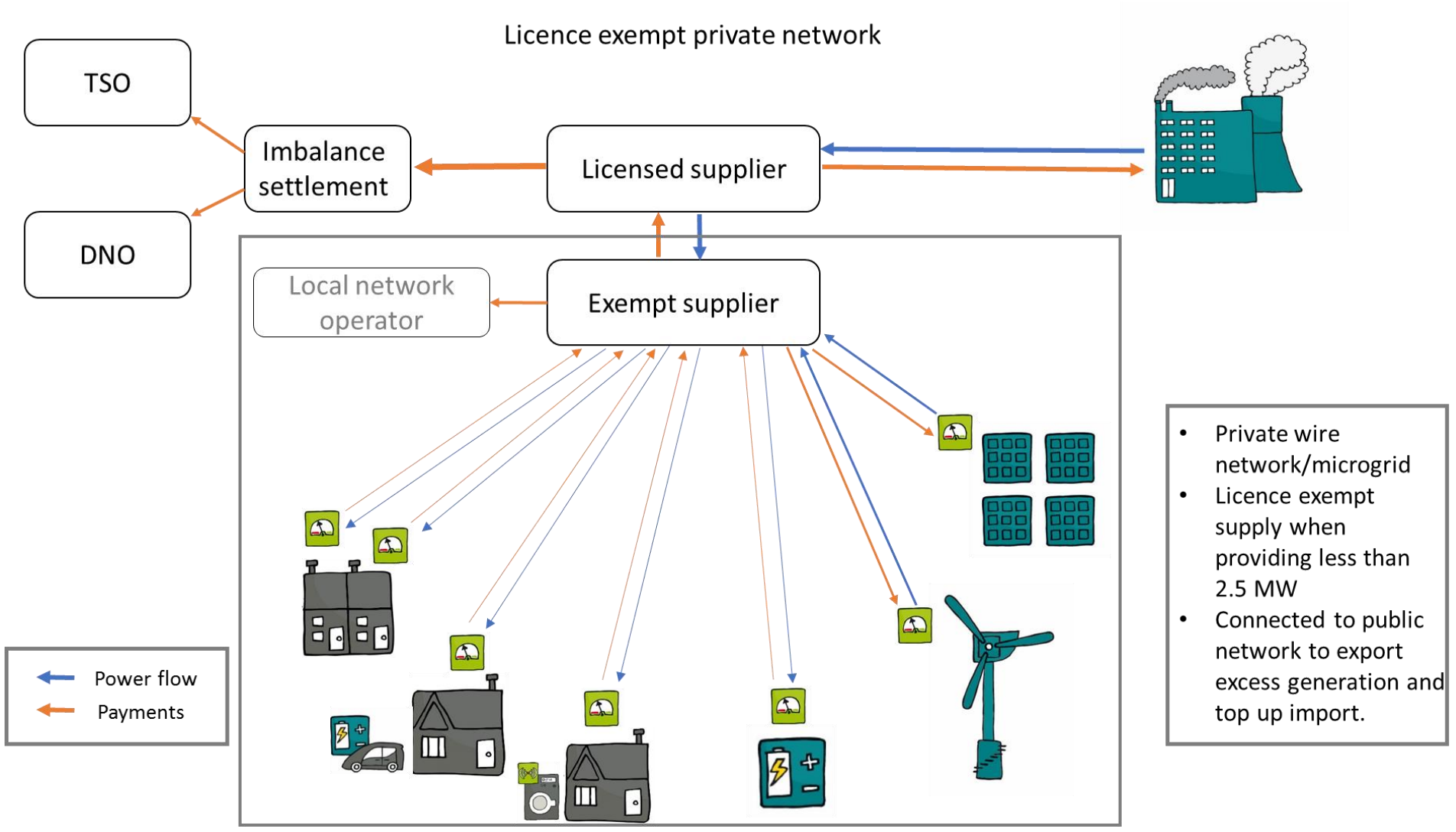
- Physical v virtual
- A look at costs
- A design statement for microgrids in new builds

Energy Local Club score

Criteria	Assessment comments	Score
Accessible model for community energy groups	Can form the club, set tariffs, sell generation	5
Makes use of local electricity generation	Buy power from generation on same LV network. Can potentially enable new generation	4
Benefits for local residents	Estimated bill reduction of between 10-30% Encourages behaviour change	5
Accommodates technology and market changes	Use of advanced HH meters Potential to access DSO markets in future	3
Retains value	Price time shifting Flexibility Supplier margin and customer recruitment	4
Has potential to overcome any regulatory or commercial barriers	Already being rolled out But reliant on a friendly supplier and meter operator	4
Is financially viable and sustainable	Still being tested	2
Is replicable	The model may work better with some generation technologies than others. Need right balance of generation and demand below a primary	2
Is attractive and protects consumers	Tariff is attractive, but more so for those with flexible load	4

Please note the scoring is provisional and should not be circulated to a wider group

Licence exempt private network (microgrid)



- Private wire network/microgrid
- Licence exempt supply when providing less than 2.5 MW
- Connected to public network to export excess generation and top up import.

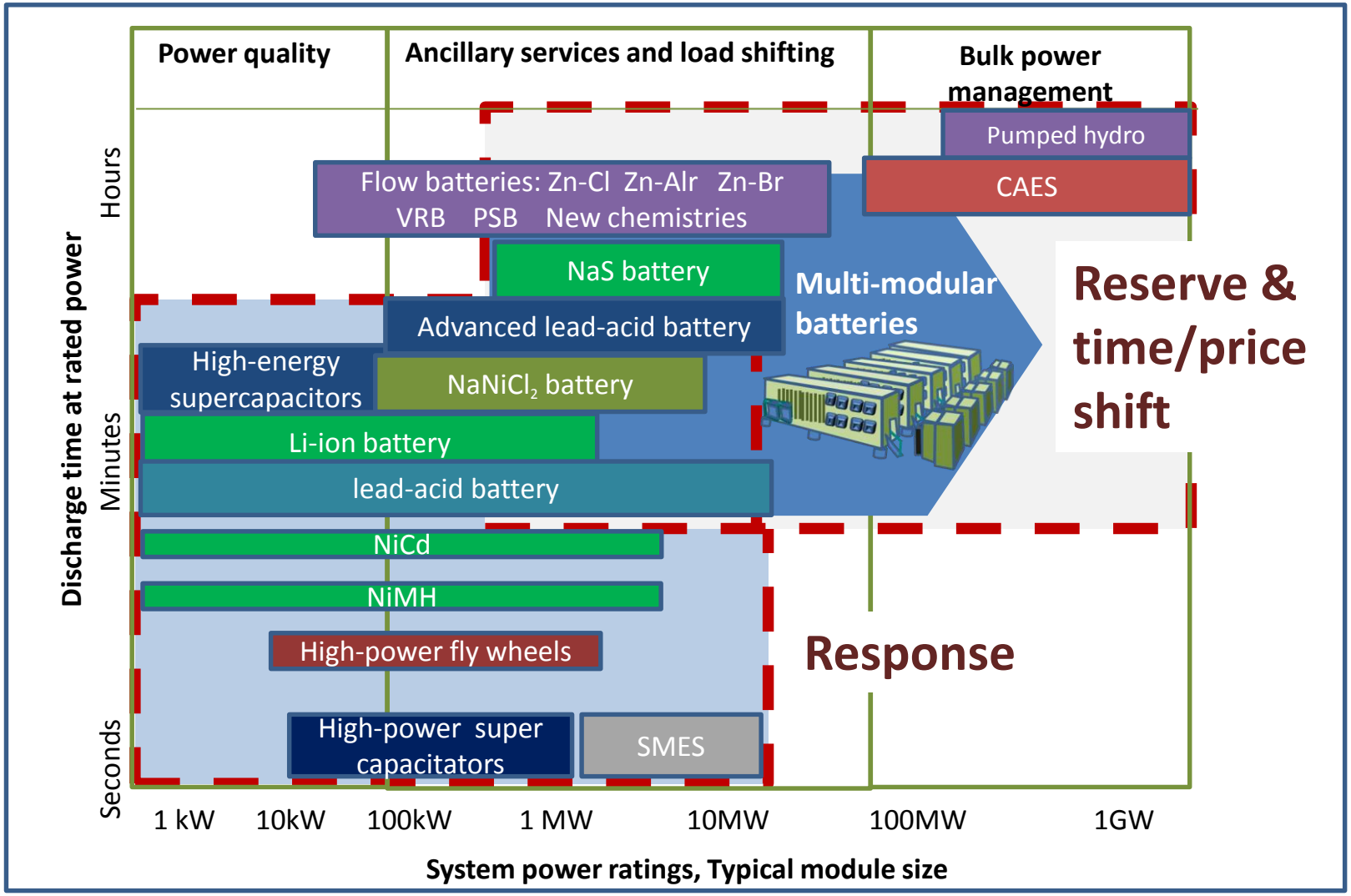
Licence exempt private network (microgrid) score

Criteria	Assessment comments	Score
Accessible model for community energy groups	Community energy groups could either become, or partner with, the exempt supplier	4
Makes use of local electricity generation	Better price for generation and potential to connect new	4
Benefits for local residents	Limited to new developments, but has potential to considerably lower bills for residents connected to network	4
Accommodates technology and market changes	Local balancing through: ToUT, storage, automated control	3
Retains value	Price time shifting Reduced use of the network Avoided reinforcement Supplier margin	5
Has potential to overcome any regulatory or commercial barriers	Licence exemption provides a lot of freedom A number of microgrids across the UK	5
Is financially viable and sustainable	Risk of customers switching away, but examples of successful exempt suppliers	3
Is replicable	Only viable for new build	1
Is attractive and protects consumers	Should provide better price and customers can switch away	3

Peer to Peer trading

Watch this space

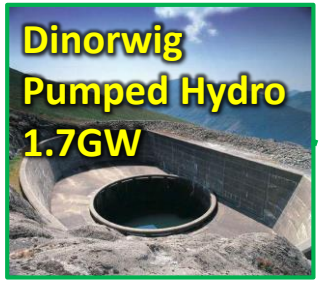
Storage


Power quality
Ancillary services and load shifting
Bulk power management
Pumped hydro
CAES
Flow batteries: Zn-Cl Zn-Alr Zn-Br
VRB PSB New chemistries
NaS battery
Advanced lead-acid battery
High-energy supercapacitors
NaNiCl2 battery
Li-ion battery
lead-acid battery
Multi-modular batteries
Reserve & time/price shift
NiCd
NiMH
High-power fly wheels
Response
High-power super capacitators
SMES
Hours
Minutes
Seconds
Discharge time at rated power
1 kW
10kW
100kW
1 MW
10MW
100MW
1GW
System power ratings, Typical module size

Operational storage – legacy & trials

Credit: Highview Power

Credit: AES

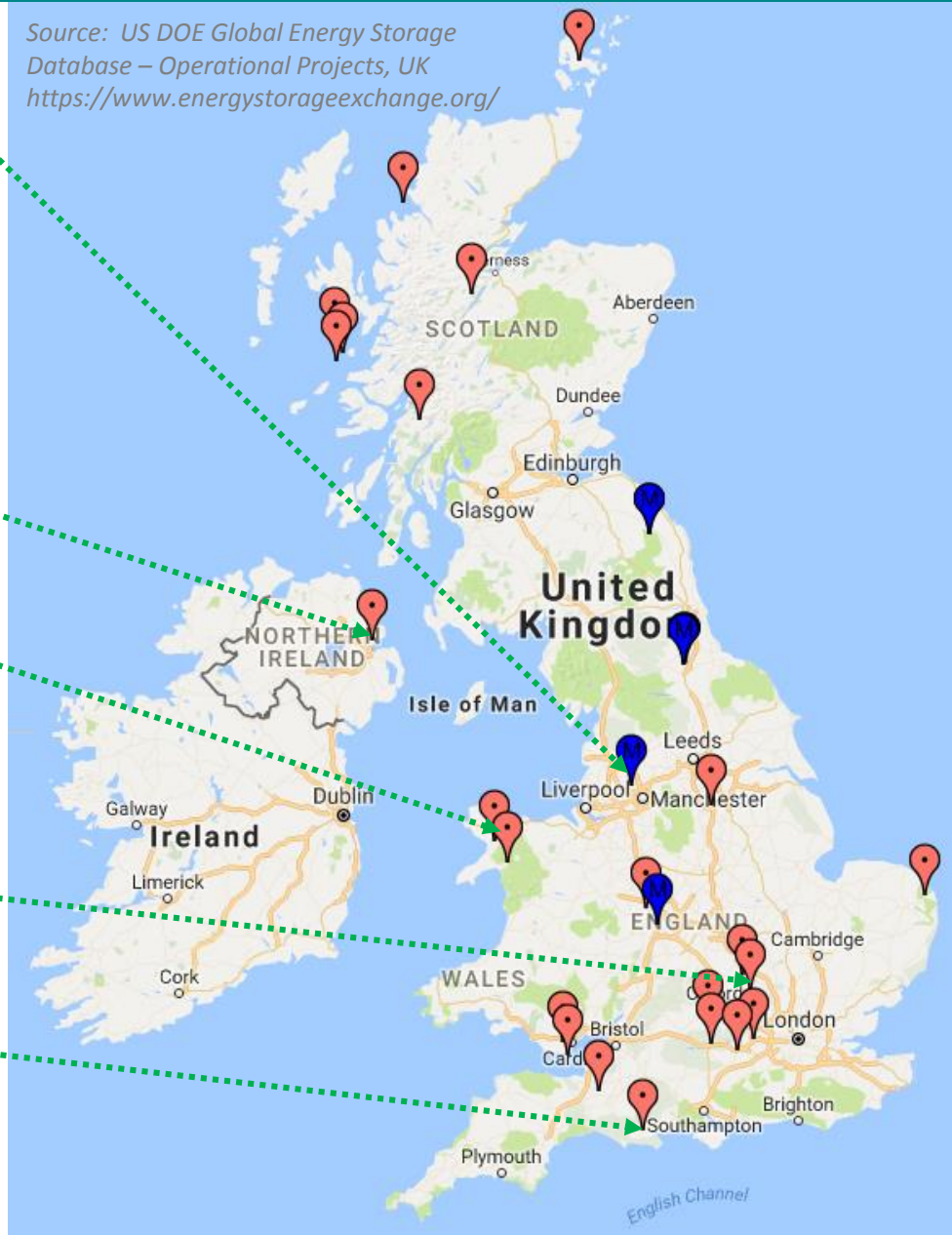


Credit: Electric Mountain

Credit: UKPN

Credit: Anesco

Source: US DOE Global Energy Storage Database – Operational Projects, UK https://www.energystorageexchange.org/



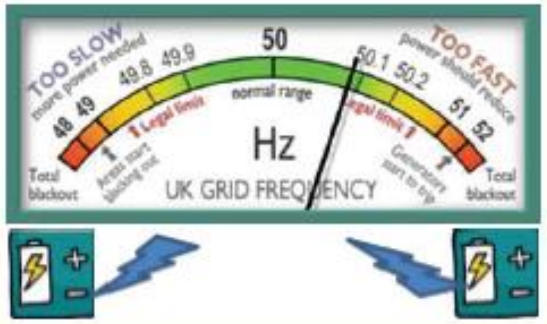
The role of energy storage

Inherent value of energy storage

Response

"ability to respond quickly to grid or price signals"

- Frequency response
- Reactive power and voltage
- Other ancillary services



Reserve

"ability to store and discharge energy when needed"

- Back-up
- Operating reserve
- Capacity reserve

Price / time shift

"ability to shift energy from lower to higher damand and price periods"

- Price arbitrage
- Peak shaving
- Grid peak price avoidance
- Aggregation

Potential “waves” of deployment

regen transforming energy

Wave 1

Response Services (EFR, FFR & DSR)

First “behind the meter” high energy users

Plus domestic “early adopters”

Today

Wave 2

“Behind the meter” industrial - DSR

RE co-location - especially for new PV

Some standalone sites

Domestic and community storage with PV

Tomorrow

Wave 3

Aggregation and marketplace models

RE co-location

Domestic and community storage becomes standard

The day after!

Potential scale of the storage market

Business model	GB market scenario growth scenario by 2030*		
	High Growth Scenario	Slower and no growth Scenario	Possible upside very high growth scenario
Response service	2 GW	0.5 - 1 GW	2 - 3 GW
	2 GWh	0.5 - 1 GWh	4 - 5 GWh
Reserve Services*	3-4 GW	2-3 GW	4 GW
C&I high energy user & behind the meter	2.5 - 4 GW	0.6 - 1.2 GW	5 GW
	10 - 16 GWh	2.5 - 5 GWh	20 GWh
Domestic and community own use with PV***	1.5 - 2 GW	0.37 - 0.75 GW	3 GW
	6 - 8 GWh	1.2 - 3 GWh	12 GWh
Generation co-location	2 GW	0.5 - 1GW	4 GW
	6 - 8 GWh	2-4 GWh	16 GWh
Total GB market	10 - 12 GW	4 - 5 GW	15 GW**
	24 - 44 GWh	6 - 13 GWh	50 GWh

* includes existing 2.7 GW of storage – mainly pumped hydro reserve services

** A very high growth scenario for all business models would probably imply some degree of revenue cannibalisation between business models and is therefore less likely by 2030.

*** Would include EV vehicle-to-house storage discharge although this has not been modelled separately

But… it could all change!

A SMART, FLEXIBLE ENERGY SYSTEM

A call for evidence

ofgem

Department for Business, Energy & Industrial Strategy

Launched 10 Nov 2016
Expired 12 Jan 2017
BEIS have responded

Minded to decision and draft Impact Assessment of industry's proposals (CMP264 and CMP265) to change electricity transmission charging arrangements for Embedded Generators

Consultation

ofgem

Significant changes to benefits for embedded generation
c.90% cuts to 'Triad credits'

Targeted Charging Review: a consultation

ofgem

A much wider, holistic look into network charging, incl. 'double charging' for storage
Consultation closed 5th May

Assessing storage for your sites

FRIENDS PROVIDENT Foundation
Fairer economy, better world

regen transforming energy

Onsite solar PV: battery storage ready reckoner for import avoidance

Instructions

Green cells must be filled in

Blue cells are optional

Inputs

DEMAND

Host site annual demand (kWh)	500000
Annual days of 'use'	195
Annual days of 'non-use'	170
Building type	Secondary schoo
Typical Ratio of 'Non-use' to 'Use'daily demand for that type of building	56%

Definition of 'Use' and 'Non-

GENERATION / IMPORT

		Start time	end time
Solar array size (kWp)	200		
Imported Electricity cost, rate 1 (p/kWh	10	07:30	23:59
Imported Electricity cost, rate 2 (p/kWh	6	00:00	07:29
Is there a PPA for PV generation?	Y		
PPA - PV electricity cost (p/kWh)	7.5		
Is there a PPA for the Storage	Y		
PPA - Storage electricity cost	7.50		

Does the project need to account for finance costs?	n

STORAGE SOLUTION

Battery capacity (kW)	30	
Battery delivery (hrs)	2	
Minimum charge %	20%	
Minimum charge kWh	12	
Battery O&M cost (% CAPEX	2%	(£224.93)
Lifetime of battery (yrs)	10	
Project development costs	6%	(£674.8)

If you feel the proportions of 'ise' to 'non-use' are not quite right, you can

Ratio of 'Non-Use' to 'Use' daily demand used:	56%
Additional annual demand (kWh)	

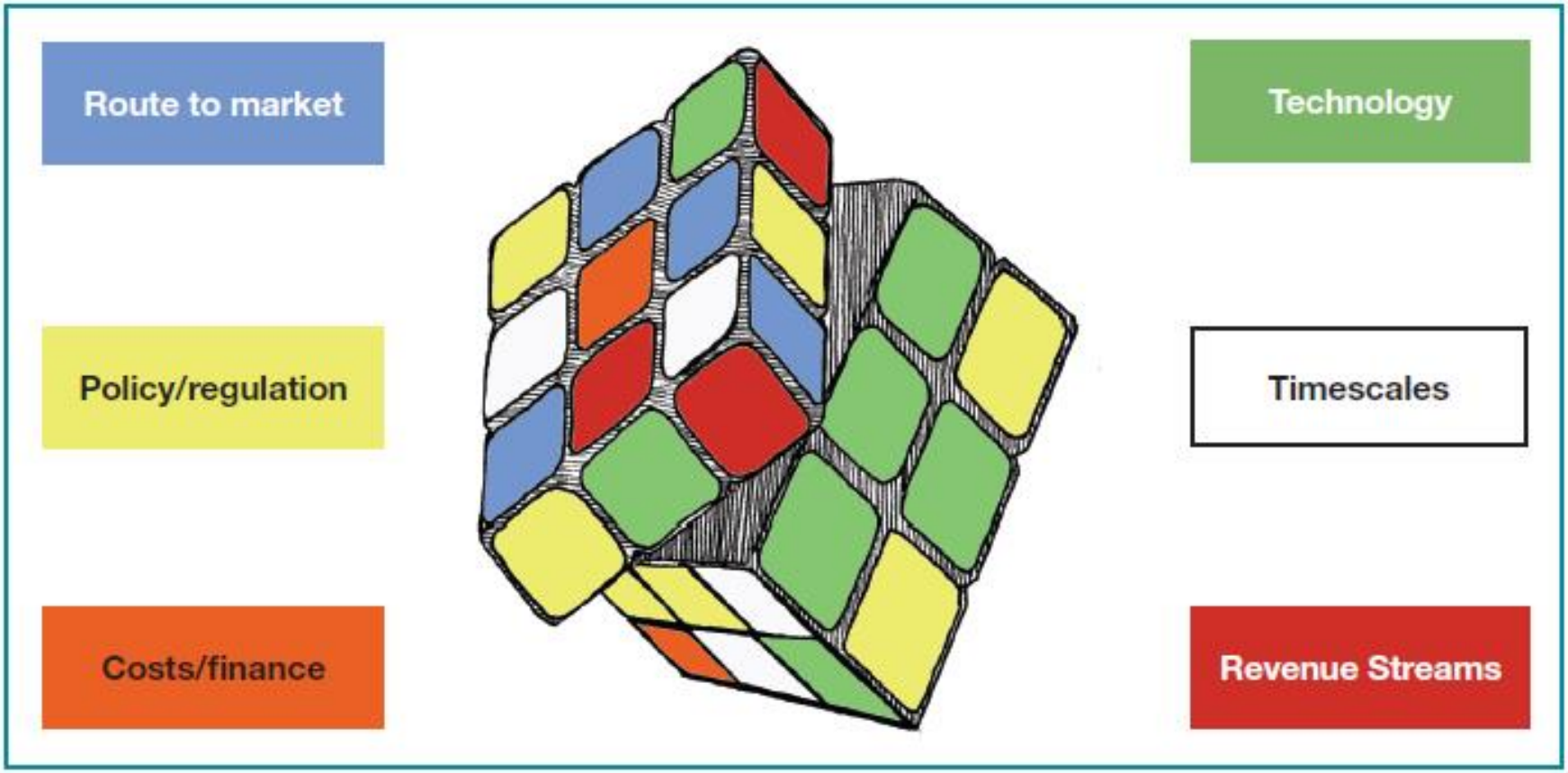
Add some extra kWh annual demand in here if you want. This could represent the demand of a proposed

FINANCE

		Per annum:
Cost of finance (annual cost)	5%	(£0)
Length of term (yrs) before full repayment	10	
Loan setup cost (%)	1%	(£0)
Target annual ROI	5%	

Storage puzzle

There is significant interest in storage across the energy sector
Progress is happening, but there are still a lot of moving parts…

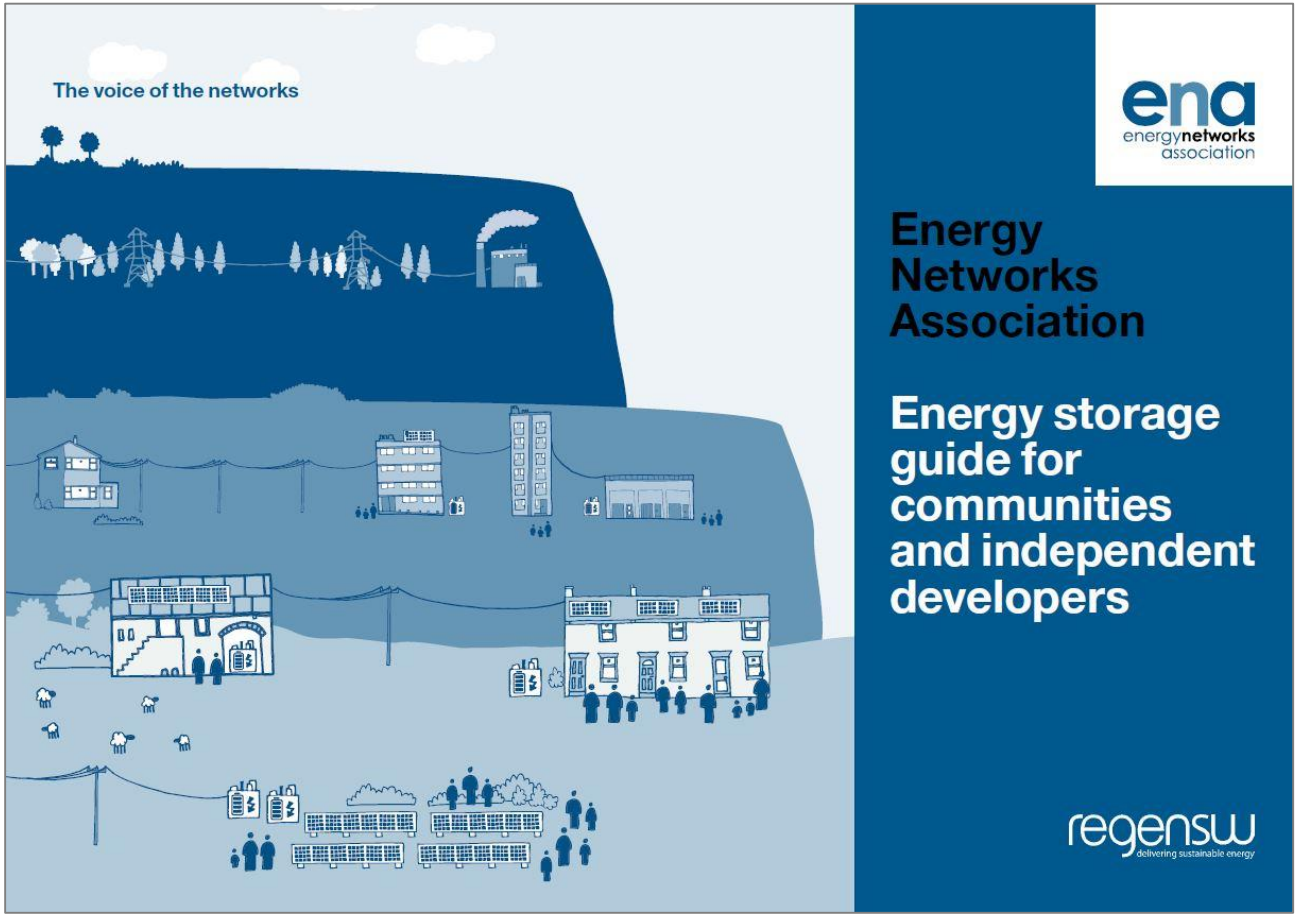


Energy Storage - Towards a Commercial Model

https://www.regensw.co.uk/storage-towards-a-commercial-model

ENA storage guide

- Introduction to area of energy storage and ways to connect to the network
- For community energy groups and smaller independent developers



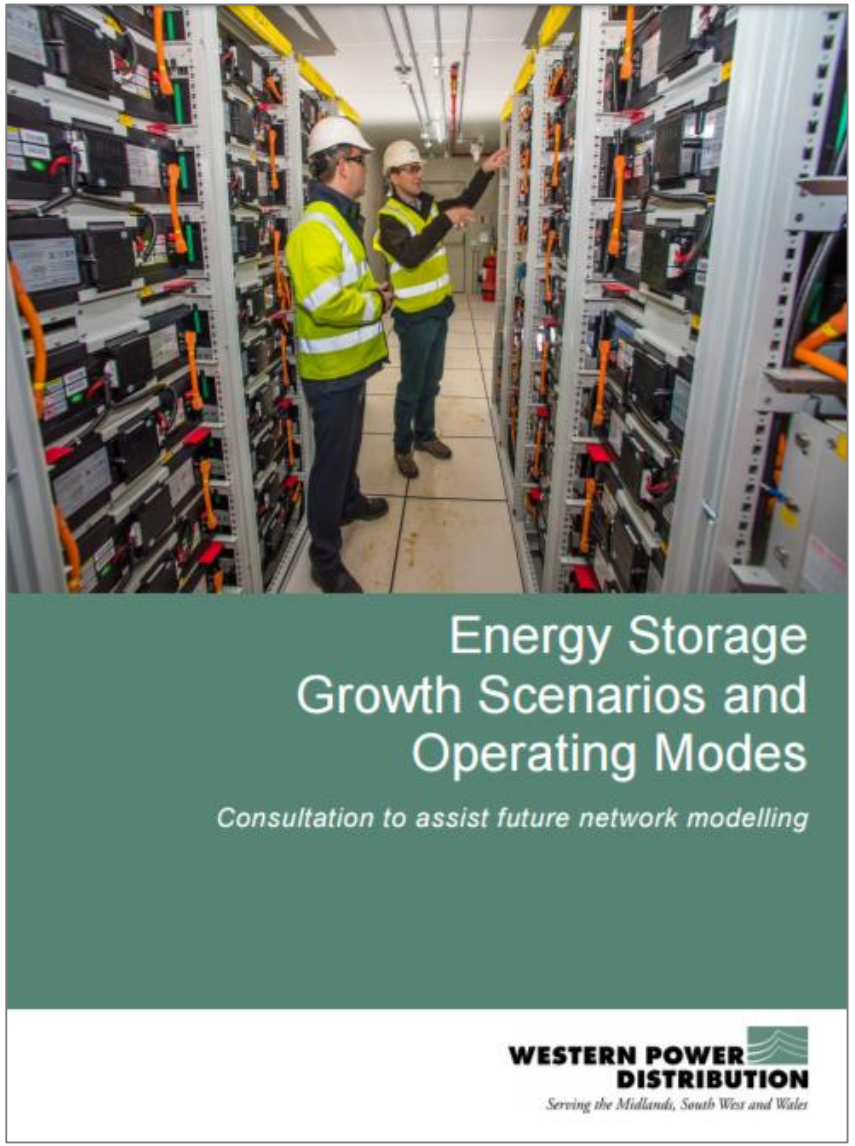
www.westernpower.co.uk/Connections/Generation/Community-Energy-Schemes/Community-Energy/Guides-and-Information.aspx

WPD consultation paper

In undertaking this consultation, WPD wanted to understand:

- scale of growth
- type of energy storage assets/projects
- operating behaviour of storage assets

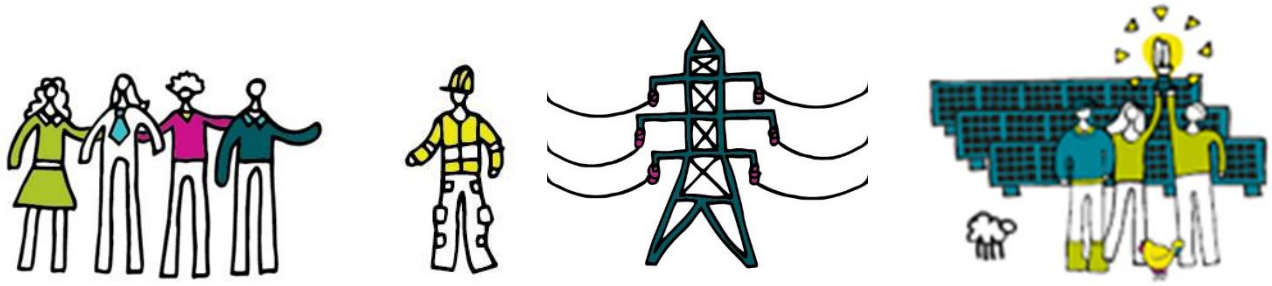
Contact:
Ray Arrell
Senior project manager
rarrel@regensw.co.uk



www.westernpower.co.uk/About-us/Our-Business/Our-network/Strategic-network-investment/Energy-Storage.aspx

How to get involved in energy innovation

- Network and develop partnerships, trials involve DNOs and licensed suppliers, smart tech businesses, developers, and communities.
- Most electricity network innovation trials funded by the Network Innovation Allowance (NIA) or Network Innovation Competition (NIC), Innovate UK, The Energy Systems Catapult, or universities.



Join an existing trial

Open LV

The project team

WESTERN POWER DISTRIBUTION

nccgroup

Centre for Sustainable Energy

nortech

...simple and elegant solutions for monitoring remote assets reliably and economically

impulse

ea technology

Promote Marketing & communication

Lucy Electric

GRIDKEY

regen transforming energy

Open LV

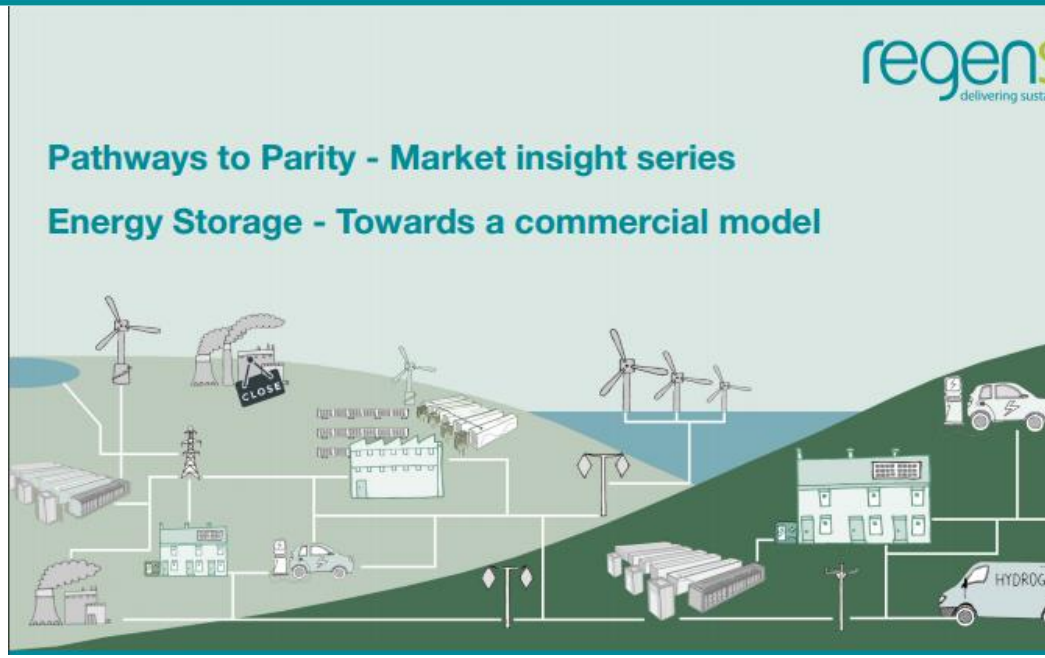
Project overview

- Project Aims:
  - To trial an open, flexible platform that could be deployed to every Low Voltage (LV) substation in Great Britain
  - To demonstrate the platform's ability to provide benefits to the network, customers, commercial entities and research organisations
- Timescales: December 2016 to April 2020
- Funding Source: Network Innovation Competition
- Value: £5,925,000
- Project host: Western Power Distribution
- Delivery Lead: EA Technology

Opportunities

Further information from Regen

- Report on the future of distribution networks
- Local Supply
- Rough Guide to Engaging Communities in Energy Network Innovation
- Guide to connecting storage for communities
- Energy Storage - Towards a Commercial Model 2nd edition



Jodie Giles
jgiles@regensw.co.uk
01392 494 399





regen
transforming energy

@RegenSW

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Registered in England No: 04554636

regen communities

Smart Community Innovation at Carbon Co-op

Smarter Community Energy Innovation

Nottingham

11th October 2017

CarbonCo-op

CO-OPERATIVES UK

MEMBER

About Carbon Co-op

- Created by a group of householders in 2008 in Greater Manchester.
- Aim was to achieve **2050 emissions reductions today** through **deep retrofit** of houses.
- Over **100 members** and **8 staff** working together to **reduce** their collective **CO_2/GHG emissions**.
- A proto-domestic-aggregator/ESCO-op (!?)

Our work

Retrofit

Energy Services

Education

Policy

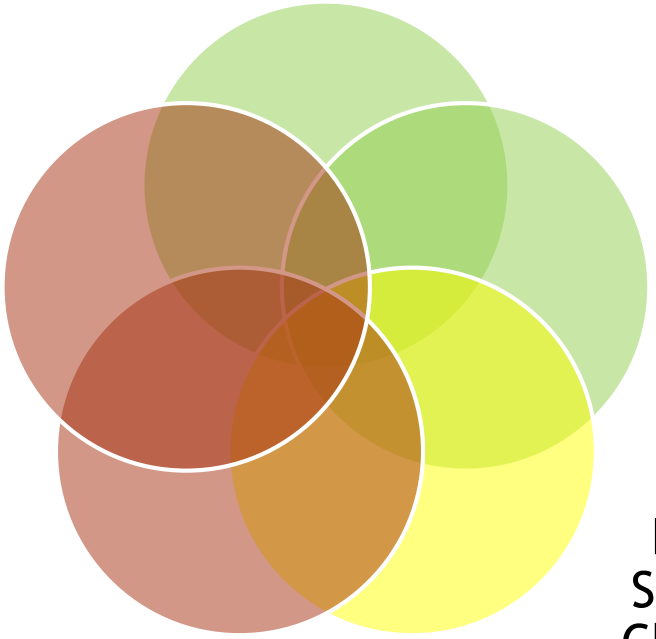
Renewable Generation

Consultancy

Carbon Co-op Energy Services

Domestic Energy Modelling

Domestic Aggregator Platform



Domestic Energy and Environmental Monitoring

Community Energy Management System

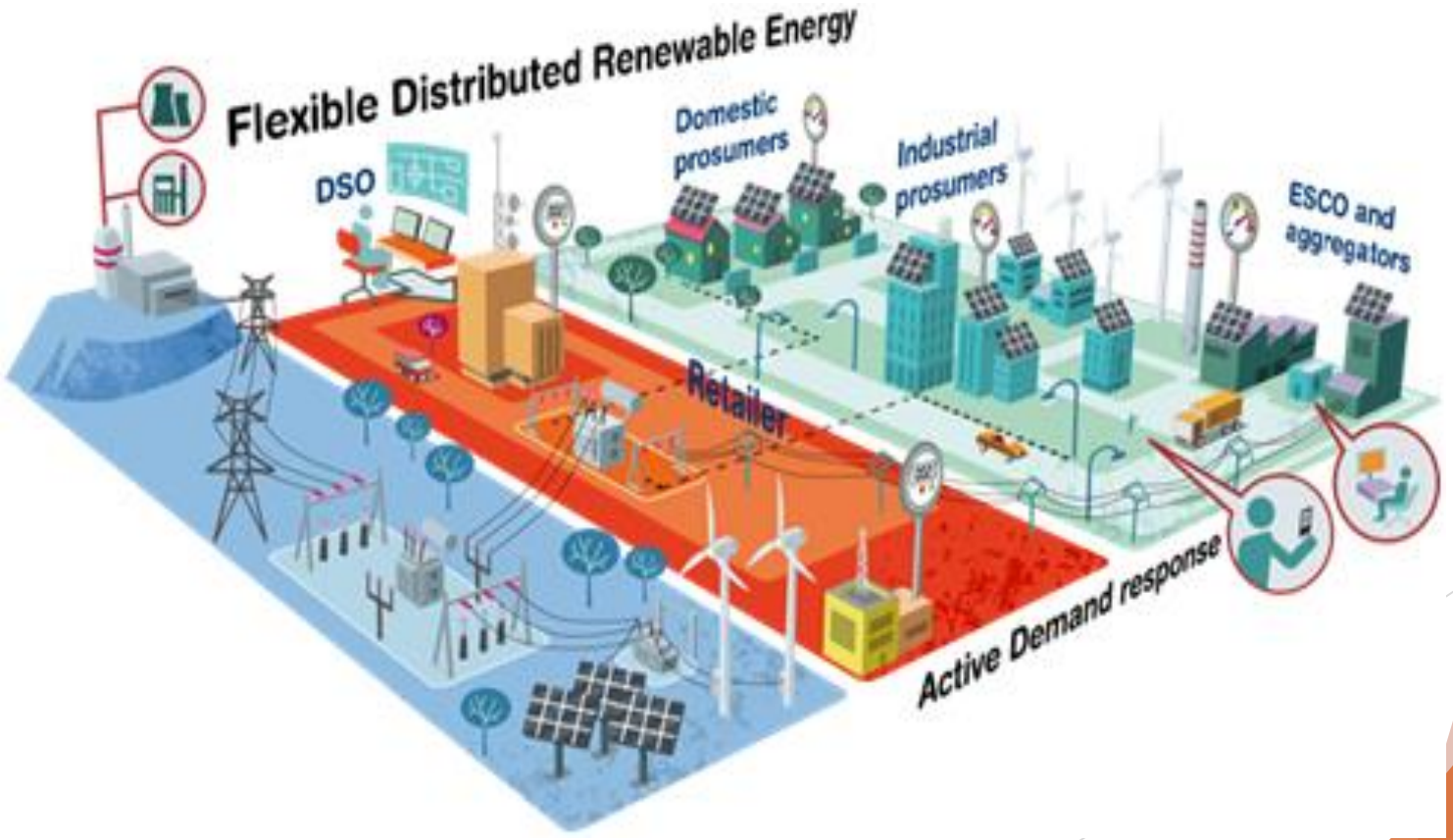
HVAC, Battery Storage, and EV Charging Control and Integration

Community energy and smart energy(?)

Pro?	Con?
Community groups have interest in long term success of projects. They can act independently. The domestic aggregator/ESCO 'looks' like a consumer co-operative.	Smart energy requires ongoing participation. Systems for smart energy are technically complex. Will require high level interaction with DNO/SO and other actors.
Potential of DSR / smart grids is huge. Community groups have lower engagement costs. Potential for sharing functions with other groups.	Financial/energy benefits can be marginal for a given house/business. How will you manage expectations? How will you make any money?!
Smart energy assets already exist/may not require much capital expenditure.	Is smart energy most cost effective way to achieve energy / CO2 reduction? Smart energy should not be substitute for energy reduction / renewable generation.

Nobel Grid

- EU Horizon 2020 project. ~25 partners. 5 pilot sites around EU. 13€mil.
- Developing smart grid solutions for community and publicly owned energy system actors.



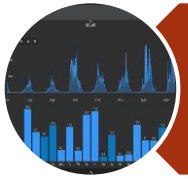
Manchester Pilot Site

- ~100 domestic users / ~20 with solar PV.
- 5 battery systems with demand response capability.
- A few EVs with smart chargers.
- 20 social housing units with heat pumps.
- 5 schools.
- Main deployment in January/February. Batteries already installed.

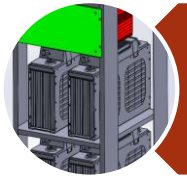
Manchester Pilot Site

Smart ‘Low-cost’ Advanced Meters

Aggregation, monitoring, and grid management system



Manual demand response to achieve environmental objectives



Battery storage demonstrator

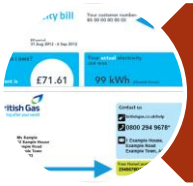
Automated Demand Response with heat pumps and battery storage

Lancaster Cohousing Pilot Site

- Single site cohousing development with ~40 domestic and ~15 commercial properties.
- Private micro-grid with 90kW PV and 150kW hydro plant.
- Deployment begun. Due for completion before Christmas.

Lancaster Cohousing Pilot Site

Smart meter extension

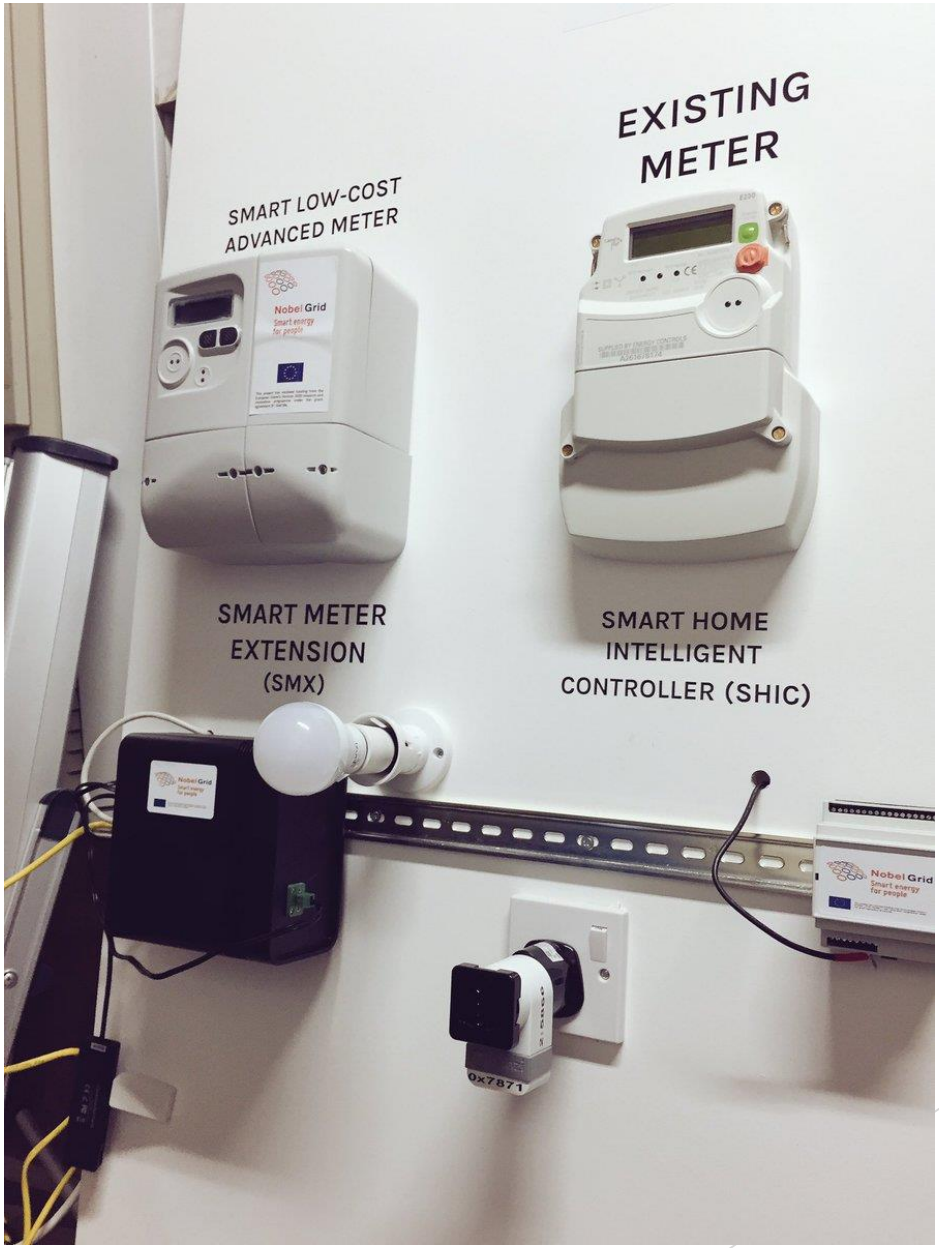


Energy management/billing system

TRIAD avoidance

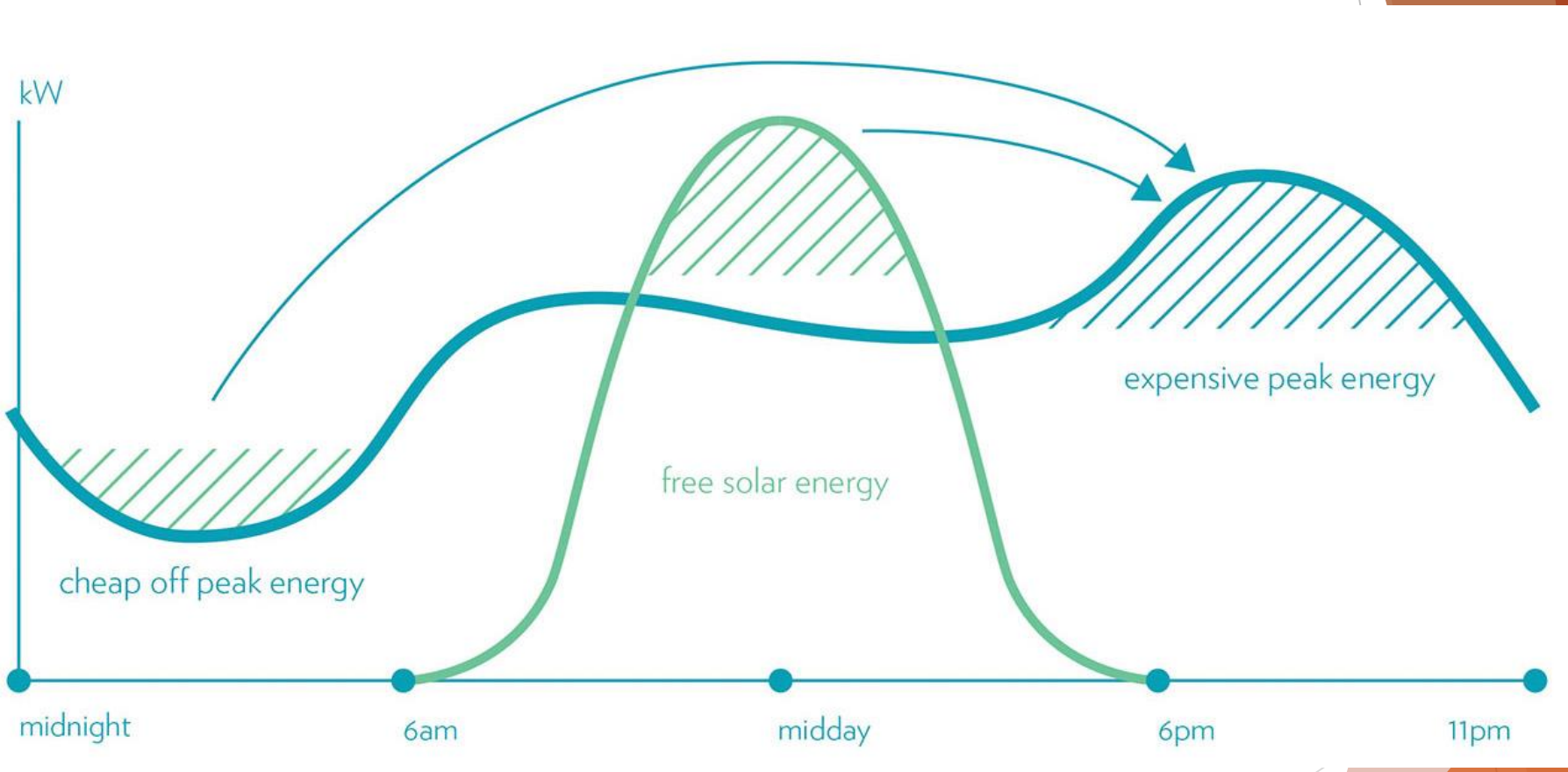
Automated Demand Response with water heaters and EV chargers

Nobel Grid Equipment



Focus on domestic batteries

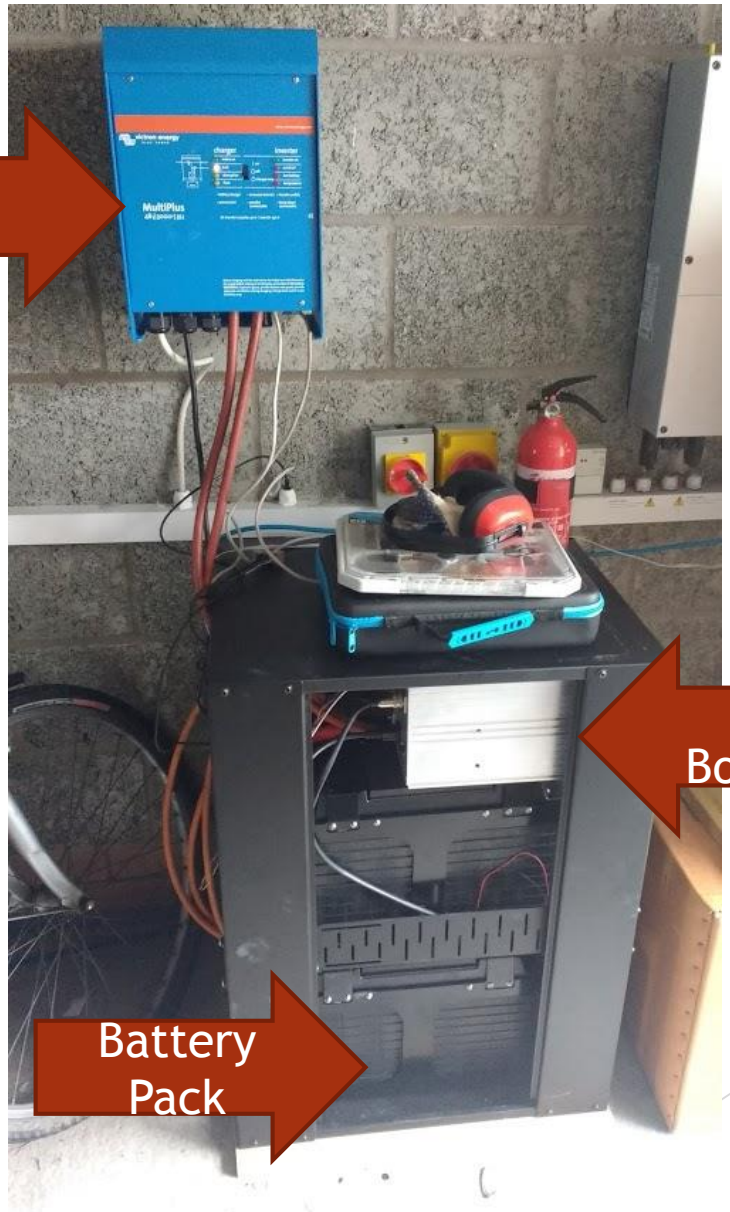
- What will they actually do? Does this make sense?



Credit: Moixa

Focus on domestic batteries

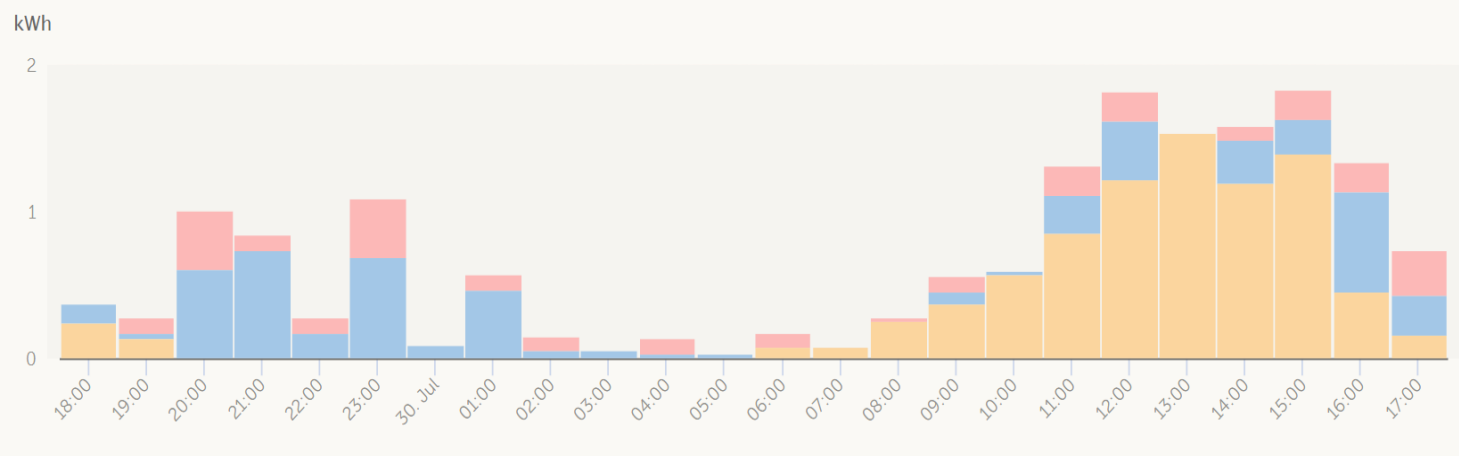
- What do they look like? Where do they go?

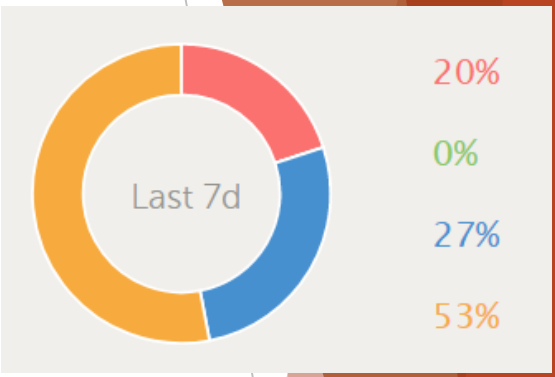


Results from some real battery systems

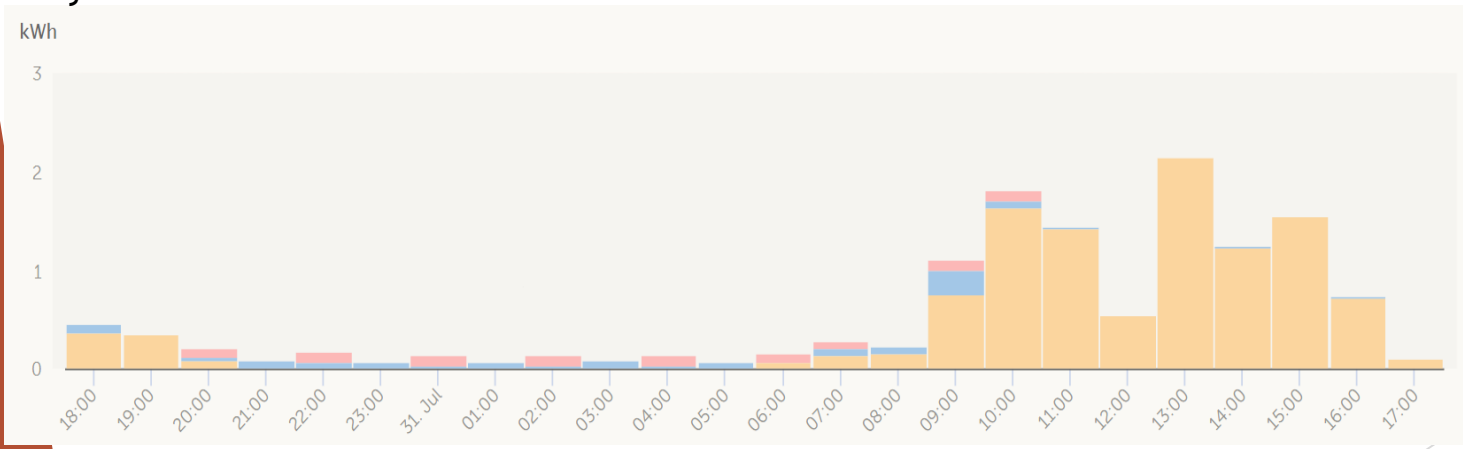
Consumption Solar Battery

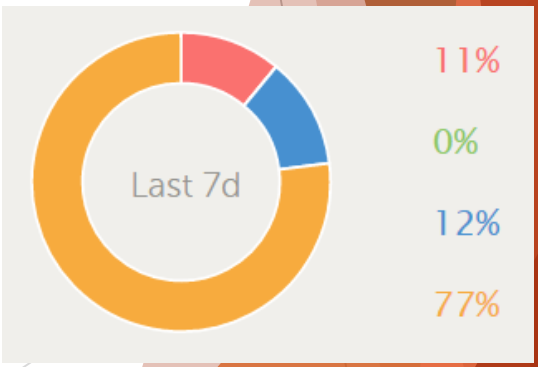
System 1



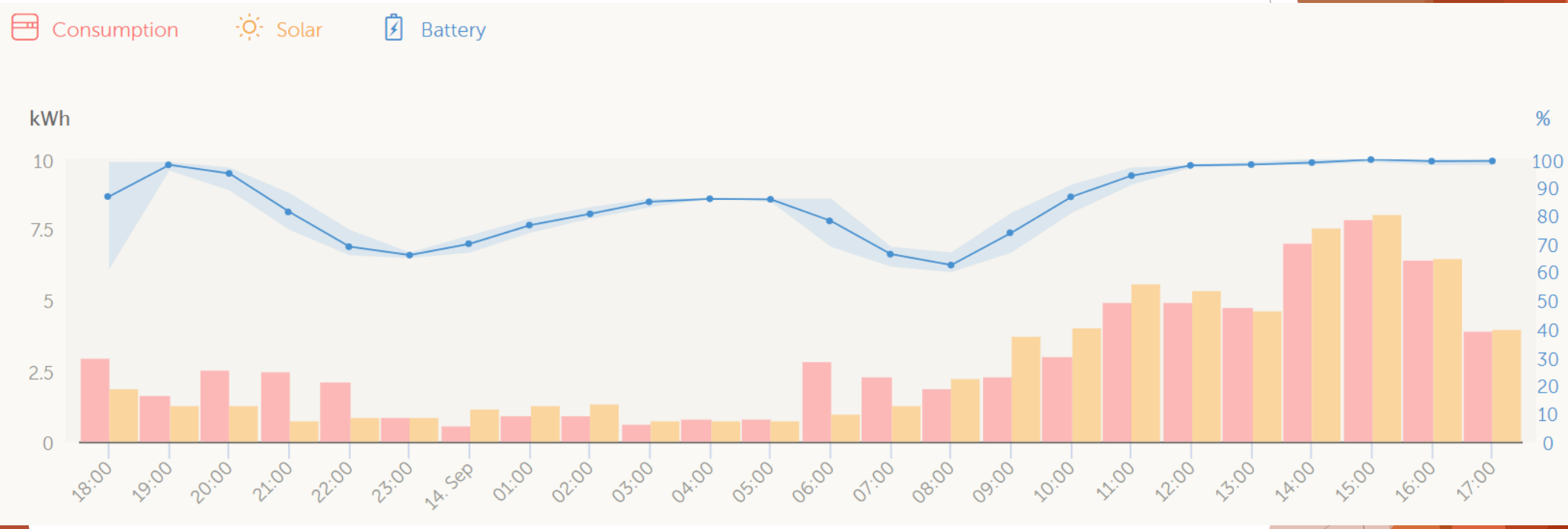


System 2





Another interesting system…



Thanks for listening

For more info on Nobel Grid see:

http://nobelgrid.eu/

RECC guidance on battery storage:

https://www.recc.org.uk/storage

Ben Aylott

ben@carbon.coop

https://carbon.coop


The Meadows
Nottingham
4,000 homes
50/50 public/private
50/50 terraces/ modern

Meadows Solar Roofs – sharing what we have.

- 55 installed, free to the poor, 30% cut in electricity bills
- Battery storage: 22 installations, 3 systems, homes and library
- Issues: coordination, cost & delivery
- Disruption and inclusion

Project SENSIBLE

Storage - Inside or out?

Security


Lessons to be learnt
• planning
• partnerships
• delivering
• energy saving
• sharing
…fighting for the right of ‘local supply’
lamy

Community energy progress and possibilities

Emma Bridge

Community Energy England

Community Energy England

- Founded by the sector to:
  - Create a voice for community energy
  - Support sector development
  - Build cross-sector partnerships
- >200 members
  - 80% community energy enterprises
  - Leading developers, energy suppliers, service providers, local authorities…

Community Energy England

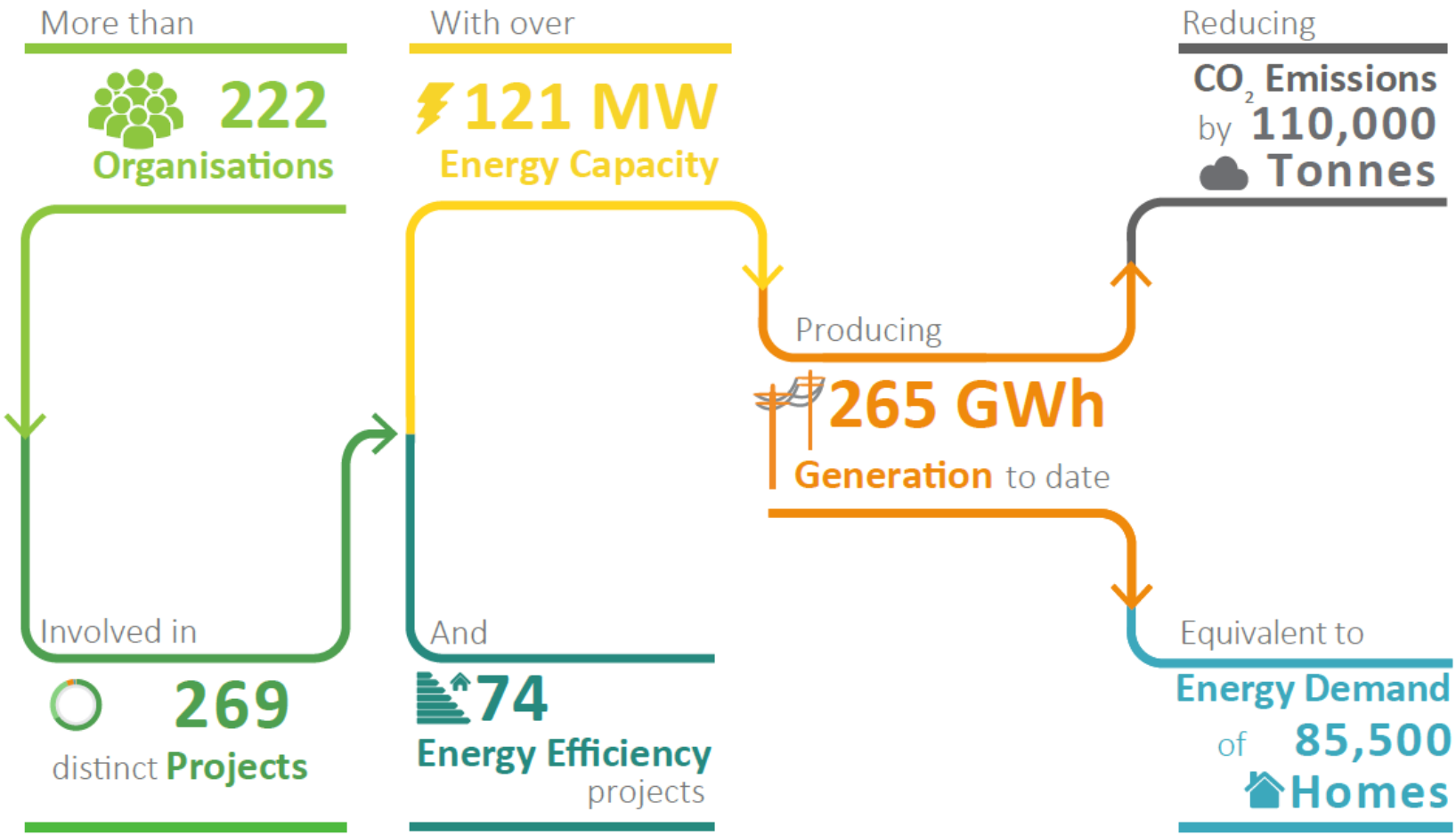
Community energy is…

POWER STATIONS FOR PUBLIC GOOD

Community Leadership
Ownership - Control - Benefit

Community Energy England

Community Energy in England & Wales



Community Energy England

More than

Organisations *with over*

30,000 Members

and

1,700 Volunteers

Community energy groups are found throughout England, Wales and Northern Ireland, the success of which is made possible by a large number of staff, volunteers and members. The number of organisations has risen rapidly over the last ten years: the community energy sector is now composed of groups utilising a diverse range of business models and legal structures and includes a range of financing approaches.

- Community Benefit Society (BenCom)
- Co-operative
- Community Interest Company (CIC)
- Charity
- Unincorporated
- Limited Company
- Other Structures

Community Energy England

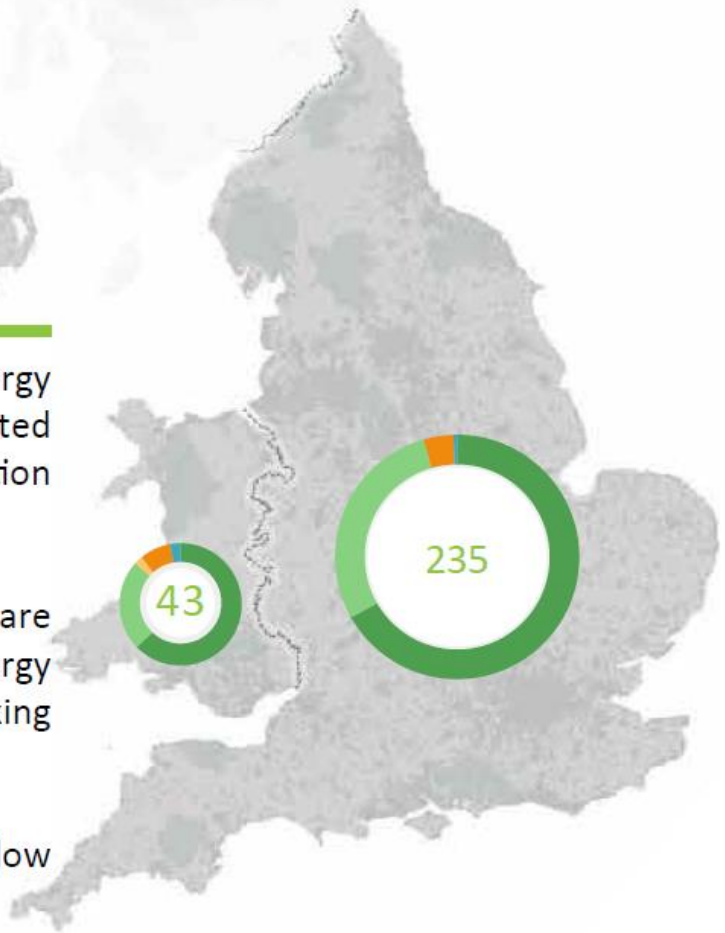
Activities by Type

- Electricity Generation
- Energy Efficiency & Demand Management
- Energy Storage
- Heat Generation
- Transport

The community energy sector is dominated by energy generation projects (191 projects), often complemented by secondary energy efficiency and demand reduction initiatives.

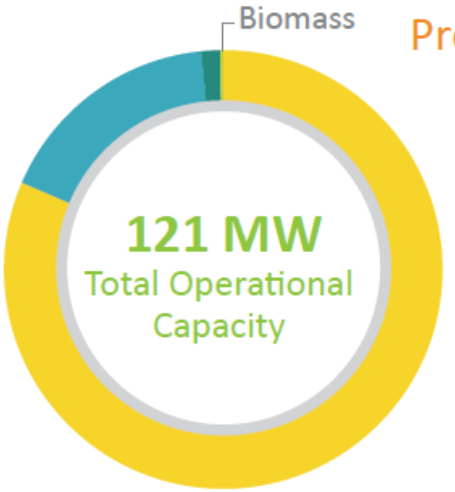
Energy efficiency and demand reduction projects are considered the primary activity of 40 community energy organisations, with a further 34 organisations undertaking projects secondary to energy generation.

Few organisations are currently actively engaged in low carbon transport or energy storage activities.



Community Energy England

Capacity by Technology



Producing

265 GWh
Generation to date

Equivalent to

Energy demand of

85,500 homes

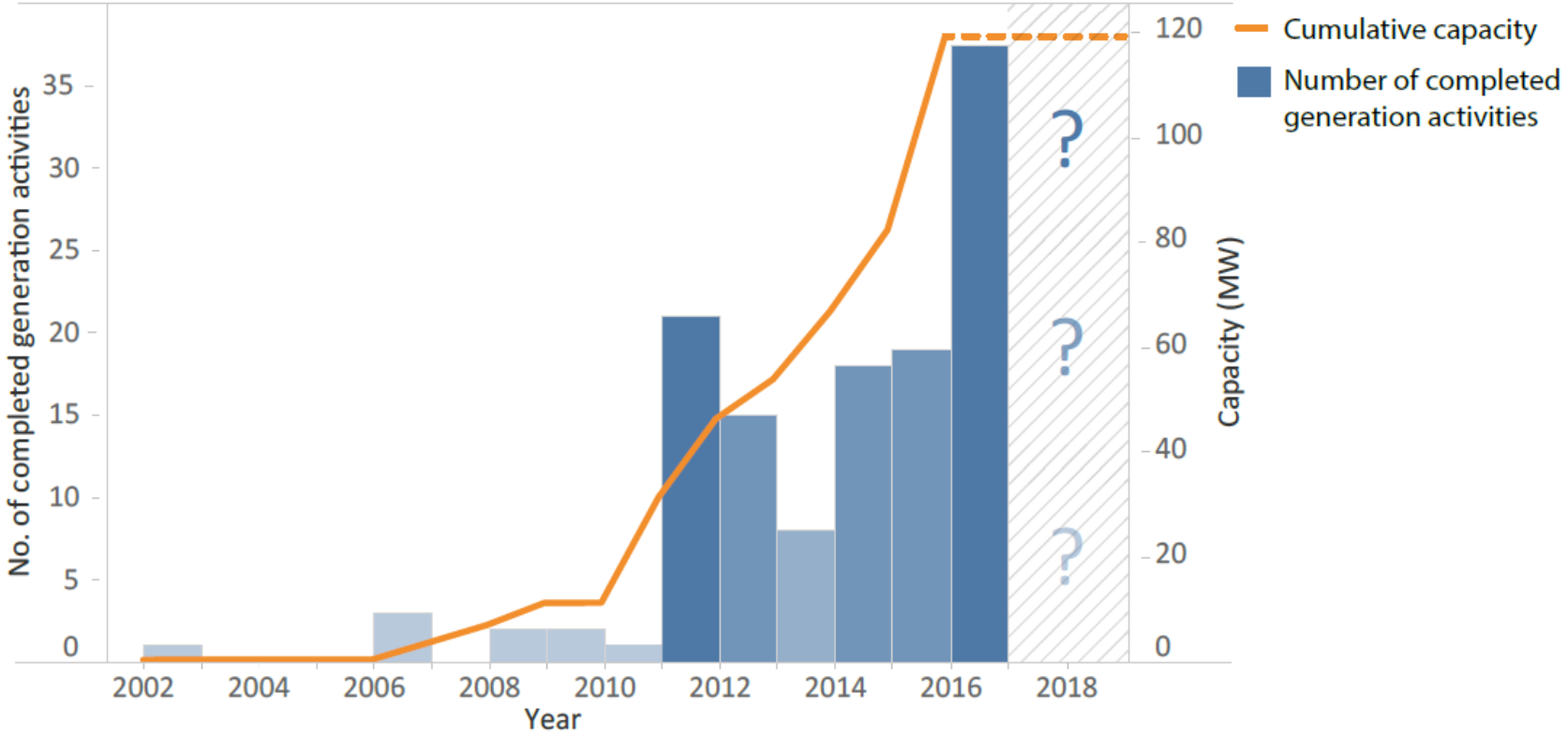
Solar PV
Wind
Hydro
Biomass

Over 121 MW of electricity generating infrastructure has been installed by community groups in England, Wales and Northern Ireland since 1997, generating 265 GWh, equivalent to the energy demand of over 85,500 homes.

The UK community energy sector has a combined generating capacity of over 188 MW, including Scottish community renewables.

Community Energy England

Activities and Cumulative Capacity in the Community Energy Sector



The community energy sector has grown rapidly in the past 20 years. Increasing project numbers from 2011 onwards have been a result of the introduction of the Feed-in Tariff.

A slowdown in the sector will soon become evident as the last schemes accredited before the 2015 cuts are installed. Many communities stated that a lack of subsidy support is limiting their ongoing and future energy ambitions.

Community Energy England

Energy Efficiency Services

Services	Energy audits Energy efficient lighting Retrofit assessments Infrared camera audits Insulation
Advice & Support	Energy switching Energy cafés Awareness raising
Demand Management	Heating control Smart meter provision Energy monitoring
Funding	Grants Loans

74 community organisations were identified as providing energy efficiency or demand management support to members of their community - ranging from advice and support to services and funding.

46% of all energy efficiency or demand management projects were considered secondary activities, building upon existing energy generation projects.

Community Energy England

Supported by

Early Stage **Funding**

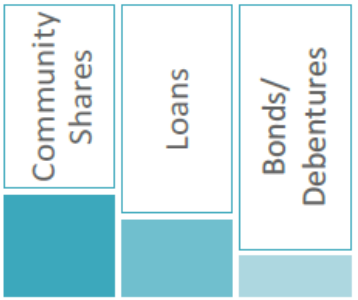
£1.9M

Leveraging

£190M

further **Investment**

Through



269

distinct **Projects**

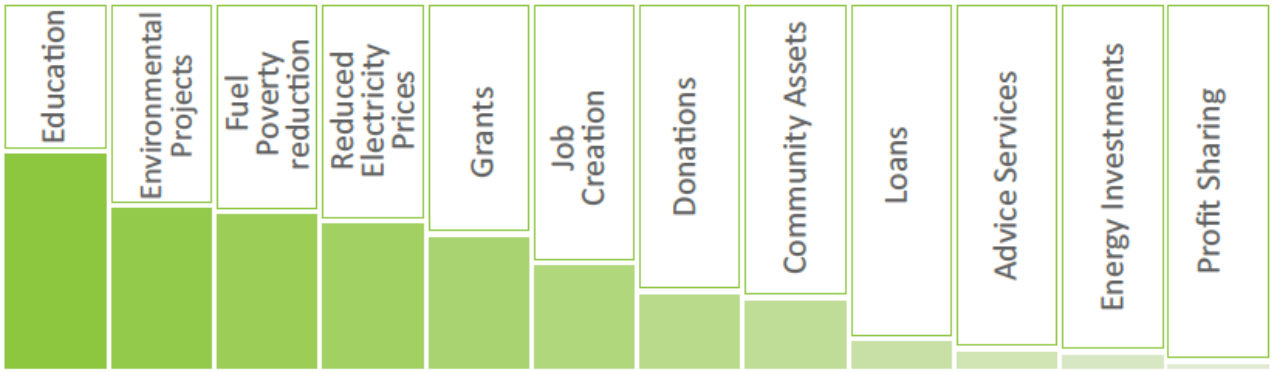
Delivering over

£620K last year in **community benefits**

127

full time **Staff**

Helping to fund

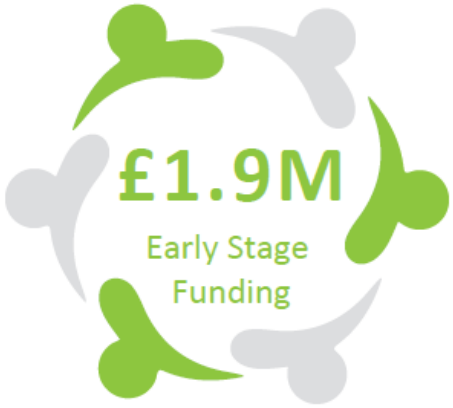


Community Energy England

Early Stage Funding

Development funding supports a wide range of activities from initial feasibility assessments through to formal consents, such as planning permissions and resource licences.

33% of surveyed organisations are using, or have previously used, grants from UCEF, RCEF or Ynni'r Fro to progress their project development to a total of £1.9m across the sector.



Government Funding
Other Development Funding

Urban Community Energy Fund (UCEF)	Rural Community Energy Fund (RCEF)	Ynni'r Fro	Other Development Funding

Community Energy England

Investment Types

Overall it was reported that £190 million has been invested in financing projects across 108 community energy projects.

Though a large number of organisations source finance through loans – similar to many commercial developers – the bulk of investment has been raised from individuals through share offers, both locally and at a national level.

£63.5 M

Community Shares

£47.5 M

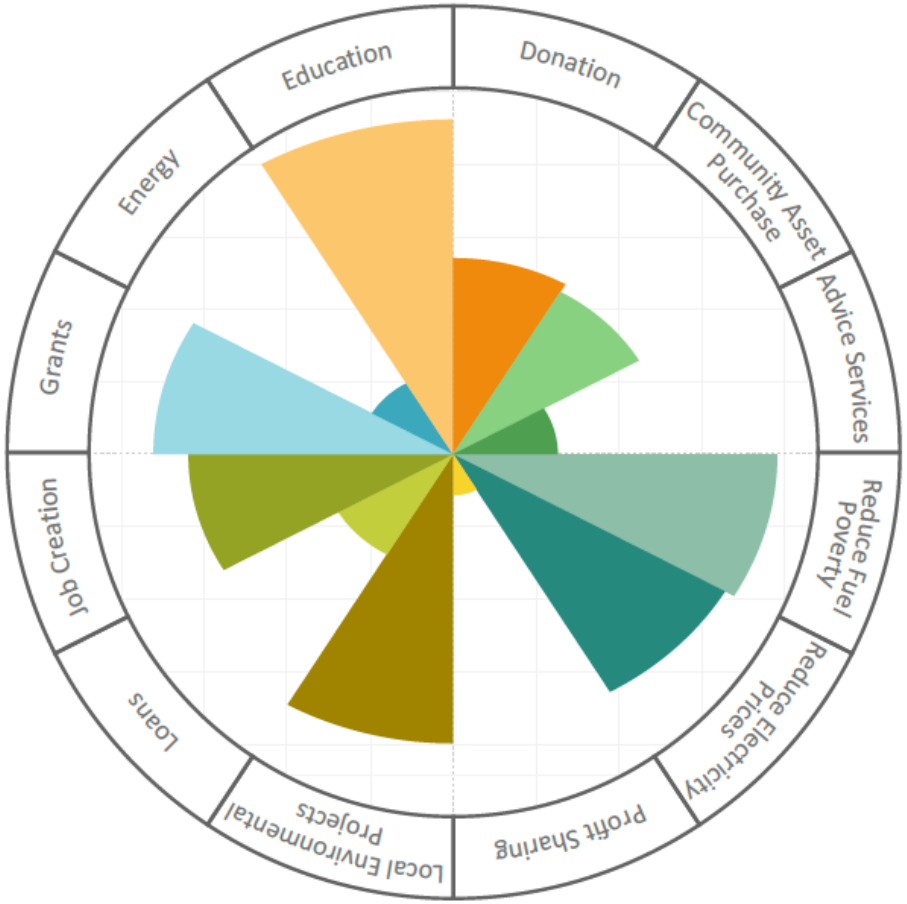
Loans

£25.1 M

Bonds/Debentures

Community Energy England

Social Benefits - Response Frequency



Reducing CO_2e Emission by **110,000 Tonnes**

Community organisations were found to have a range of motivations and objectives relating to their activities.

A number of projects directly contributed to energy cost reduction or fuel poverty reduction or aimed to support further initiatives in this area. Softer approaches to local development included education and awareness, as well as investment in job creation to stimulate the local economy.

At a non-local scale, communities were found to have reduced over 110,000 tonnes of CO_2e since 2002.

Community Energy England

- Education
- Local Environmental Projects
- Reduce Fuel Poverty
- Reduce Electricity Price
- Grants
- Job Creation
- Donation
- Community Asset Purchase
- Loans
- Energy Investment
- Profit Sharing

Subsidiary benefits resulting from community energy projects were highlighted by the majority of respondents, in particular education initiatives (47%) and improving the local environment (35%).

More direct economic benefits were cited as the key impacts of projects, including fuel poverty reduction (33%), reduced energy prices (31%) and job creation (22%).

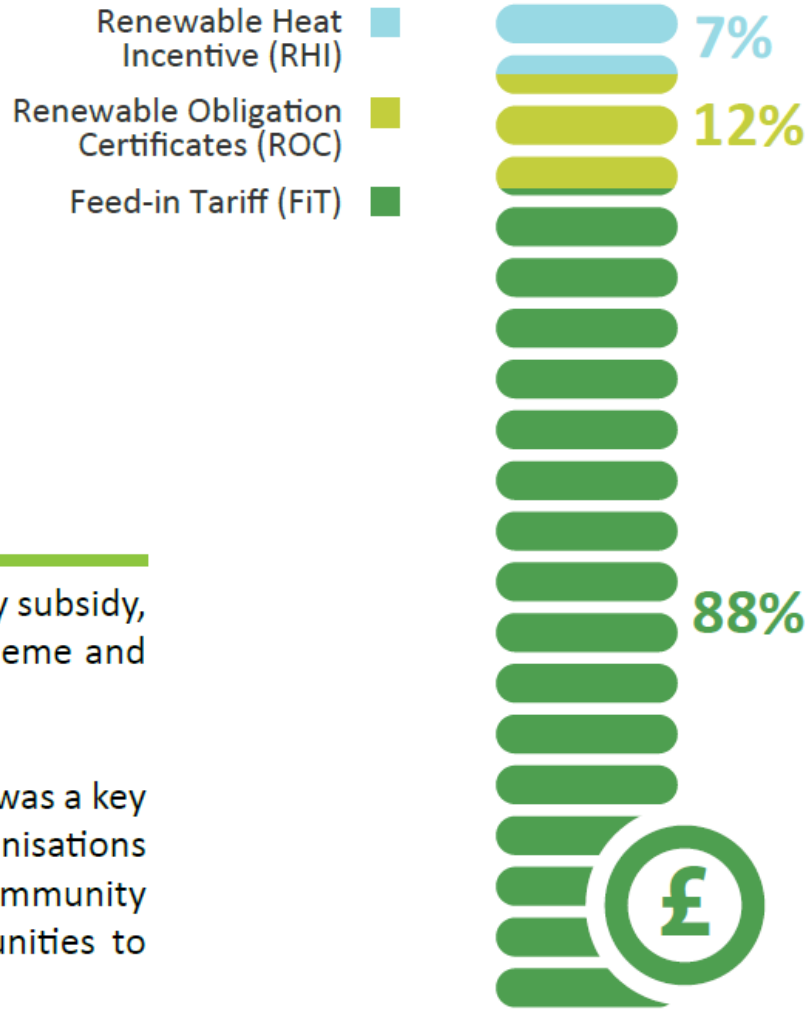
Community funds were often found to be utilised in securing community assets (14%), including further energy activities (4%).

Income from projects is directed into the local community through a variety of means, including through grants (28%), donations (16%) and loans (5%).

Community Energy England

Energy Subsidy Use

Using a form
of energy subsidy *



Of the 123 projects surveyed using a form of energy subsidy, 88% utilised the FiT subsidy, 9% used the ROC scheme and 2% used the RHI.

21 organisations stated that Feed-in Tariff changes was a key reason for their project stalling. A further 36 organisations stated that reinstatement of viable FiT levels or community specific support are essential in enabling communities to realise their community energy objectives.

Community Energy England

Barriers

due to

Capital Finance
National Opposition
Engineering Issues
Feed-in-Tariff
Local Opposition
Lack of Expertise
Planning Process
Attracting Volunteers
Volunteer Motivation

Community Energy England

Policy

Decentralisation, Democratisation, Digitisation, Decarbonisation

- Industrial Strategy
- Smart, flexible energy systems
- DNO-DSO transition
- Clean Growth Plan
- City Region Energy Strategies
- Inclusive economy
- Brexit

Community Energy England

forum for the future
action for a sustainable world

FRIENDS PROVIDENT Foundation

Funding and financing

- Community shares and bonds
- Community energy ISA
- Joint venture
- Community bridge
- Grants
- Impact investing
- Mainstream investment
- Increasing efficiency
- New business models e.g. solar + storage

Community Energy England

The future of community energy

- ~2/3 groups have future plans in place or aspire to do further projects
- Smart technology
- Re-engaging people with energy issues
- Supporting wider infrastructure changes
- Greater collaboration
- Community and business development
- New financing and funding mechanisms
- Increasing efficiencies

Community Energy England

Emma Bridge
Community Energy England
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@comm1nrg
@emmabridge_1

Community energy – the next wave

Published on October 16, 2017

Author: Jodie Giles

We love waves at Regen, especially when the community energy movement is riding to the crest again. At our event in Nottingham last week, the spirit of collaboration was strong, and the amount of local authorities in attendance was promising. Western Power Distribution (WPD), who have supported these community energy events for the past four years, shared stories of their latest innovation projects involving communities and talked about their aim to maintain the highest standards of customer service in a changing system. This will require greater engagement between WPD and the community energy groups. Ben Aylott from Carbon Coop and Alan Simpson talked about their experience of community projects installing battery storage in real homes. These stories from the front line tell a tale of communities actively participating in our new energy system, finding new business models and technical solutions to complex problems, but also professionalising and becoming equal partners in trials and projects that seek to unlock the environmental, social and economic potential of our energy system, and to democratise it.

Emma Bridge from Community Energy England (CEE) set the scene, talking about their latest research demonstrating the impact and scale of this grass roots crusade. With 222 organisations, 121MW of installed capacity and 1700 volunteers this revolution is delivering real and lasting impact in communities all over the country. Emma and I agree this is only part of the picture and as CEE prepare for the 2018 state of the sector report, we hope that every group in the country will participate so that we can demonstrate the incredible work being done by ordinary people to change our energy system. We need to be prepared and armed

with the full story if we are going to continue to demonstrate the role grassroots community energy groups can play.

Yiango Mavrocostanti, an innovation and low carbon networks engineer at WPD talked about the changing energy system, the shift from a passive to a smart network, and the need to understand power flows in real time as well as forecast future energy flows. This shift towards becoming a distribution systems operator (DSO) means WPD is thinking about commercial arrangements for demand side response (DSR) and flexibility services, pointing to a potential future revenue stream that prepared communities could access. Understanding complex power flows, new services, and trialling smart technologies are all part of this brave new system. WPD are aware that these changes mean greater engagement if they are to maintain the highest standards in customer service. This means more supportive events, connection surgeries, a great website and even a set of films to help communities learn about the new energy system.

Many of the innovation trials WPD lead involve customers directly, and successful elements of the trials are rolled out as business as usual. Electric Nation is the world's largest electric vehicle trial, which aims to understand the charging patterns of 700 electric vehicle owners and the impact on the network. Plugs and Sockets is their local electricity markets trial in Cornwall that includes new flexibility services, and Open LV is about enabling communities to access data from low carbon substations to build apps.

Ben from Carbon Coop talked about their opensource, open standards and collaborative approach, and reflected on the move away from installing renewable technologies, towards ongoing involvement in how the energy system works. This is a big shift for the community energy movement, but one I think we should all engage in. If communities dip out at this stage the market will be controlled by incumbents and the opportunity for people to move from passive consumers to active participants in energy will be lost. Carbon Coop have been installing batteries and trialling technology for smart grids as part of their EU funded Nobel Grid project, which has given them valuable data and helped them build their own capacity. On their Lancaster cohousing pilot site, which fortunately has its own microgrid, there are 40 domestic and 15 commercial properties. Carbon Coop connected black boxes to each electricity meter to find out how much people are using and how they could control some of their usage, such as water heating. They even developed their own advanced meter and are thinking about installing batteries. Unfortunately, the data needs to be available before the batteries can be sized appropriately and economic viability can be assessed for the domestic households. Installing batteries in Manchester has given them real insight into the challenges of fitting sometimes noisy boxes the same size as a fridge into people's homes.

Alan Simpson reflected on similar challenges in their MOZES project, which has 55 households with PV, and another 22 batteries enabled via EU funding. Size matters with batteries; they are too heavy to put in the roof and finding space in a terraced property for such a large item is challenging. The MOZES project approach is to put them outside and to build protective boxes to keep them secure. Alan talked about the challenges of bringing engineering, academic and community worlds together in partnership projects, not least because of the

language barrier, but also to get the project to a deliverable state before asking households to sign up. Delays lead to disillusionment and good community engagement requires clear expectation setting. There are plenty of technical/engineering issues to resolve, but these must be addressed before you reach people's living rooms, otherwise you generate anxiety and confusion. Remembering it is real people who should be at the heart of these types of project is the key lesson.

If you want to find out more about how your community can move beyond renewable energy generation then join us at one of our events this autumn, we look forward to seeing you soon.