Storage & local supply – the community energy perspective

1 June, March 2017

Olly Frankland, project manager, Regen

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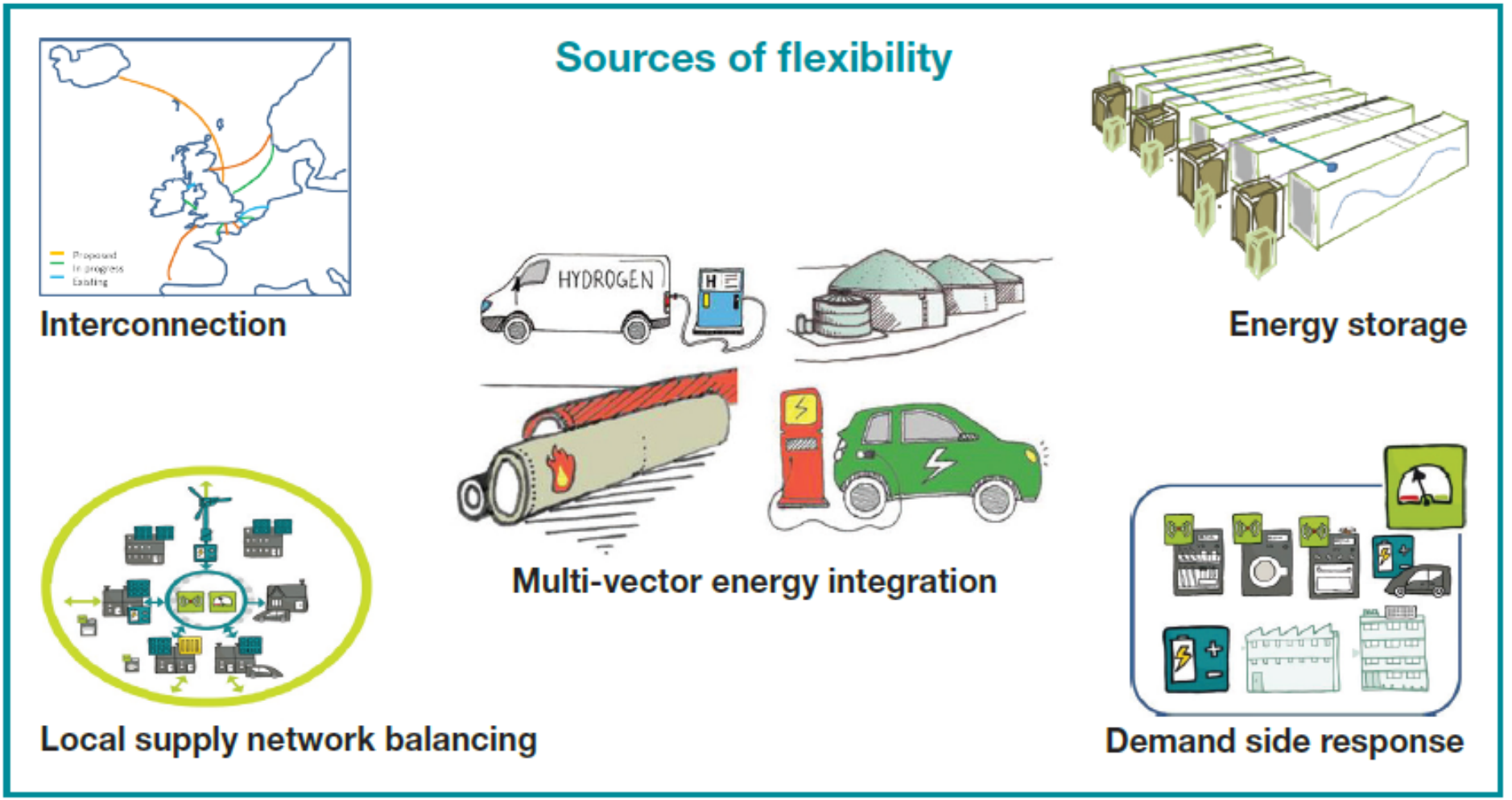
Flexibility

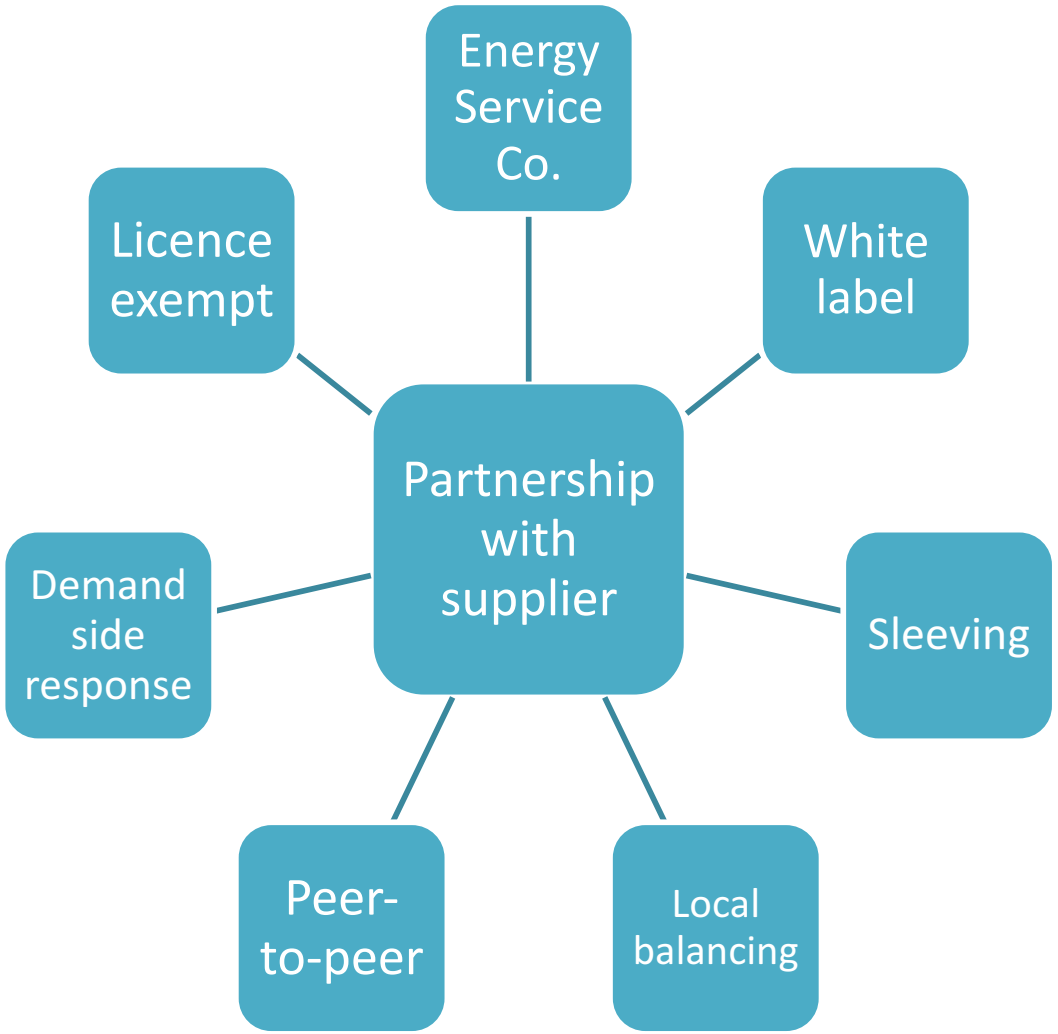


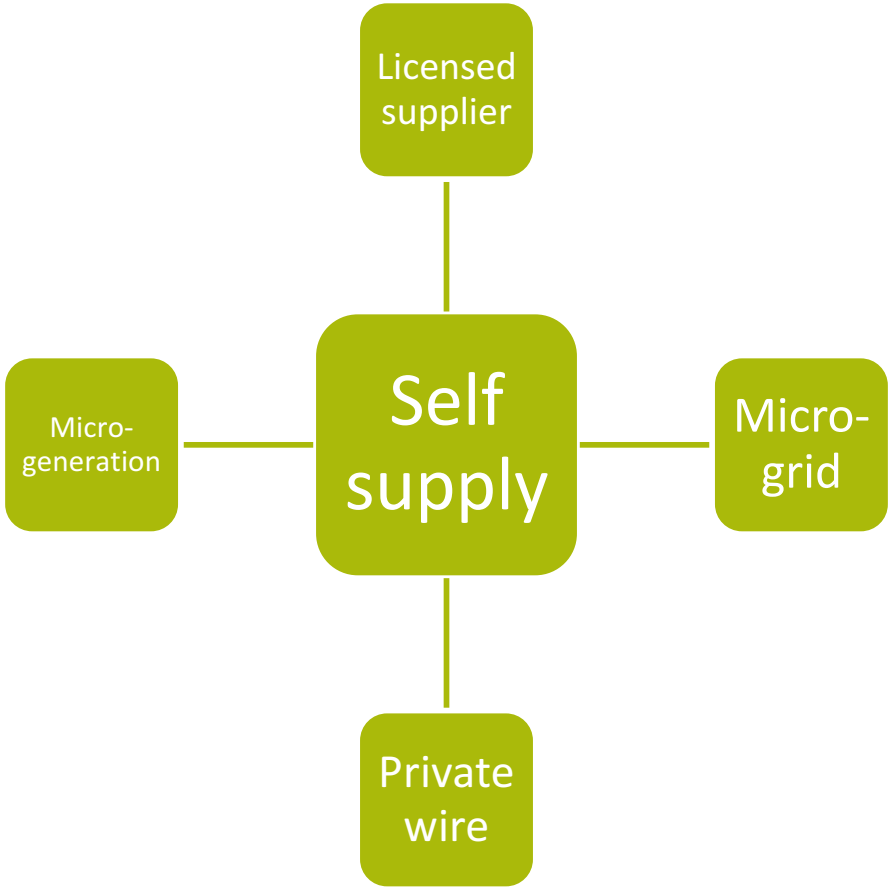
‘The saving could be as large as **£8 billion** a year by 2030.’

Lord Andrew Adonis, Chair, The National Infrastructure Commission

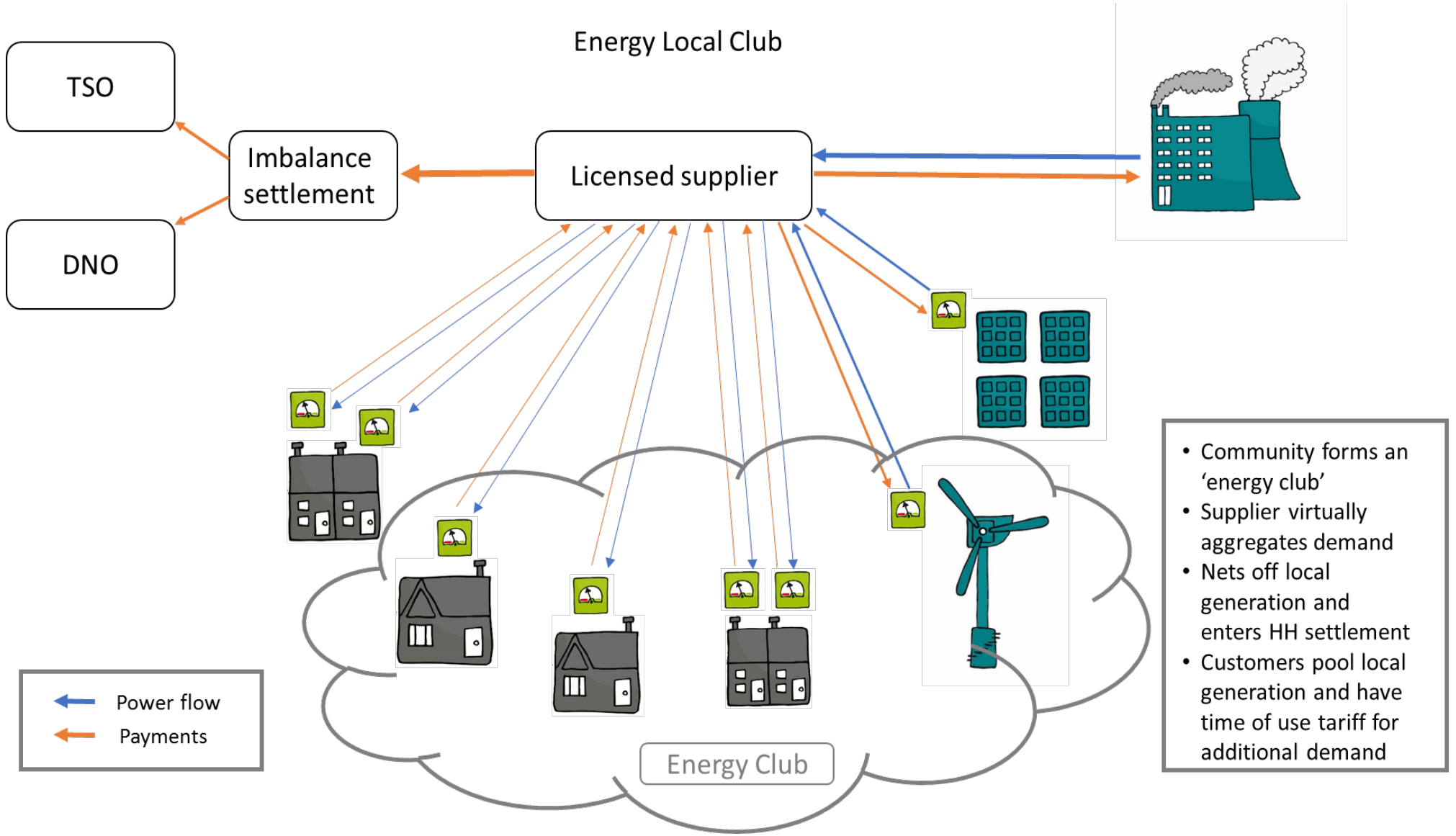
1. Local Supply models

Local supply = the supply of locally generated electricity to a local group, for the benefit of local domestic consumers





Energy Local Club



Energy Local Club

Benefits:

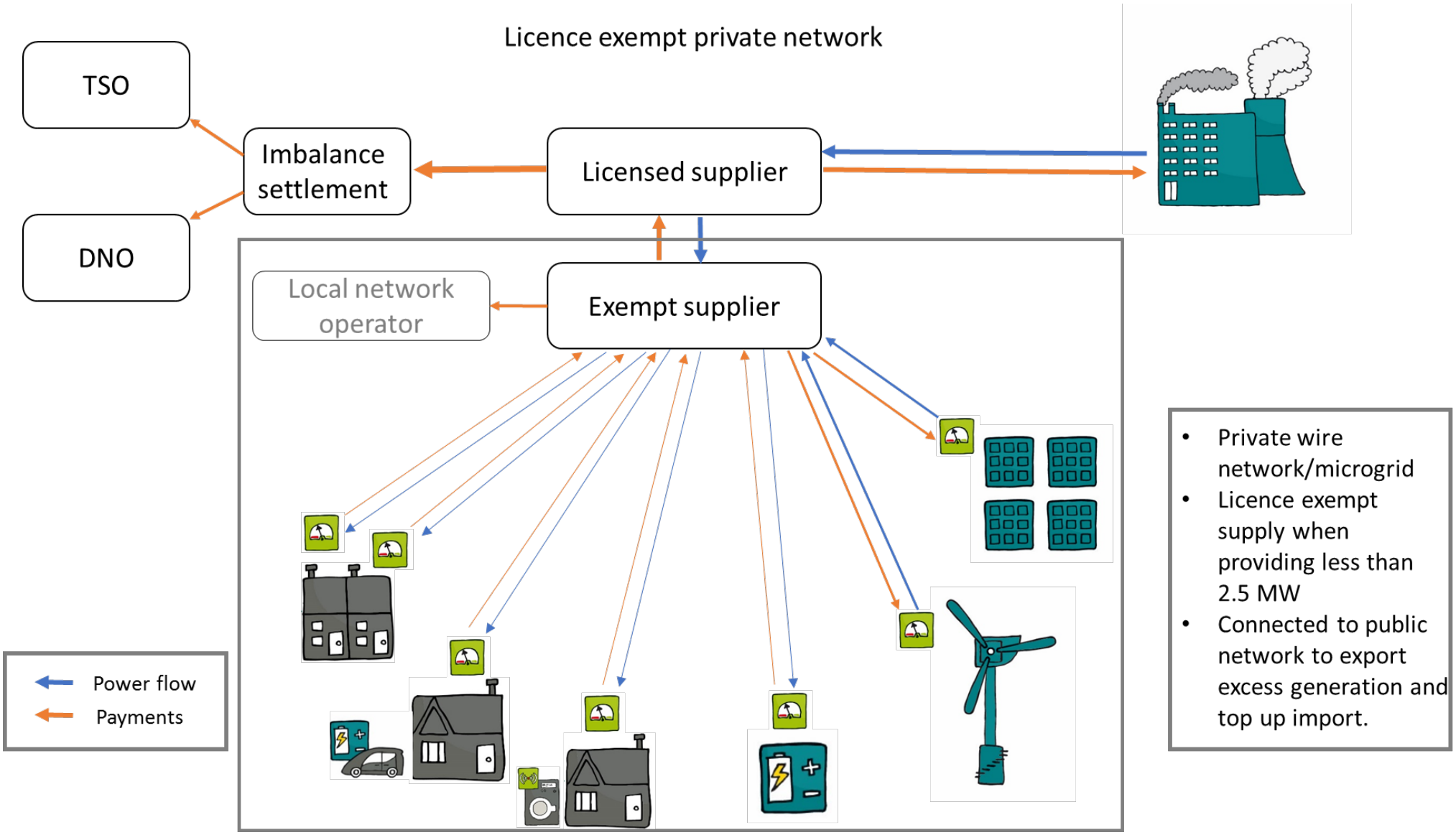
- Closer link between local generation and demand
- Good value flow to consumers

Drawbacks:

- Hard to switch customers
- Energy supplier needs to be amenable
- “Smart” metering

Case study – Energy Local, have linked 100 households in Bethesda, Wales with a National Trust hydro turbine

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)

Benefits:

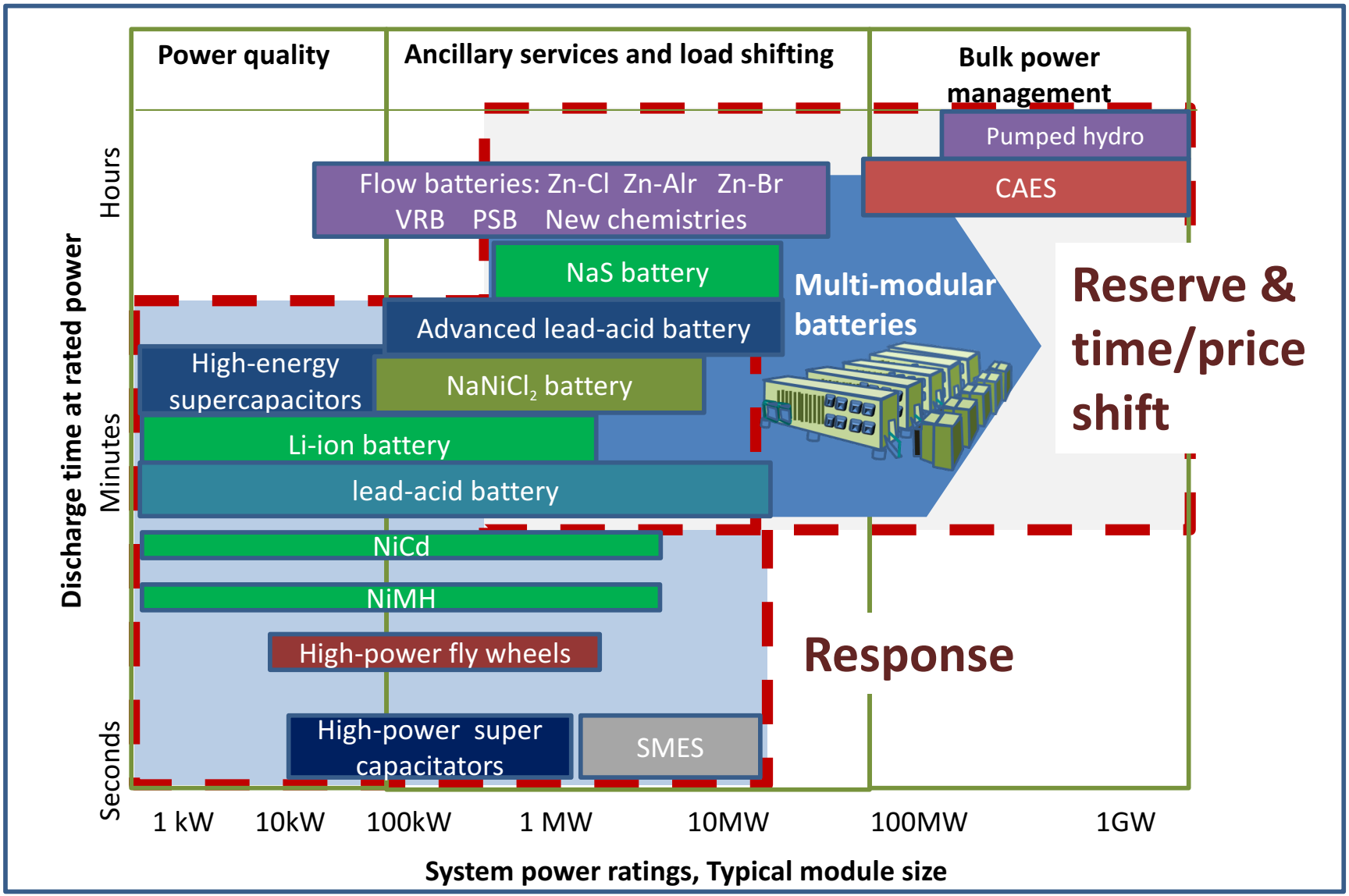
- No need for supply licence
- Solution for subsidy free generation

Drawbacks:

- Hard to find the right customer to guarantee demand
- Large upfront capital investment

Case study - Thameswey, has a private wire network in Milton Keynes providing power to businesses and households

2. Energy storage technologies



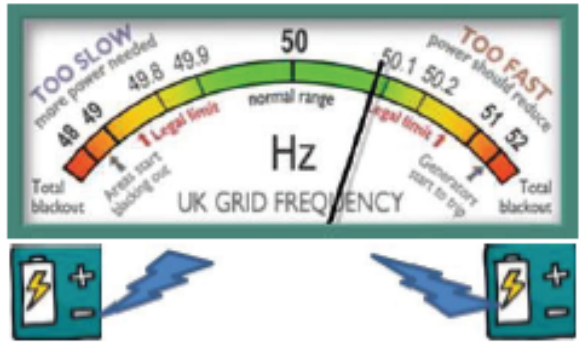
The role of energy storage

Inherent value of energy storage

Response

"ability to respond quickly to grid or price signals"

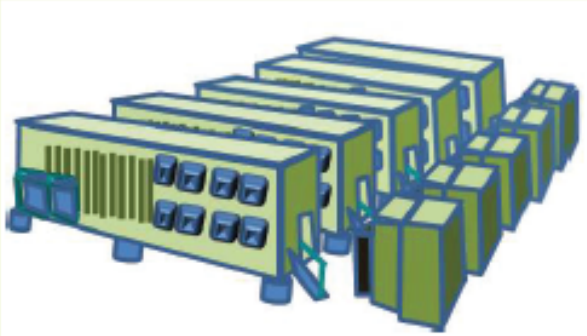
- Frequency response
- Reactive power and voltage
- Other ancillary services



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

Which revenues for which assets?

	Main Revenue Streams	Target Incentive Programmes / Benefits
1. Response service	*Frequency & voltage programmes*	*Enhanced Frequency Response (EFR)* *Firm Frequency Response (FFR)* *Enhanced Reactive Power Services (ERPS)*
2. Reserve service	*Capacity & reserve contracts*	*Short Term Operating Reserve (STOR)* *Fast Reserve* *Capacity Market*
3. C&I high energy behind the meter 'prosumers'	*Network charges & capacity contracts*	*Transmission peak charges (Triads)* *Distribution peak charges (DUoS red band)* *Demand Turn-up*
4. Domestic and community 'own-use'	*Optimising self-usage of on site generation*	*Future Time of Use Tariffs (ToUTs)?* *Community scale aggregation into FFR/STOR?*
5. Generation co-location	*Time & Price Shift*	*Avoiding export restrictions (Time-Shift)* *Diverting generation into high price zones* *Capacity Market*

Potential “waves” of deployment

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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

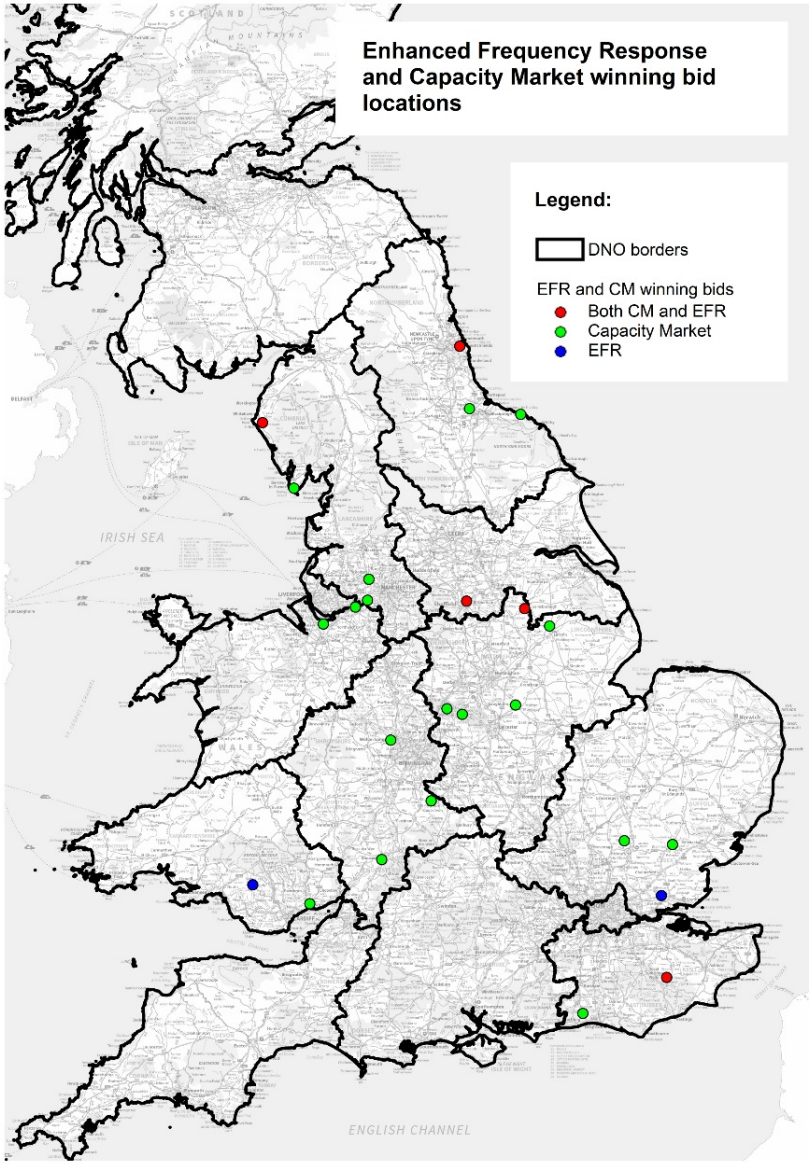
Aggregation and marketplace models

RE co-location

Domestic and community storage becomes standard

The day after!

Current pipeline cont.

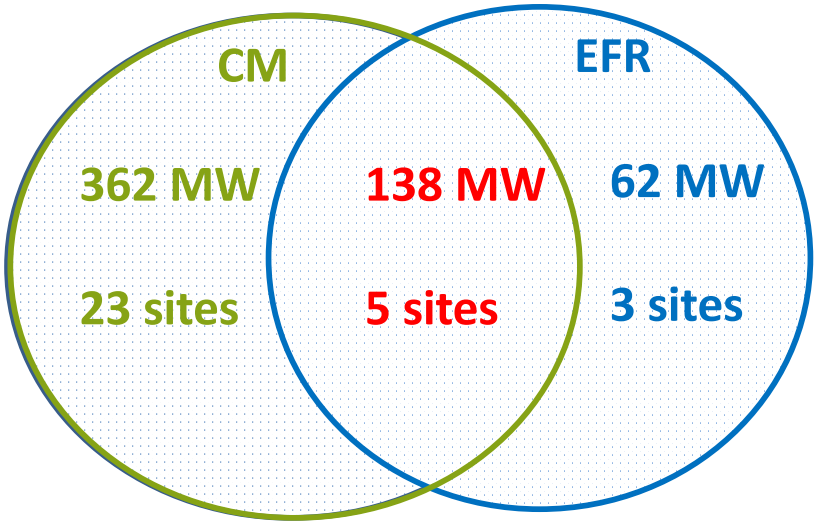


Capacity Market

500 MW
28 Sites

Enhanced Frequency Response

200 GW
8 sites



Total EFR and CM Winners
562 MW
31 Sites

* National Grid reports a lower figure @ 62 sites which could well be right

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 2 GWh	0.5 - 1 GW 0.5 - 1 GWh	2 - 3 GW 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 10 - 16 GWh	0.6 - 1.2 GW 2.5 - 5 GWh	5 GW 20 GWh
Domestic and community own use with PV***	1.5 - 2 GW 6 - 8 GWh	0.37 - 0.75 GW 1.2 - 3 GWh	3 GW 12 GWh
Generation co-location	2 GW 6 - 8 GWh	0.5 - 1GW 2-4 GWh	4 GW 16 GWh
Total GB market	10 - 12 GW 24 - 44 GWh	4 - 5 GW 6 - 13 GWh	15 GW** 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

Key points for communities

- The income is less certain
- Lithium-ion batteries are dominant
- Costs are coming down rapidly
- Warranties and lifetime vary
- Regulation is lagging behind the market
- There is a risk of mis-selling

https://www.linkedin.com/pulse/energy-storage-key-points-communities-olly-frankland

Summing up…

Domestic (10's kWh)	Small commercial (100's kWh)
Mainly new solar PV + battery installations due to lower rate of VAT (5%) Innovators/early adopters – non-financial drivers Cost and lack of awareness main barriers	Behind-the-meter high energy user (with generation) Early adopters with financial case possible - mainly through network cost reduction Changes to DNuOS in SW undermine model Cost and lack of finance main barriers

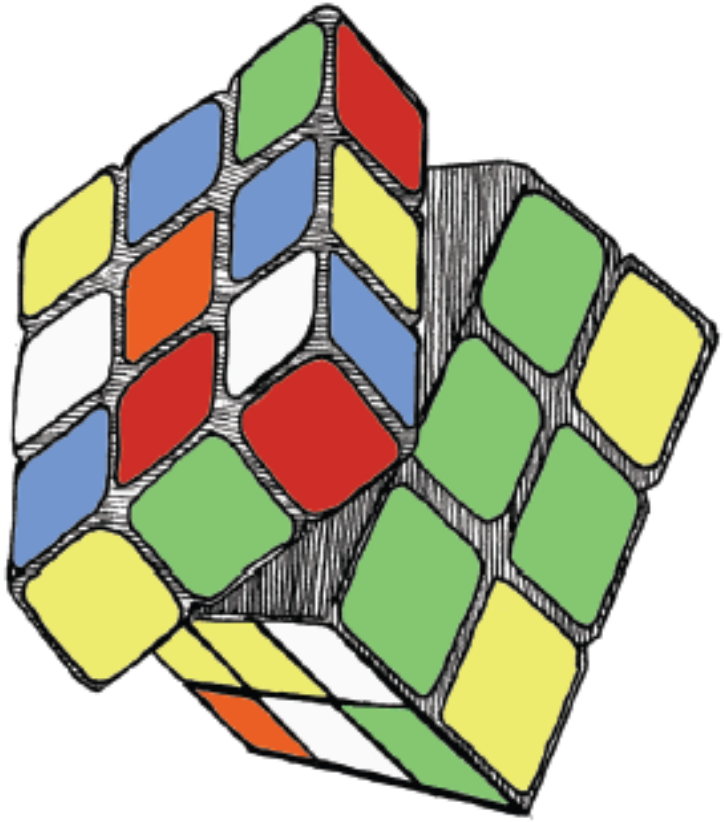
Summing up…

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

Route to market

Policy/regulation

Costs/finance

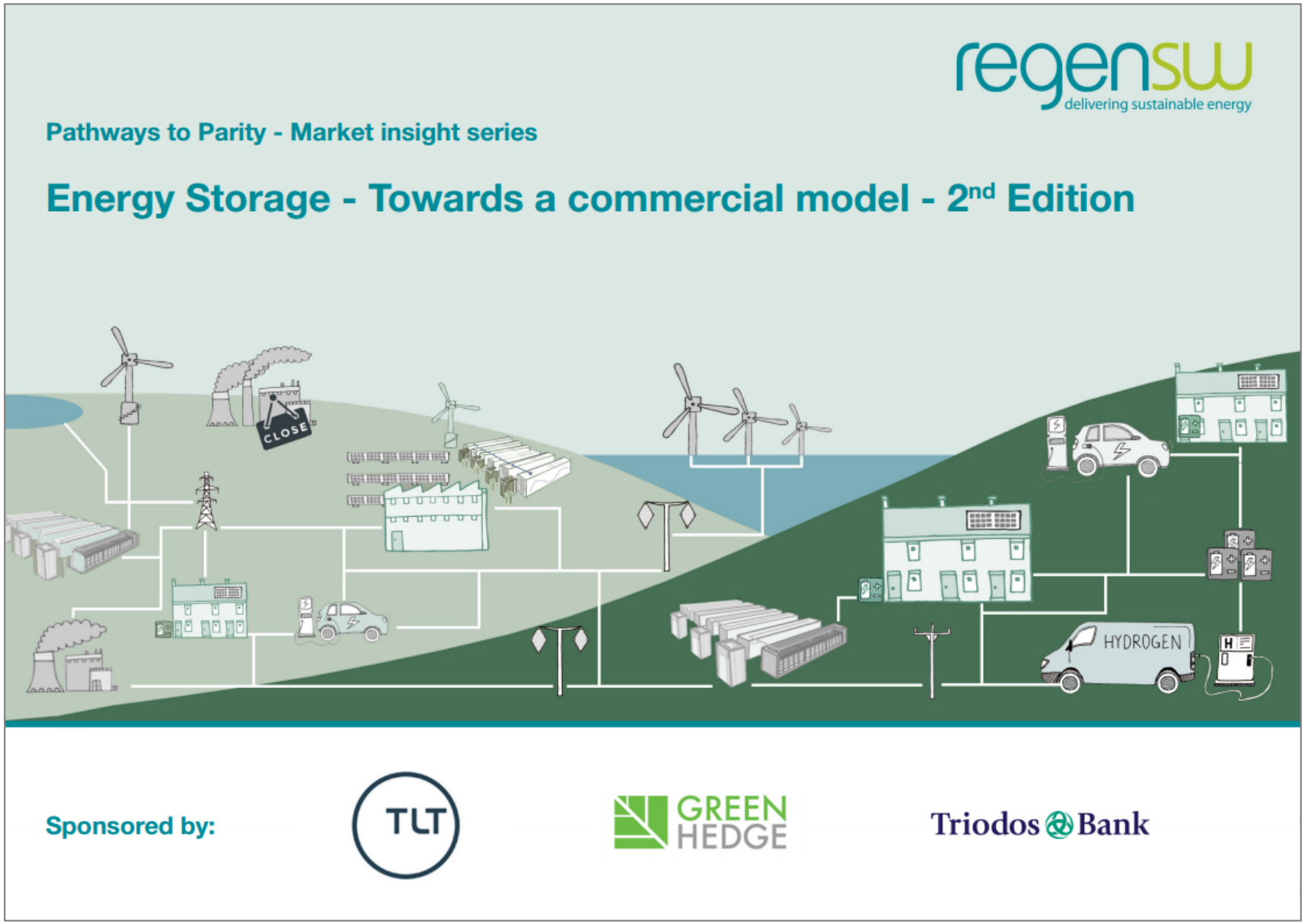


Technology

Timescales

Revenue Streams

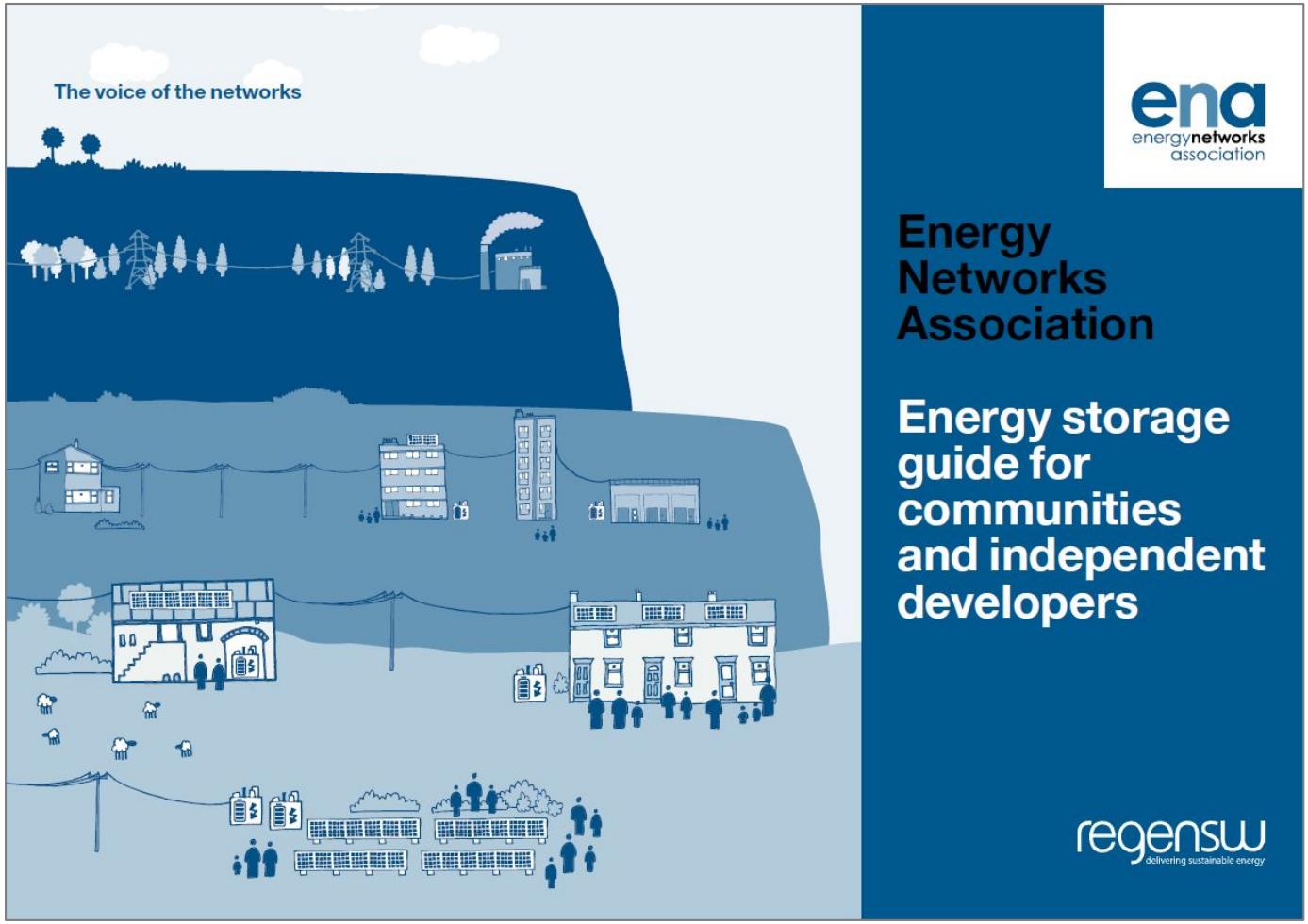
Energy Storage - Towards a Commercial Model



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

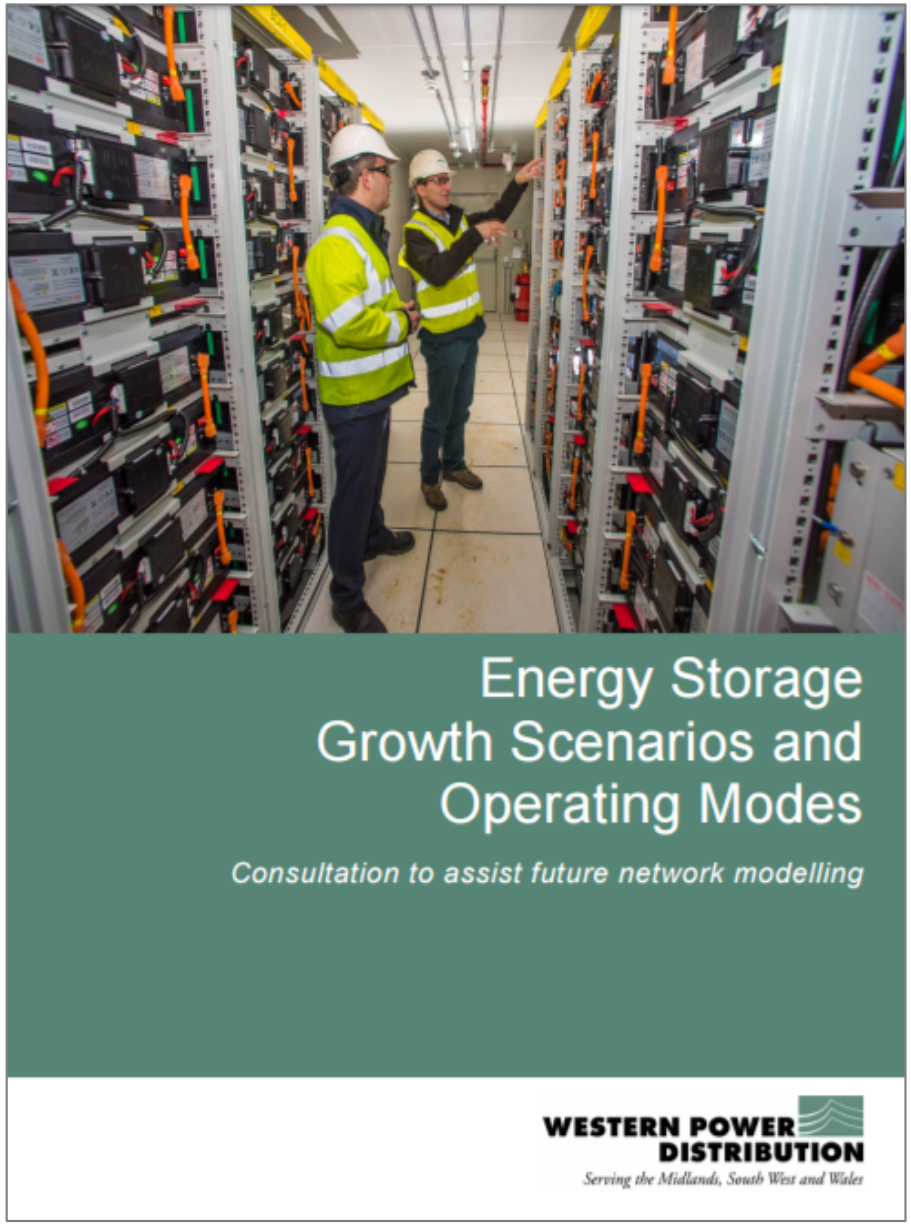


www.westernpower.co.uk/Connections/Generation/Community-Energy-Schemes/Community-Energy/Guides-and-Information.aspx

WPD consultation paper

In undertaking this consultation, WPD is seeking 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

Questions

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Generic storage operating modes

Operating Mode	Summary Definition
i) Network Auxiliary services only	*Operating under direct contracted response services such as frequency, Voltage / Reactive Power. This mode is for battery systems that are dedicated to being available for these response programmes 24hrs a day*
ii) Network Auxiliary services + Network Peak	*As above, but carving out a small window of operation (2-4hrs) to discharge in peak network charge + commodity price periods.*
iii) Reserve service standby only	*Operating mode reflecting operation under balancing service contracts, effectively operating to be available for STOR, Fast Reserve, CM etc. - idle operation awaiting triggers/alerts*
iv) Reserve service + Network Peak	*Operating under balancing services contracts as above, but also carving out a window of operation to discharge during peak network charge + commodity price periods*
v) Network Peak Charge Avoider Only	*A mode of operation designed predominantly for behind the meter classes of project, whereby a battery system has been implemented to supply a demand load during network peak charges. Battery charging is during lowest price periods.*
vi) Cost Sensitive Self-consumption	*A mode where a demand user with generation is maximising self-consumption, but discharging during high commodity/delivery charge periods. This could currently be a C&I user with generation, subject to cost sensitivity or smaller users with Time of use Tariffs*
vii) Max Self-Use	*A mode where the maximisation of self-usage is not sensitive to high/low price thresholds (i.e. domestic solar with a flat electricity import tariff). Charging when solar is generating, discharge when energy is needed.*
viii) Generation Peak Shaving	*Mode of operation where storage is co-located with a stand alone generation, diverting proportion of generation into storage, so as to bypass grid export limitations. Likely to also discharge during network peak.*
ix) Generation Time & Price Shift	*Mode as above, but whereby there is no grid export limitation restriction and the co-located storage is simply shifting the time of some exported volume into more beneficial times - i.e. evening network peak*

Standard Storage operating modes

Response service	Automatic triggered (±) power response	+	with winter peak TRIAD discharge window
Response service	Peaking reserve on call for STOR and Fast reserve	+	with winter peak TRIAD discharge window
High energy user “behind the meter”	Peak demand shaving (with generation time shift)	+	With peak (TRIAD/Red Zone) discharge
Domestic and community “own use” with PV	Maximise Own Consumption – usage optimisation	or	Minimise Energy Cost with price optimisation
Generation co-location	Peak generation shaving	+	Revenue optimisation
Energy trader	Price Arbitrage		

Storage growth factors

Wave 1 - led by response services

- Storage dominates the EFR, FFR, DSR and new voltage support services
- Higher value services drive market growth with focus on MW and response time
- First applications for high energy industrial and commercial users behind the meter models
- Domestic and community scale early adopters
- Development of a DSO distribution network model creates new market opportunities
- Government creates framework for a flexible and smart energy system

Wave 2 - co-location business models become viable

- Market for C&I high energy user/generators grows rapidly
- Emission controls and an attractive business case mean that storage effectively replaces diesel generators for most C&I application
- First co-location projects with solar PV lead to a rapid expansion and new ground mounted solar PV farms are developed
- Domestic and community scale storage market expands rapidly driven by falling costs

Wave 3 - expansion and new market models

- Aggregation and new trading platforms develop
- Local supply markets, private wire and virtual markets rely heavily on electricity storage
- Domestic electricity storage becomes common as costs fall and electric vehicle purchases increase, alongside growth in the electrification of heat
- Most new solar and wind farms now include electricity storage to harness low marginal cost energy and price arbitrage
- Towards the end of the decade, heat storage and electricity storage are increasingly integrated

Agenda

13.30	Welcome
13.45	**Adapting to policy changes and engaging with government** Jodie Giles, senior project manager – communities, Regen
14.00	**The changing electricity network: the transformation from DNO to DSO, innovation and opportunities for community groups** Alison Sleightholm, regulation manager, Western Power Distribution Q&A
14.45	Refreshment break and networking
15.15	**New community energy business models: local supply and storage** Olly Frankland, senior project manager, Regen
15.45	**Creating, Catalysing, Collaborating. Saving lives and more with solar** Anthony Walters, Chase Community Solar & South Staffordshire CE
16.15	Q&A
17.00	Networking drinks
17.30	Close

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