

Drivers for revolutionising our energy data

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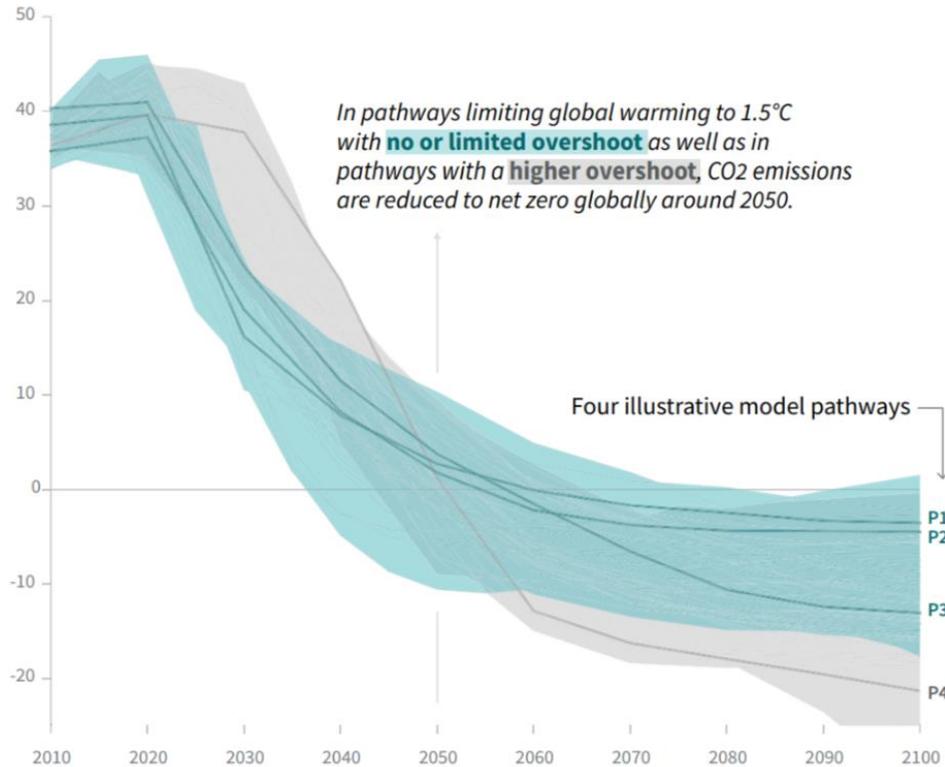
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Driver of change: Net zero carbon

Global total net CO₂ emissions

Billion tonnes of CO₂/yr



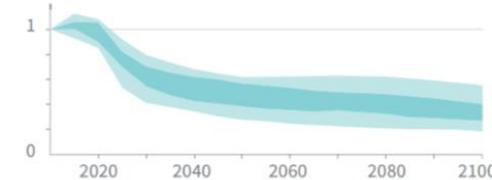
Timing of net zero CO₂
Line widths depict the 5-95th percentile and the 25-75th percentile of scenarios



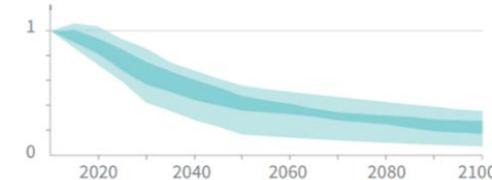
Non-CO₂ emissions relative to 2010

Emissions of non-CO₂ forcers are also reduced or limited in pathways limiting global warming to 1.5°C with **no or limited overshoot**, but they do not reach zero globally.

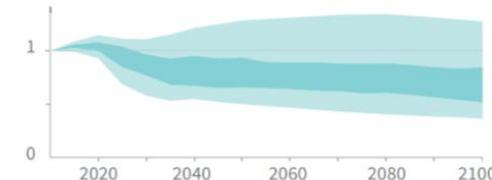
Methane emissions



Black carbon emissions



Nitrous oxide emissions

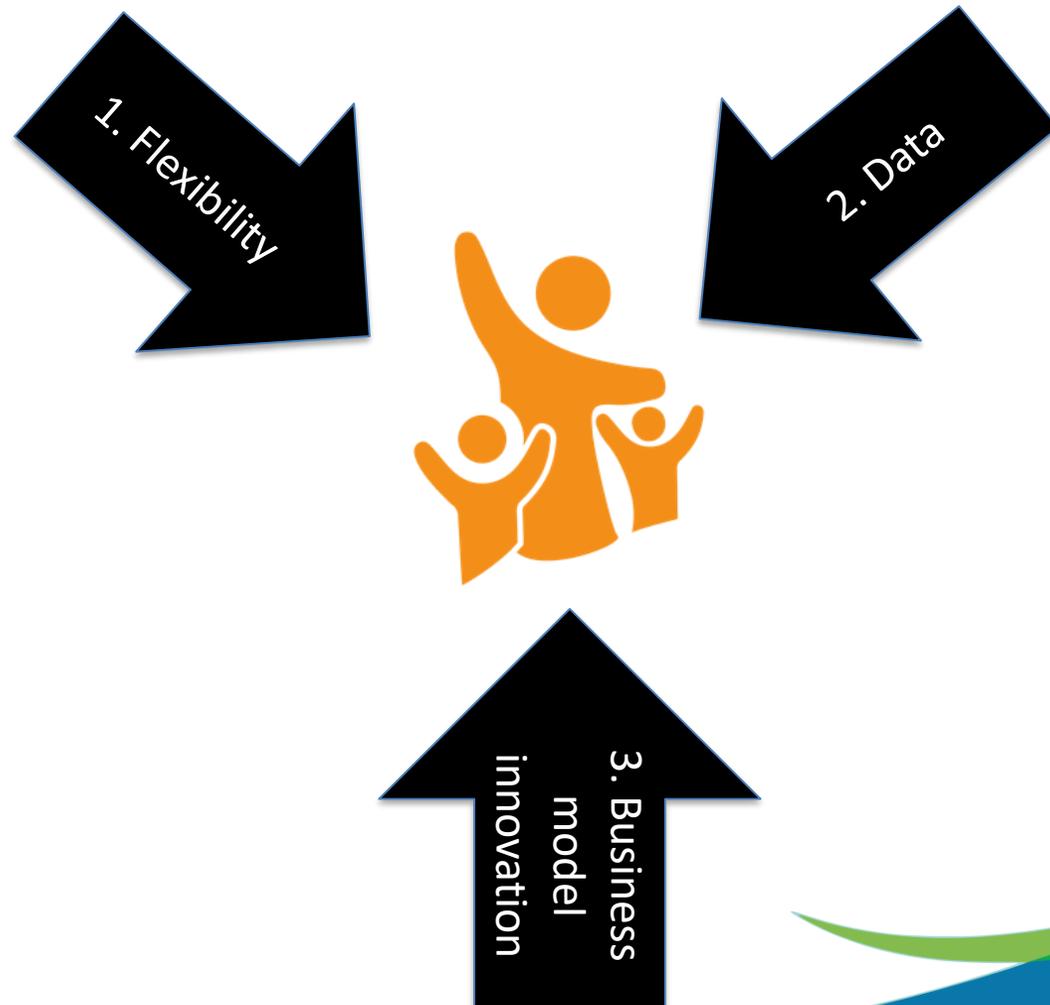


Source: https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

“Limiting warming to 1.5°C is possible within the laws of chemistry and physics but doing so would require unprecedented changes,” said Jim Skea, Co-Chair of IPCC Working Group III.



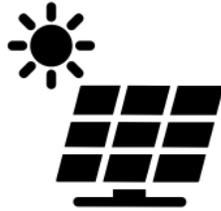
Consumers are
at the heart of
this low-carbon
transformation
(even if 'we'
don't know it)!



1. Low-carbon energy needs flexibility



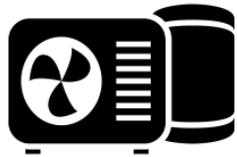
29% 2017



65% 2050



35 million 2050



20 million 2050



74 billion 2025

Sources

- [FES 2018](#)
- [Connected devices](#)

“The UK could save £17-40 bn across the electricity system from now to 2050 by deploying flexibility technologies”

Smart systems and flexibility plan

“The UK is uniquely placed to lead the world in a Smart Power Revolution. If we get this right we could save consumers up to £8bn a year”

NIC Smart power report

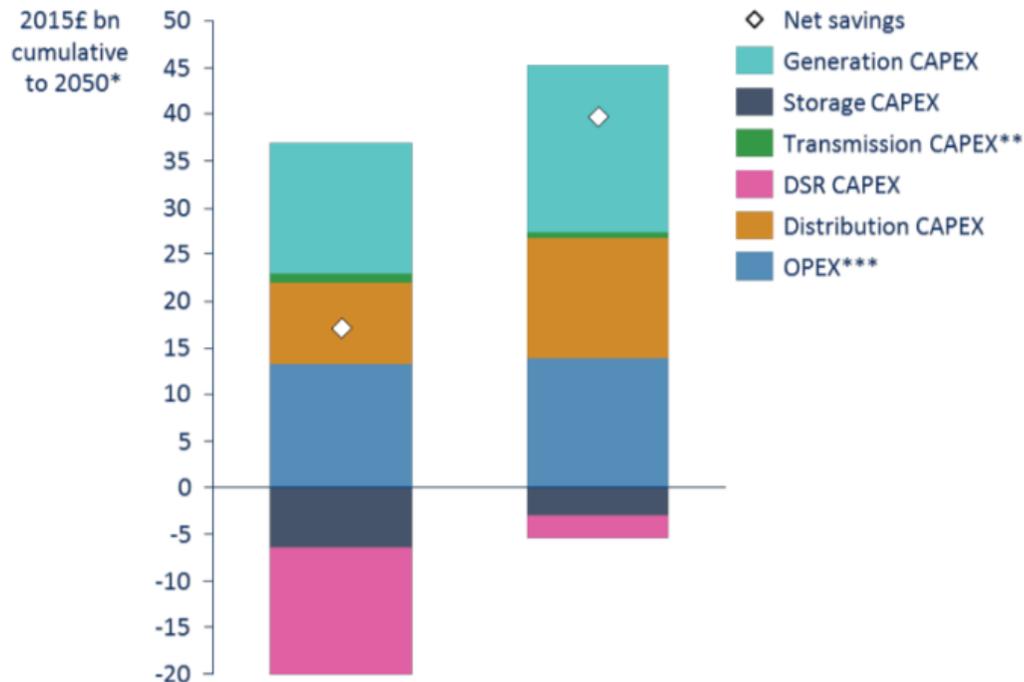
This research suggests that by 2050 up to £21 billion per year of new financial value is available in the UK electricity system...

Utility 2050 project

1.1 Digging into ‘flexibility’

Analysis for Smart systems and flexibility plan shows that the deployment of flexibility technologies could save the UK energy system **£17-40 billion cumulative to 2050** compared to scenarios in which DSR and storage aren’t available.

Chart 24 A breakdown of the minimum and maximum cost differences between the twelve core scenarios and the no flexibility scenarios (N1, N2) cumulative to 2050



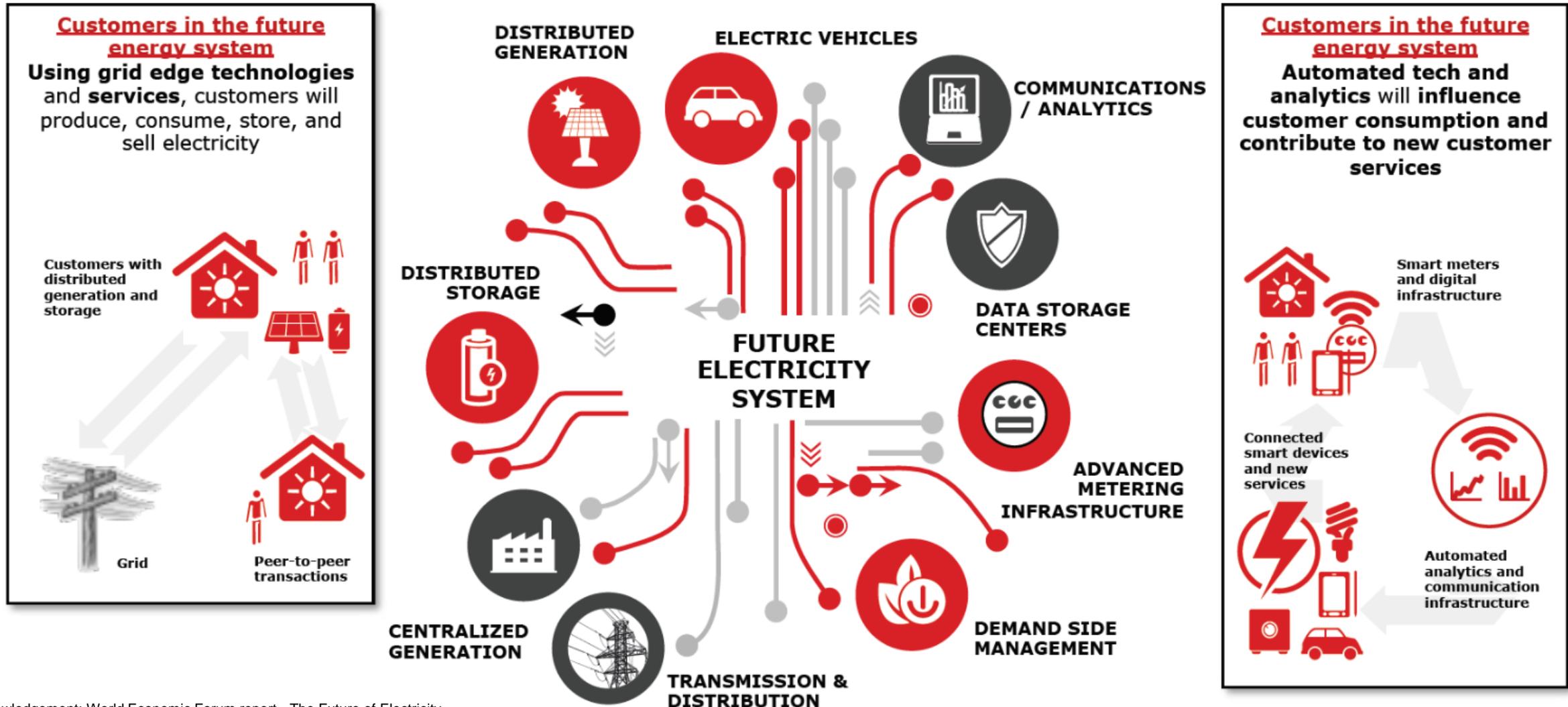
Flexibility:

1. Reduces the capacity of low carbon generation needed to achieve carbon reduction targets
2. Enables system balancing at a lower cost by displacing more expensive flexibility options
3. Improves the utilisation of existing conventional generation, and defer investments in transmission and distribution network reinforcement.

Demand side response and storage are hugely important!

- (In the £40bn scenario)
- Demand side response from homes, EVs and electric heat contribute 30GW of response in 2050
- Storage a further 19GW
- **That’s 35% of the total flexibility available (or £14bn)**

2. (Useful) Data = options and opportunities

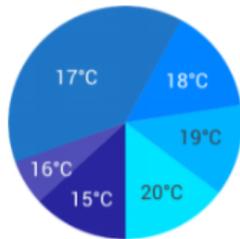


2.1 What can data tell us

Everyone enjoys better control, but they use it very differently
(e.g. temperature)

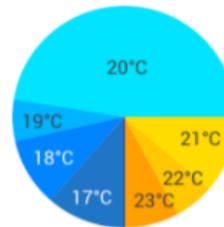


Cool Conservers



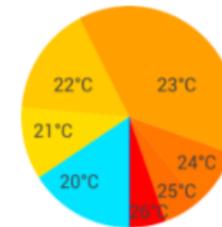
Often adjust temperature to try and cut bills

Hot and Cold Fluctuators



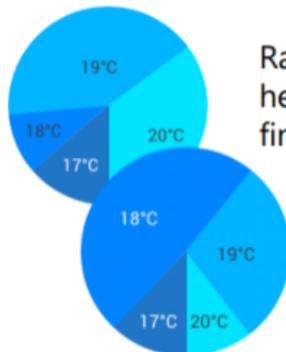
Often adjust temperature to get comfortable

On-Demand Sizzlers



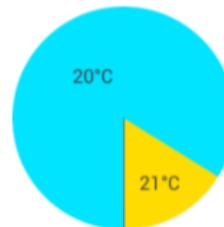
Some like it hotter or want to spend more than others in their home

Steady and Savvy



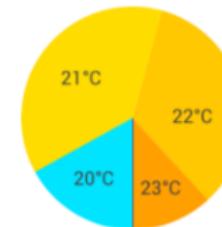
Rarely adjust their heating as they are fine with 18-20°C

On-off Switchers



Turn it on and off to try and make sure home is only warm when someone is in

Toasty Cruisers



Love feeling cosy and prefer not to put clothes on if they're cold

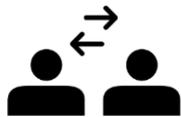
3. Business model innovation needed

New electrifier



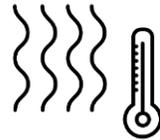
Traditional utility that is helping consumers switch to electric heat and mobility, including installing equipment and automating DSR

Peer-to-peer



P2P customers directly buy, sell or swap electricity with each other.

Energy as a Service



An ESCo delivers energy services to customers, such as comfort and illumination, rather than units of energy like a traditional supplier.

Lifestyle as a service



A third party, such as a price comparison website, takes decisions on consumers' behalf, like automatically switching energy supplier.

Everyone has an opinion on the energy business model of the future...



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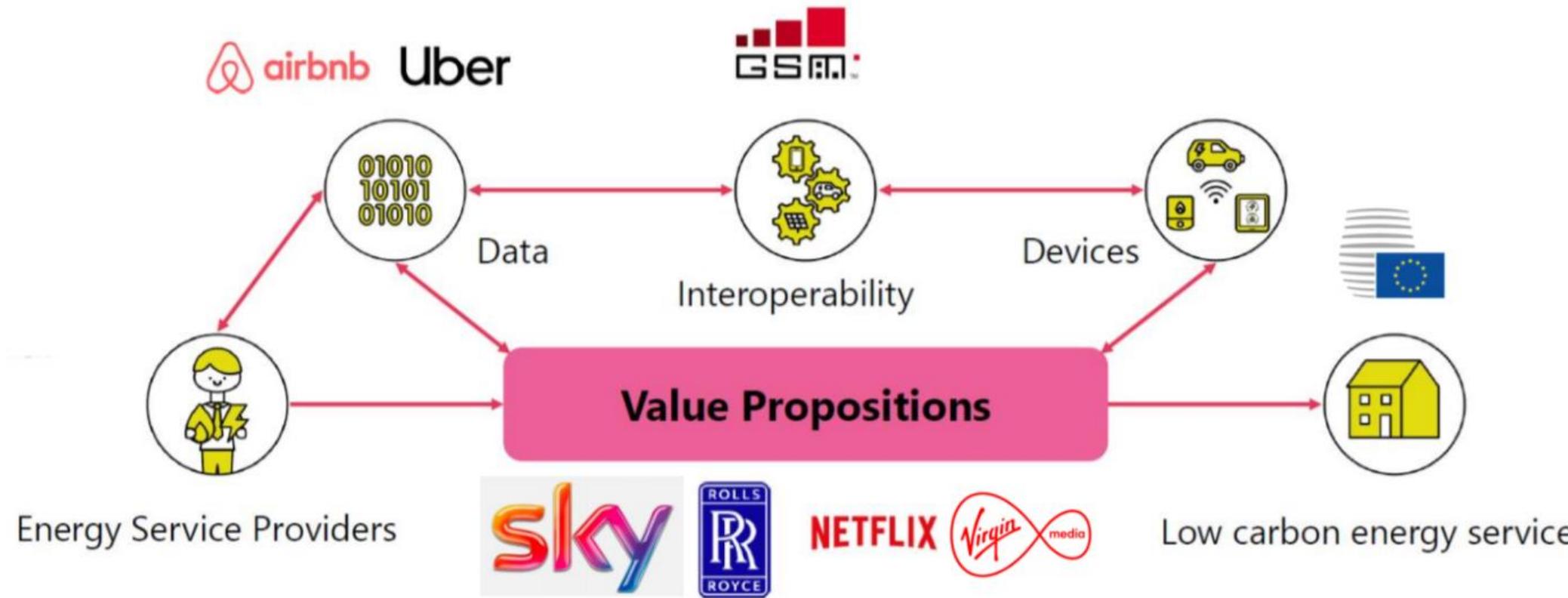
How could we buy energy in the smart future?

Dr Jeffrey Hardy, Imperial College London

March 2017

3.1 Nothing new here...

Learning from what has worked well in other industries...



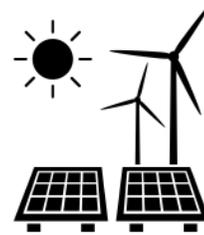
Size of prize of electricity utilities



Plant efficiency
£75 – 1809 m



Service provision
£5 – 9 bn



Local LC generation
£42 – 4600 m



Large LC generation
£0.61 – 8 bn



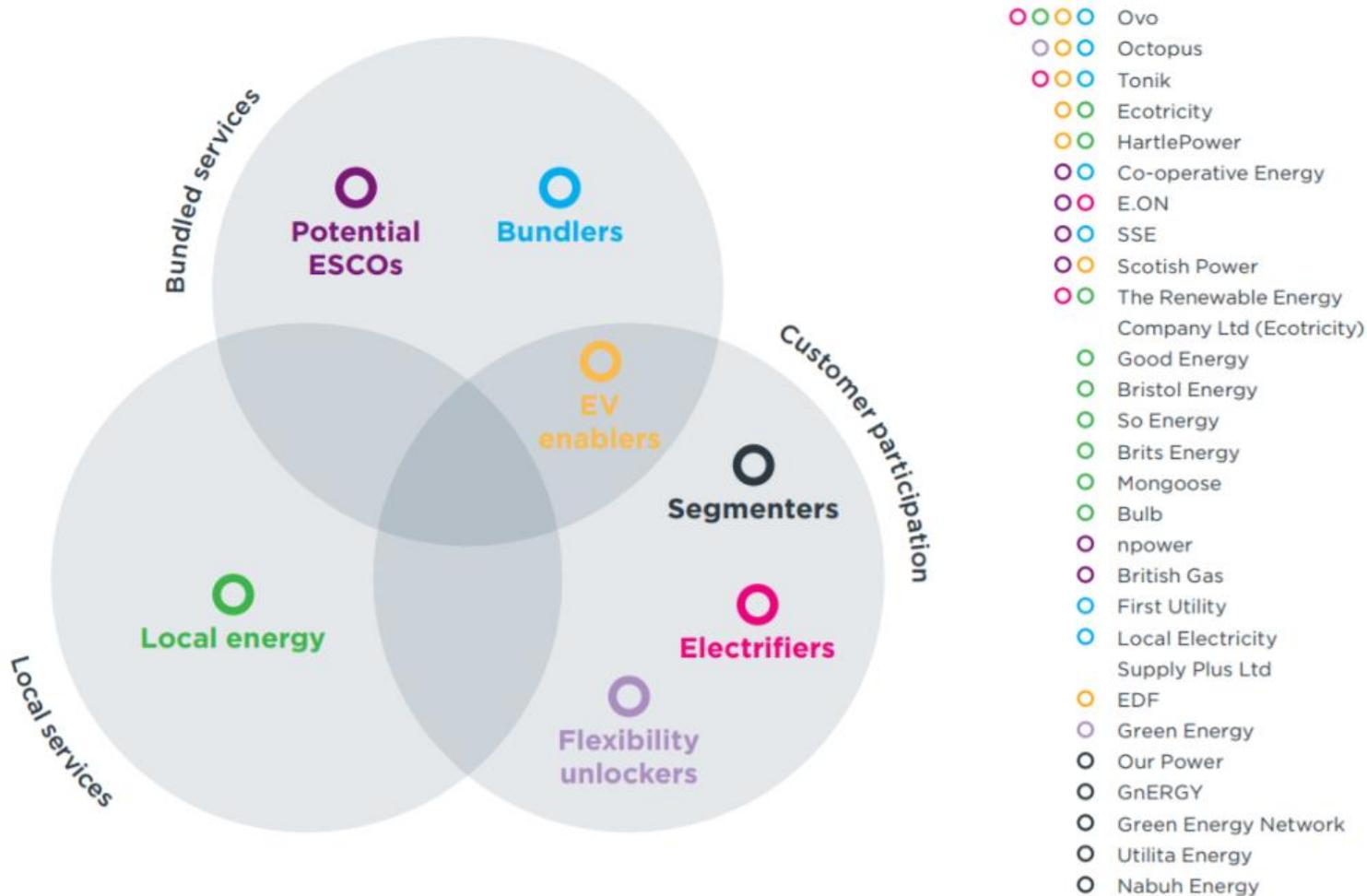
Flexibility optimisation
£400 – 2000 m



CCS
£-0.14 – 1669 m

**Up to £21bn of
new value is
available to
electricity
utilities per
year by 2050
(excluding
heat!)**

Innovation in energy suppliers

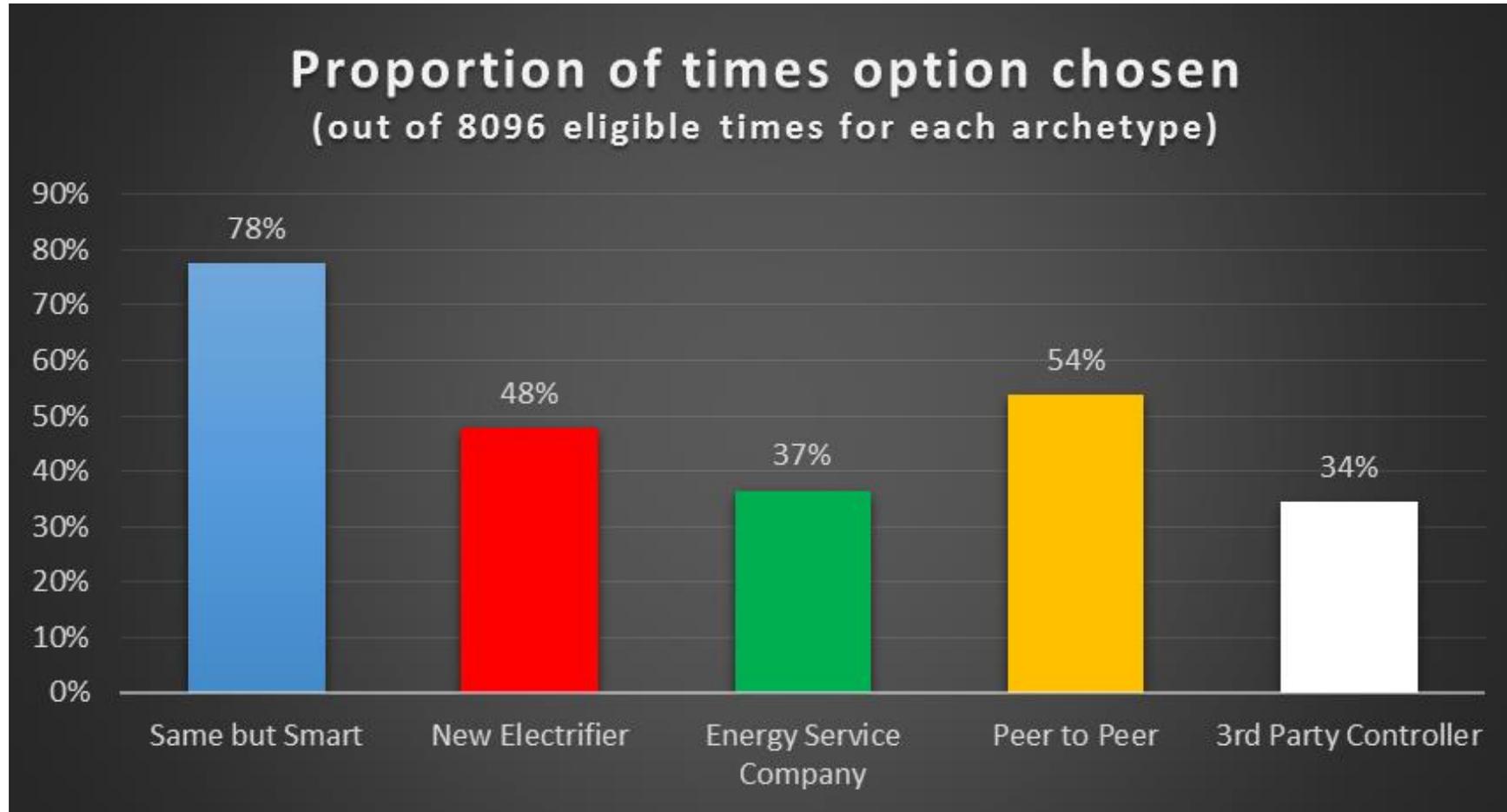


- Lot's going on, particularly on local energy, electric vehicles, 'smart' electric homes and bundling products
- However, little innovation in the core traditional utility business model (selling units of electricity and gas)

Credit: IGov - <http://projects.exeter.ac.uk/igov/wp-content/uploads/2019/01/IGov-BM-Analysis-report.pdf>

Figure 8: Emerging domestic electricity supplier value propositions compared to broad NTBM themes

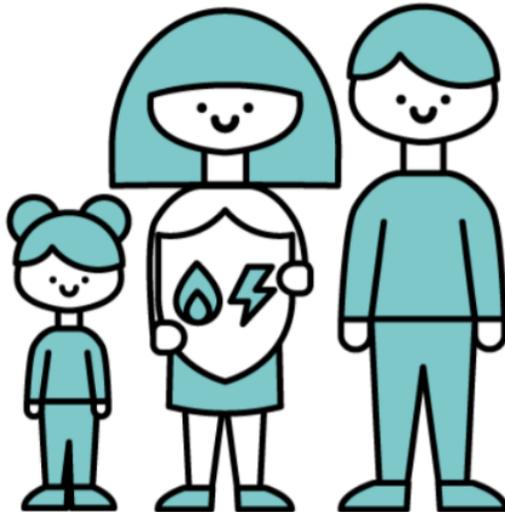
Do consumers want new business models?



Credit: Soon to be published research by Utility 2050 project

New consumer protection challenges

Consumers will need protecting in this smarter new energy world



Know what they're buying

Can get the experience they want

Can get their problems fixed

Can compare offers and switch

Credit: Energy Systems Catapult - <https://es.catapult.org.uk/wp-content/uploads/2019/03/SSH2-Event-presentations.pdf>

Lots of policy, but is there a clear direction?

Cost reflectivity

“We do not think the current approaches to allocating and using capacity – and charging for the associated network usage – on the electricity networks can adequately address the associated challenges and opportunities.”

https://www.ofgem.gov.uk/system/files/docs/2018/07/network_access_consultation_july_2018_-_final.pdf

Supplier hub model

“...we are not confident [the current supplier hub model] will enable consumers to benefit fully from the greater levels of innovation, digitalisation and competition made possible by the energy system transition...”

https://www.ofgem.gov.uk/system/files/docs/2018/07/future_supply_market_arrangements_-_response_to_our_call_for_evidence_0.pdf

Playtime

“A regulatory sandbox enables innovators to trial new products, services and business models without some of the usual rules applying.”

<https://www.ofgem.gov.uk/publications-and-updates/what-regulatory-sandbox>



“These [smart, local energy system demonstrators] will include new business models that intelligently link supply, storage and demand patterns across power, heating and transport.”

<https://apply-for-innovation-funding.service.gov.uk/competition/158/overview>



The market principle – we must wherever possible use market mechanisms that take full advantage of innovation and competition

The insurance principle – given intrinsic uncertainty about the future, government must be prepared to intervene to provide insurance and preserve optionality

The agility principle – energy regulation must be agile and responsive if it is to reap the great opportunities of the smart, digital economy, and finally

The “no free-riding principle” - consumers of all types should pay a fair share of system costs

<https://www.gov.uk/government/speeches/after-the-trilemma-4-principles-for-the-power-sector>

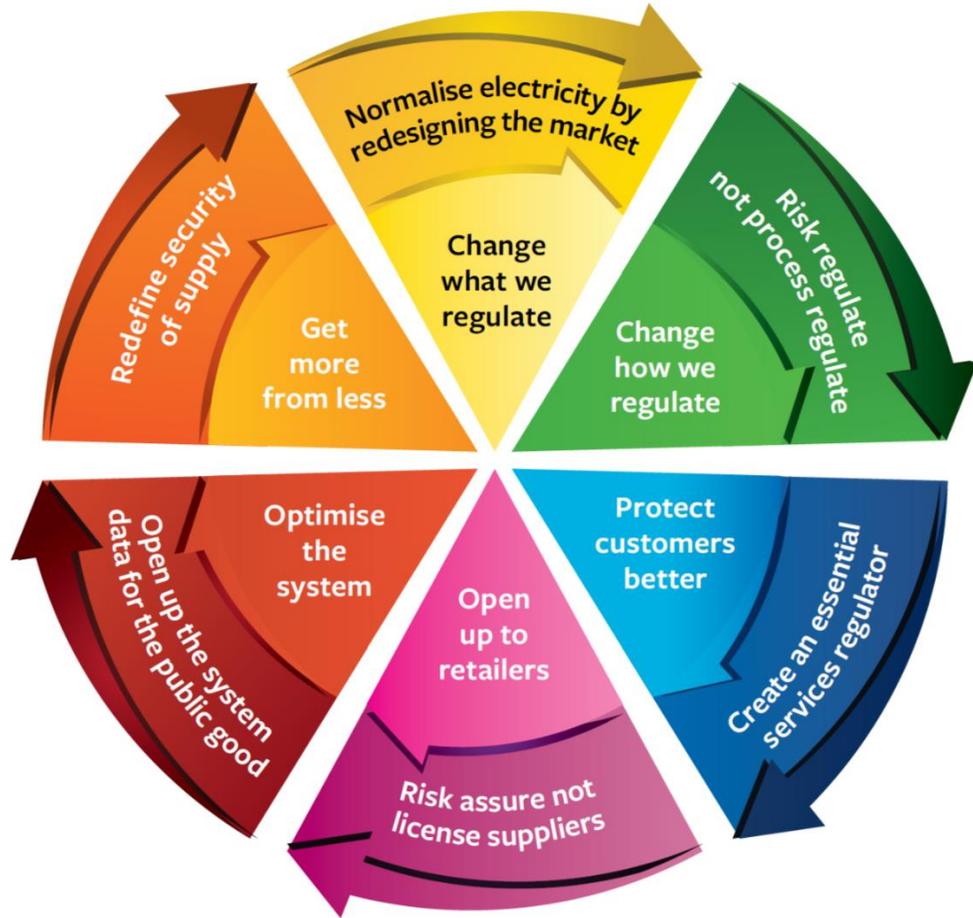
What does business want?

Top 5 priorities

- (1) A transparent commitment to carbon pricing.
- (2) A clear strategy on transport *and* (especially) heat.
- (3) Controlling consumer risk.
- (4) A reformed regulatory framework across the supply chain.
- (5) A framework and platform that allows new energy services to emerge.

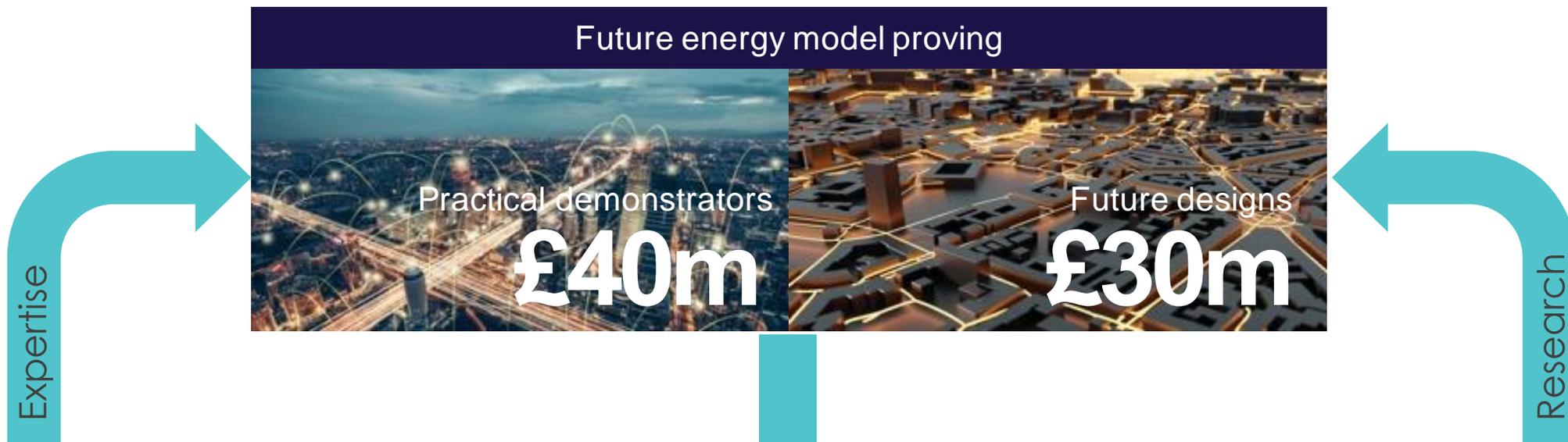
	UK Utilities	UK Policy	International (EU)	International (US)
Markets and innovation	"The regulatory framework needs to adapt so that new products and services can emerge"	"Create markets, including for flexibility, that are accessible, cost reflective, transparent and technology/business model agnostic."	Enable flexibility services on an open platform	We need to create open, data driven platforms to provide actionable evidence to improve & develop energy system (management) tools and regulations
Simpler regulatory framework	"We need a simpler institutional framework to support the energy transition"	"Ofgem moves to principles based regulation across the supply chain."		"We need to reduce regulatory barriers to drive market innovation and efficiency"
Consumer benefits and protection	"New markets need to develop to allow customers to benefit from flexibility, while maintaining an acceptable social contract "	"Customers should be protected from innovation by a fall back mechanism."		"We need to design and operate an equitable consumer-oriented market to ensure consumer engagement and fair access to energy"
Transport and heat strategy			"Commit to a national energy vision 2050, including transport and heat, with roadmap. "	
Carbon pricing	"There must be long term certainty about UK carbon pricing that is compatible with the Paris agreement"		"Decide and communicate: Are we going for low carbon capacity markets or energy only market with sufficient carbon price?"	"We need to place incentives & penalties on energy & carbon use, down to the individual level to spur investment in clean energy technology and to meet carbon targets"

Way forward? Redesigning Regulation



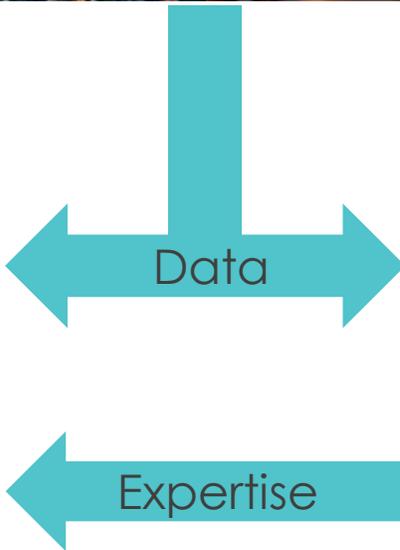
- **Change what we regulate:** normalise electricity through redesigning the market
- **Change how we regulate:** change from regulating process to regulating for risk
- **Protect and serve consumers better:** create one essential service consumer regulator
- **Open up to retailers:** risk assure retailers rather than license suppliers
- **Optimise the system:** opening up system data for the public good
- **Get more from less:** redefine and recalibrate security of supply

PROSPERING FROM THE ENERGY REVOLUTION



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