21.10.20

Bridging the Gap to Net Zero: Introduction

Louise Schmitz

Senior Manager, ESO Strategy

nationalgridESO

Bridging the Gap recommends what *needs to happen* to achieve net zero emissions

Future Energy Scenarios (FES):

- Explore what *could* happen in the next 30 years.
- Used by thousands across the energy industry from energy investors to academics and policy makers.

FES Bridging the Gap to Net Zero:

- Considers what *needs* to happen next if we are to meet net zero.
- Explores key areas of uncertainty, gathers evidence and works collaboratively with stakeholders to build consensus.
- Recommends actions for policymakers and industry to move towards net zero.
- Informs FES modelling and analysis

Bridging the Gap 2020: Peaks and troughs: how markets, technology and digitalisation can help meet the new challenges of a decarbonised energy system.

PART 1	The energy system has been designed to meet one definition of peak. However, we're now in a world where there are new challenges – not just peak demand but also things like peak supply or peak EV demand. **What are these challenges and associated risks and opportunities?**

PART 2a: Technology	PART 2b: Markets	PART 2c: Data & Digitalisation
What kinds of technology, in terms of appliances and assets, can assist in decarbonising our energy system?	How will markets need to evolve in order to maximise the use of low carbon energy?	Data and digitalisation are a fundamental part of the solution but how can we make the most of their potential?

The consumer's needs and behaviour are fundamental to all three – any solution needs to be designed to serve consumers, at least cost, with greatest stability and security.

Agenda

Time	Agenda item	Speaker
10.00 – 10.05	Introduction to Bridging the Gap to Net Zero	Louise Schmitz, ESO Strategy
10.05 – 10.20	The energy system: then, now and in future	Julian Leslie, Head of ESO Networks
10.20 – 10.45	Audience discussion: What are the new peaks and troughs that we could see in our energy system between now and 2030? What are the challenges associated with these?	Laura Sandys, Independent Chair and Facilitator
10.45 – 10.50	Break	
10.50 – 10.55	Introduction to the Bridging the Gap's three workstreams of: markets, technology and data and digitalisation	Laura Sandys, Independent Chair and Facilitator
10.55 – 11.10	Markets presentation	David Sykes, Data Scientist, Octopus
11.10 – 11.25	Technology presentation	Teodora Kaneva, Programme Manager, Tech UK
11.25 – 11.40	Data and digitalisation presentation	Richard Dobson, Practice Manager, Energy Systems Catapult
11.40 – 11.55	Audience discussion: How can markets, technology and data and digitalisation help decarbonisation over the next 10 years?	Laura Sandys, Independent Chair and Facilitator
11.55 - 12.00	Next steps	Becky Hart, ESO Strategy

Peaks and troughs; then, now and in future

Julian Leslie

Head of Networks, ESO

The electricity system: then and now

We've seen huge change in the last decade…

10 years ago

Our electricity came from:

- 16% nuclear
- 47% natural gas
- 28% coal
- 7% renewable generation
- 1% imports

Main challenge for system operation: peak demand, when we might need all installed generation operating at the same time.
Solution: Security of supply standard written to ensure sufficient capacity during a typical cold spell.

Today

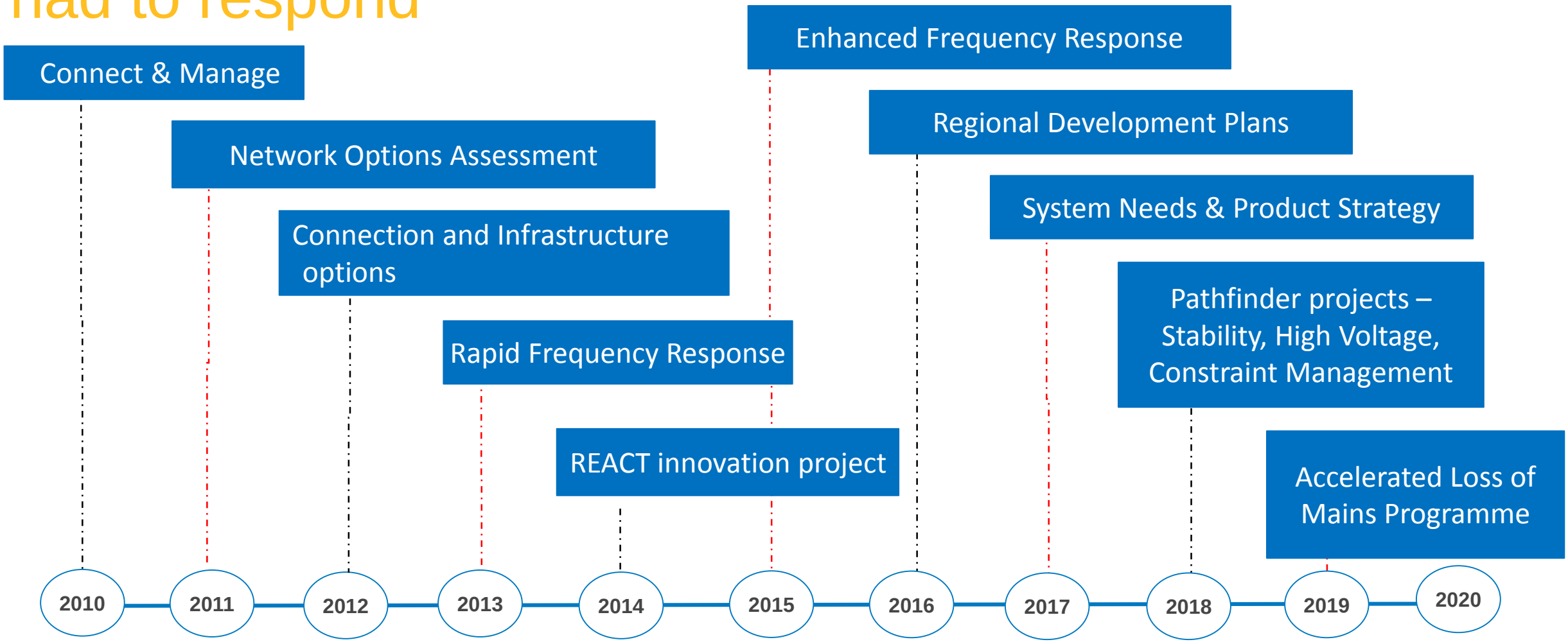
Our electricity comes from:

- 20% nuclear
- 34% natural gas
- 2% coal
- 38% renewable generation
- 6% imports

Main challenge for system operation: A variety of peaks and troughs relating to supply as well as demand
Solution: In fact, many different solutions have been introduced by the energy industry to meet these new challenges.

Data from Dukes and FES

Changing system dynamics has meant the ESO has had to respond

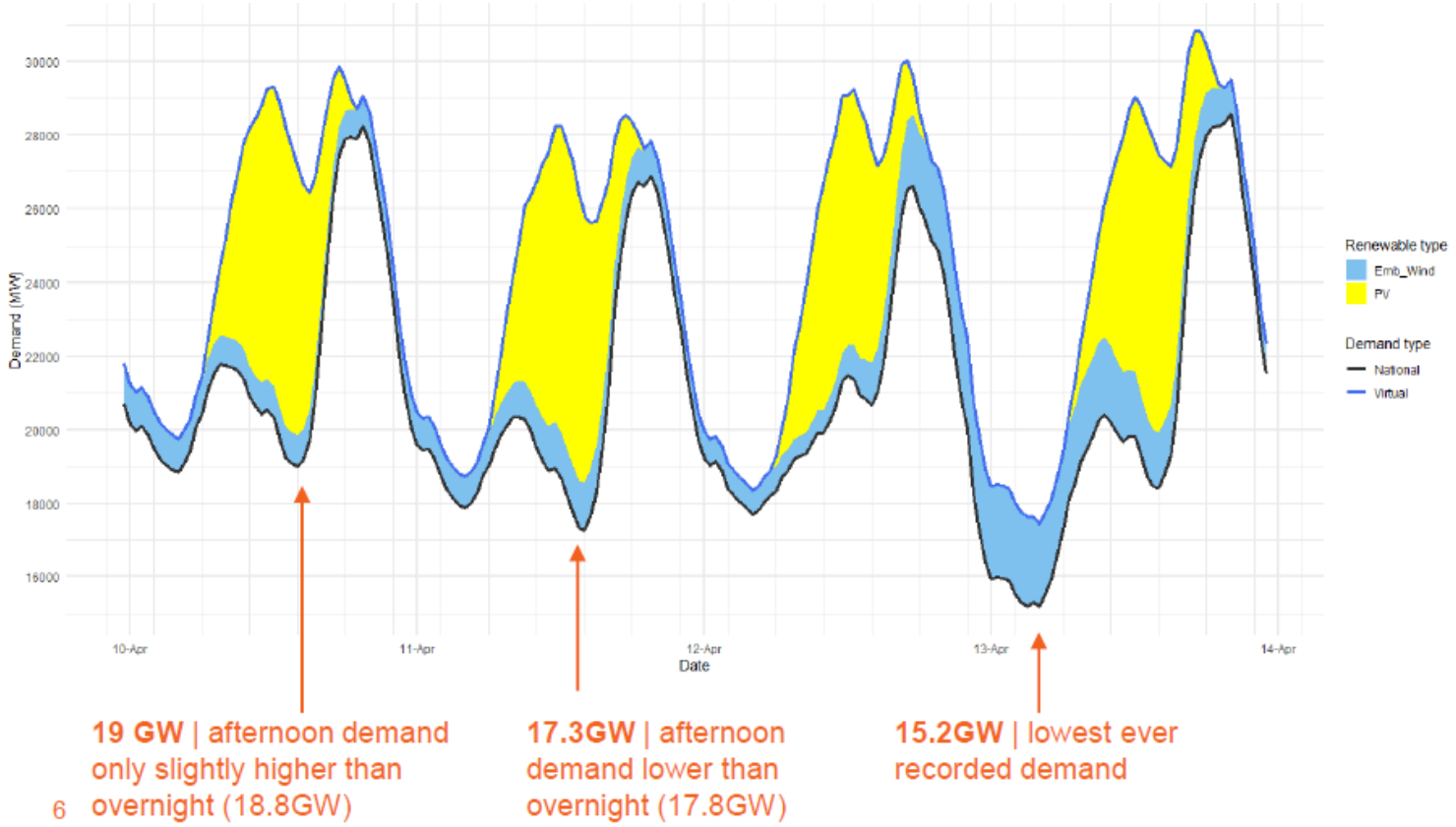


We’ve already seen, and adapted to, significant change in our energy system.

What could the future look like?

Lockdown provided a glimpse into future operating conditions

The control room perspective: National Demand from Good Friday to Easter Monday 2020

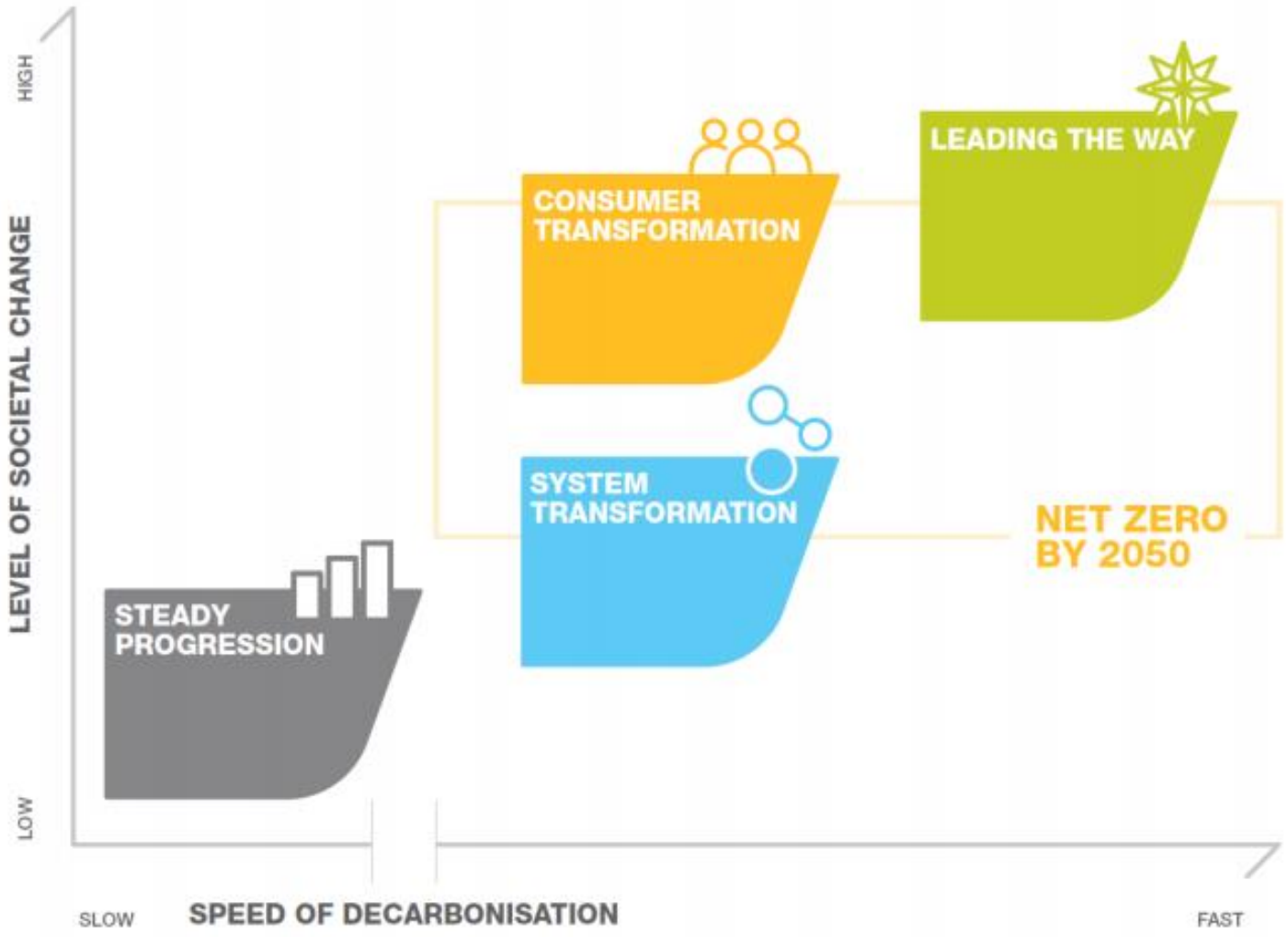


To manage this low demand, the control room:

1. Exported power to France, the Netherlands and Belgium
2. Instructed pumped storage and hydro power to pump

There was an estimated 2.3 GW of embedded wind generating over this time (blue ribbon)

Our Future Energy Scenarios look further into the future



Consumer Transformation

- Electrified heating
- High energy efficiency
- Demand side flexibility

System Transformation

- Hydrogen for heating
- Lower energy efficiency
- Supply side flexibility

Leading the Way

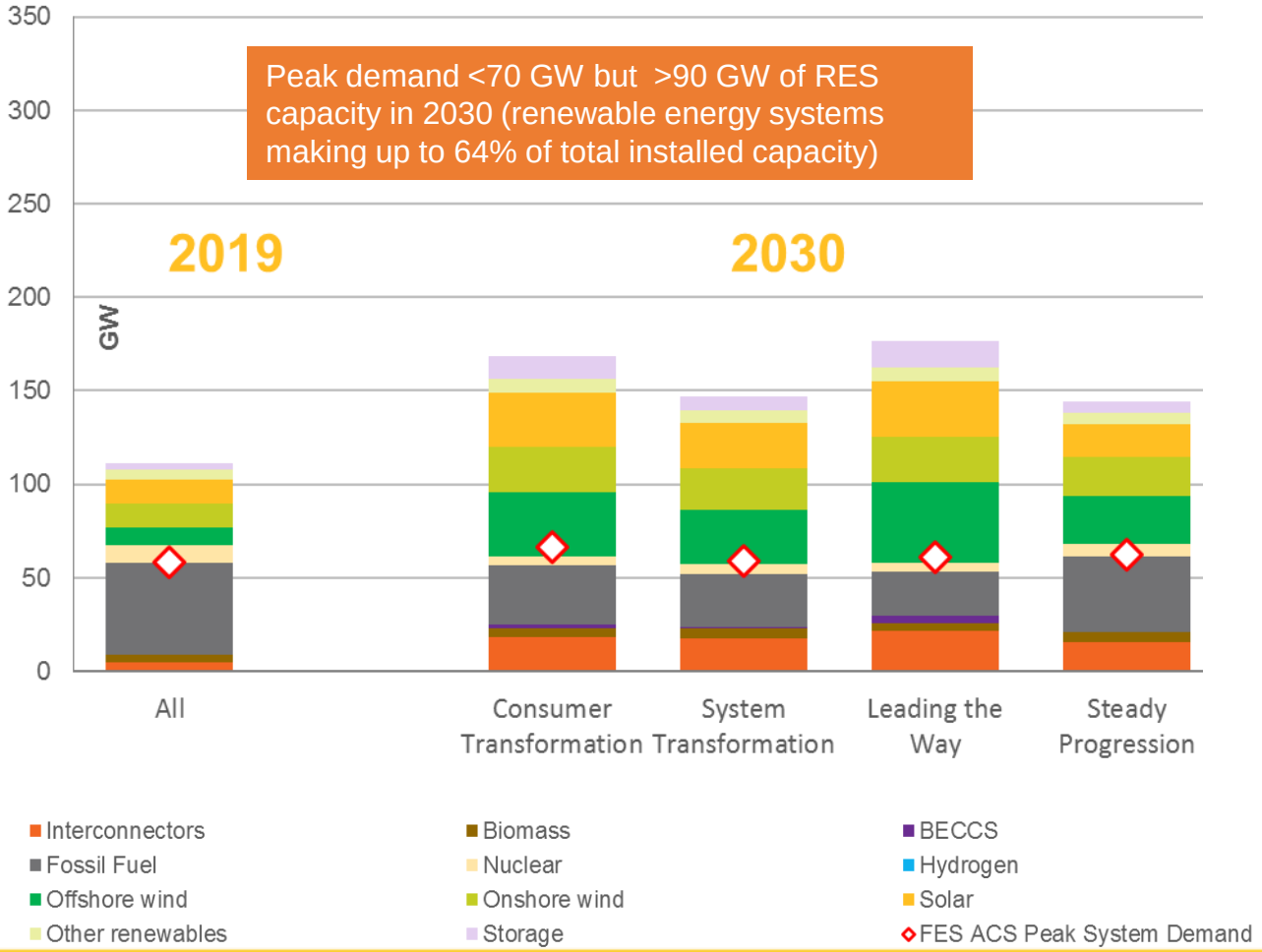
- Significant lifestyle change
- Mix of hydrogen and electrification for heat

Steady Progression

- Minimal behaviour change
- Decarbonisation in power and transport but not heat

FES analysis shows that net zero means significant change to the energy system in the next 10 years

Installed electricity generation capacity in 2030, plus storage and interconnection (no vehicle-to-grid or non-networked offshore wind)



What could our energy system look like by 2030? (in one or all of the net zero scenarios)

- 17% reduction in amount of dispatchable capacity available
- Over 10 million Battery Electric Vehicles on the road
- Lower nuclear baseload electricity supply
- Electricity demand for home heating exceeding 40 TWh
- Installed electricity storage capacity above 10 GW
- Carbon emissions reduced by up to 37%
- Negative emissions in the power sector
- Increased number of energy system participants.

The challenges associated with our decarbonised energy future

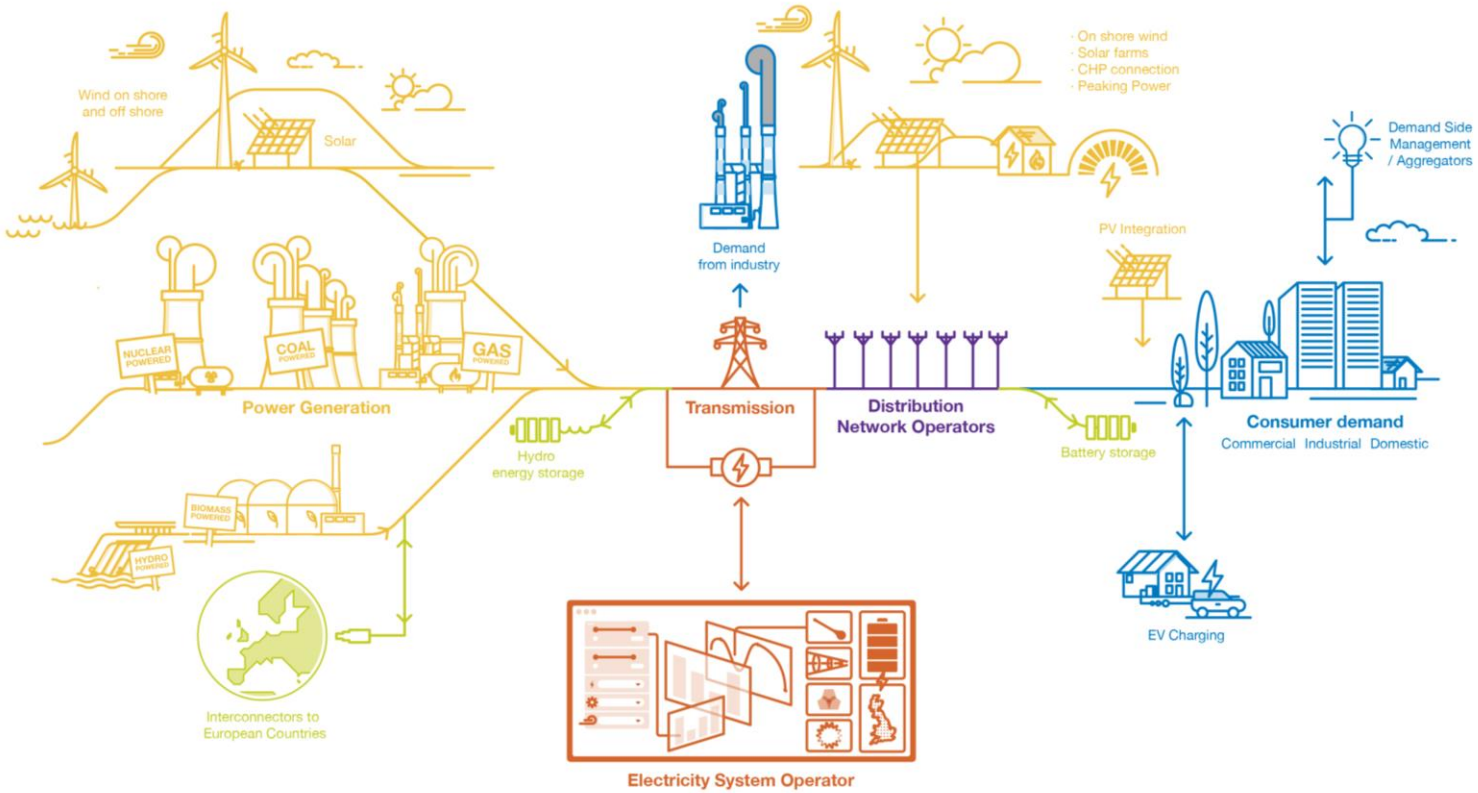
What are the new peaks and troughs that we could see between now and 2030, and how can markets, technology and data and digitalisation help to mitigate these?

Laura Sandys

In future, we will need our system to cope with more than just winter peak demand

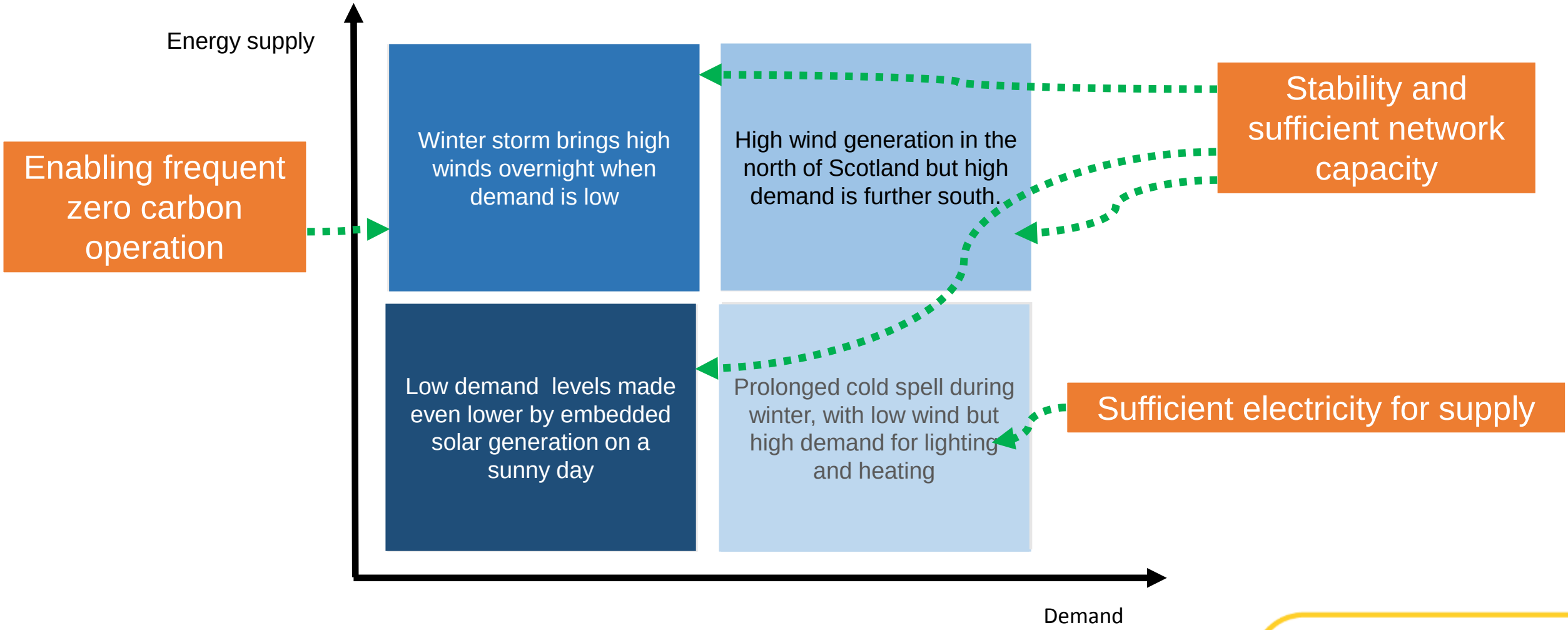
These peaks and troughs will become increasingly dynamic, variable and unpredictable with changing characteristics in terms of:

- **Quantity:** quantity and intensity of actions throughout the system
- **Diversity:** diversity of assets and actions throughout the system
- **Interaction:** cumulative impacts of each action
- **Different:** different nature of products and services
- **Devolution:** acting <u>with</u> new partners and actors and requiring a supportive, complementary environment

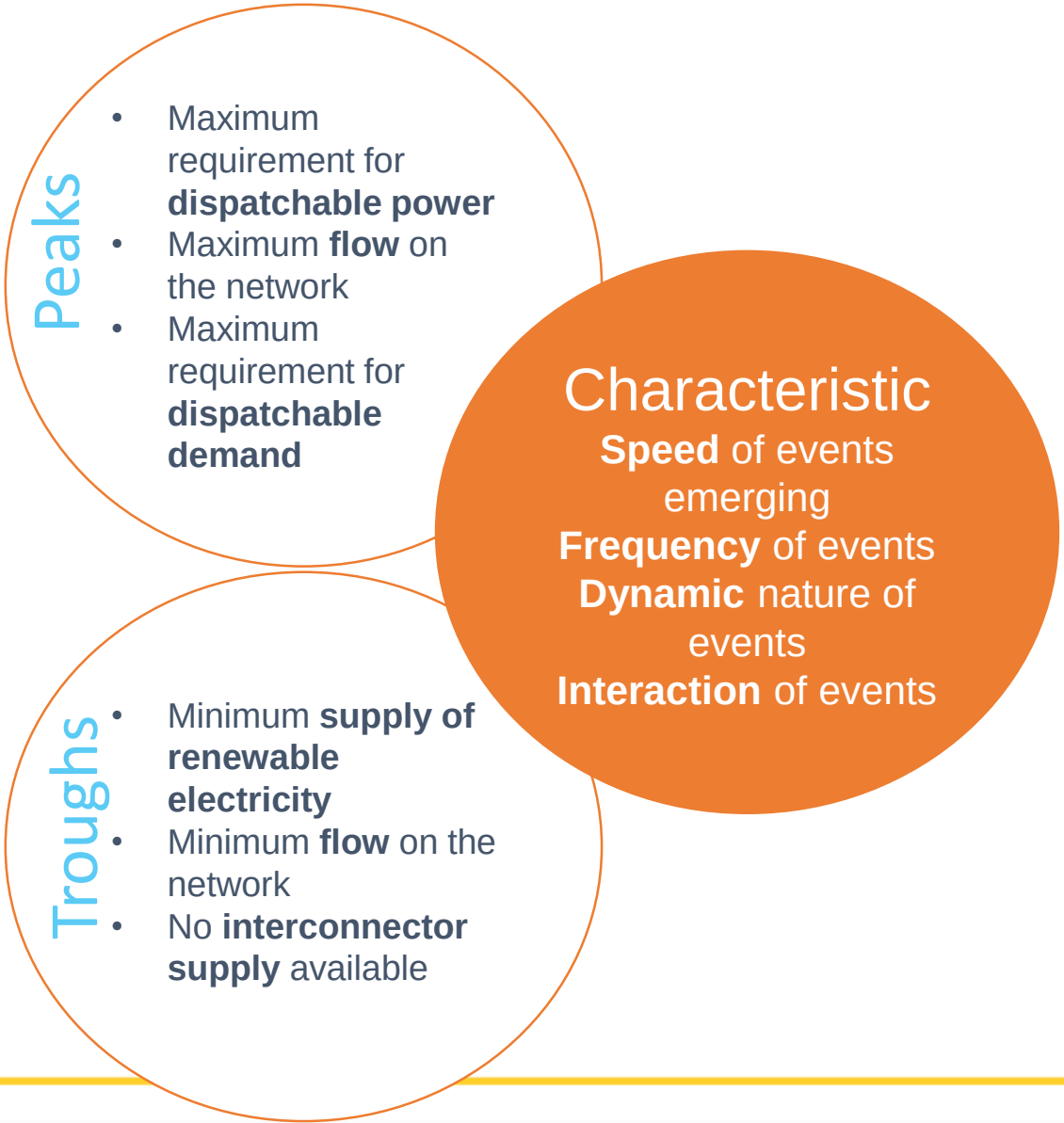


The system will need to be flexible to manage more dynamic and variable peaks and troughs, as we continue to decarbonise our energy system.

Some examples of the new peaks and troughs presenting challenges to electricity system operation



Have we captured the new peaks, troughs and challenges for the future?



When thinking about how to address these, we need to consider the following:

- Roles and responsibilities
- Whole system
- Consumer behaviour
- Visibility and transparency
- Decentralisation
- System standards and resilience
- Cost
- Policy changes

We have discussed and agreed the peaks, troughs and challenges of decarbonisation. How can we address these?

Our Bridging the Gap workstreams will look at the following key areas:

Markets

Technology

Data & Digitalisation

During the upcoming presentations, you will be asked via slido to vote on which aspect the workstream we should explore further after this workshop.

If you would like to take part in the workstream please let us know on FESbtg@nationalgrideso.com

A closer look at the workstreams

Laura Sandys

Where are we now, and where do we need to get to in order to meet the challenges associated with the new peaks and troughs?

Today:

Markets	Technology	Data & Digitalisation

• Wholesale market
• Balancing mechanism
• Capacity market
• CFDs and other renewable support mechanisms
	• Gas and steam turbines
	• Internal combustion engine
	• Some early adoption of smart goods, appliances and EVs
		• Small numbers of smart:
		  • Meters
		  • Heating devices
		• Little interoperability
		• Little use of data available

Where do we need to be by 2030?

Markets	Technology	Data & Digitalisation
Markets supporting diverse technologies to meet the new system challenges.	New technologies (physical assets) allowing the stable and secure operation of an increasingly dynamic energy system.	Data and digitalisation are underpinning an efficient and cost-effective whole system response to decarbonisation.

Presenting their views about these topics:

David Sykes
Octopus Energy

Teodora Kaneva
Tech UK

Richard Dobson
Energy System Catapult

FES Bridging the Gap

Markets

David Sykes | Octopus Energy
david.sykes@octoenergy.com

If you have any questions about David's presentation, please get in touch with him directly using the contact details above.

techUK
FOR WHAT COMES NEXT

Bridging the Gap 2020: Peaks and troughs: how technology can help meet the new challenges of a decarbonised energy system

Teodora Kaneva

Programme manager Smart Energy and Utilities

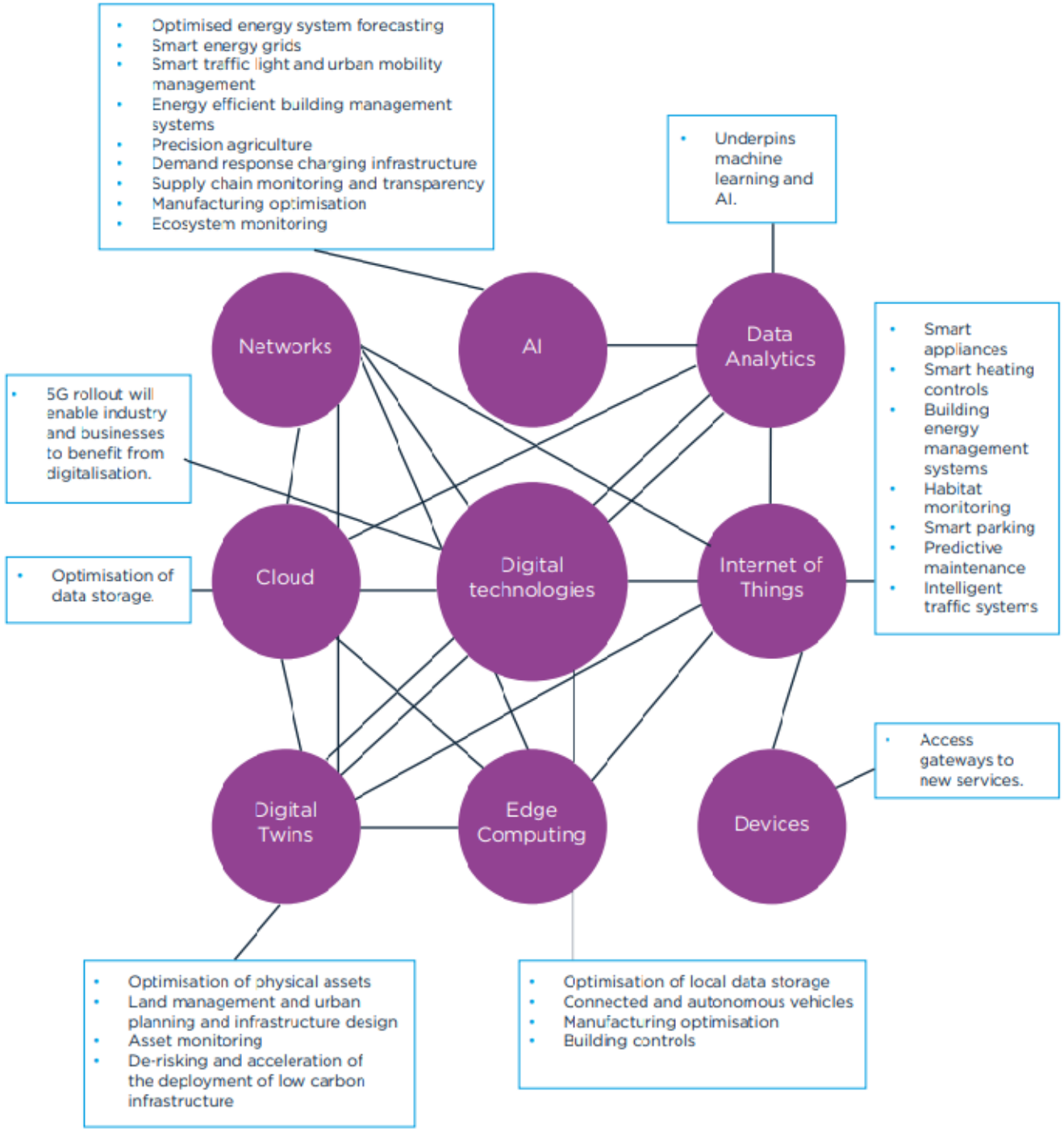
21 October 2020

techUK

Who we are

techUK is a membership organisation that brings together people, companies and organisations to realise the positive outcomes that digital technology can achieve.

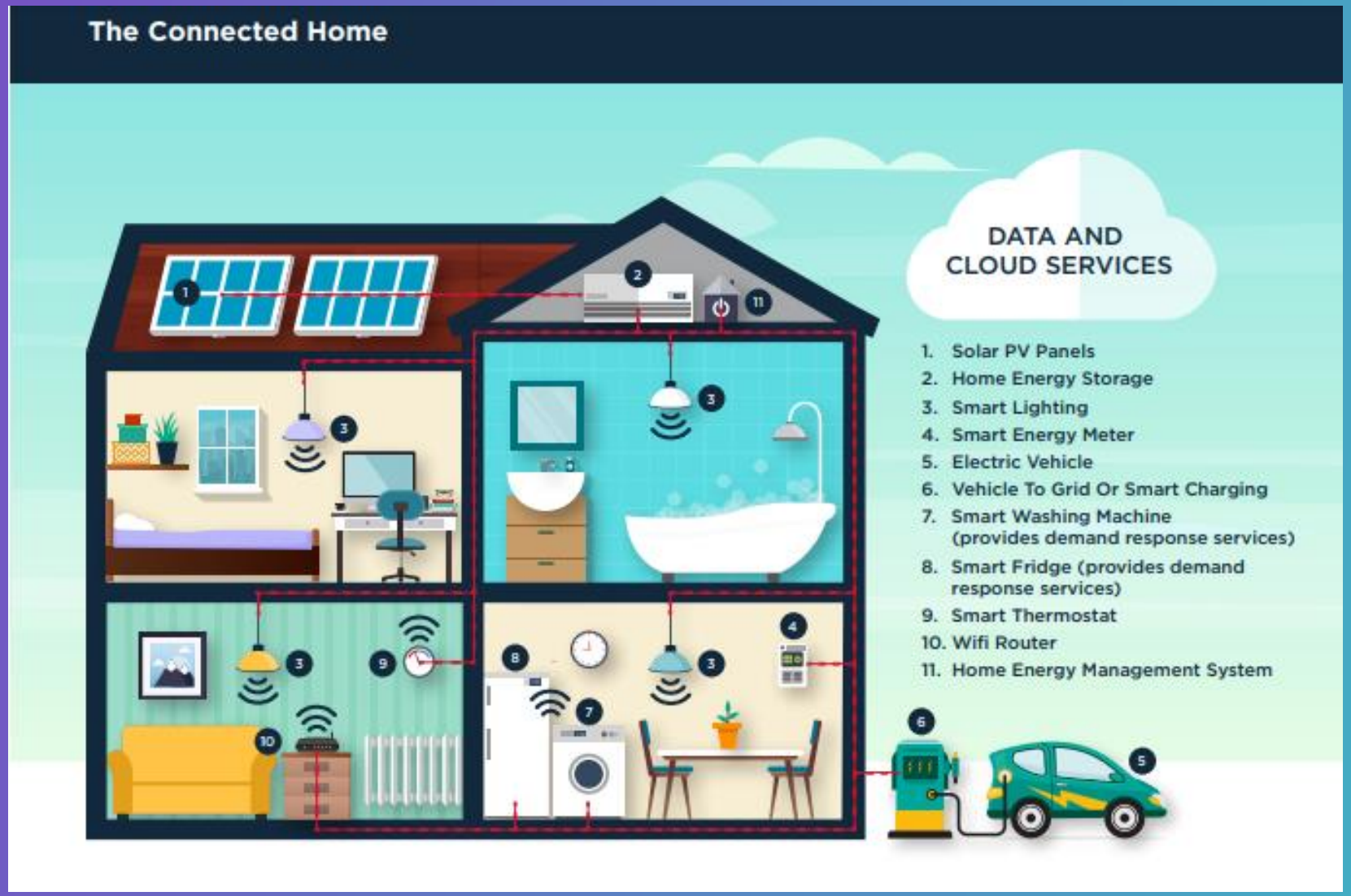
With more than 830 members (including 550 SMEs) spread across the UK, techUK is a network that enables our members to learn from each other and grow in a way which contributes to the country both socially and economically.



techUK

Technologies already in the field can deliver:

- Annual reductions in consumer bills by 2030: £354m
- Reduction in energy intensity of the energy system: 2%
- Carbon savings by 2030: 4 million tonnes



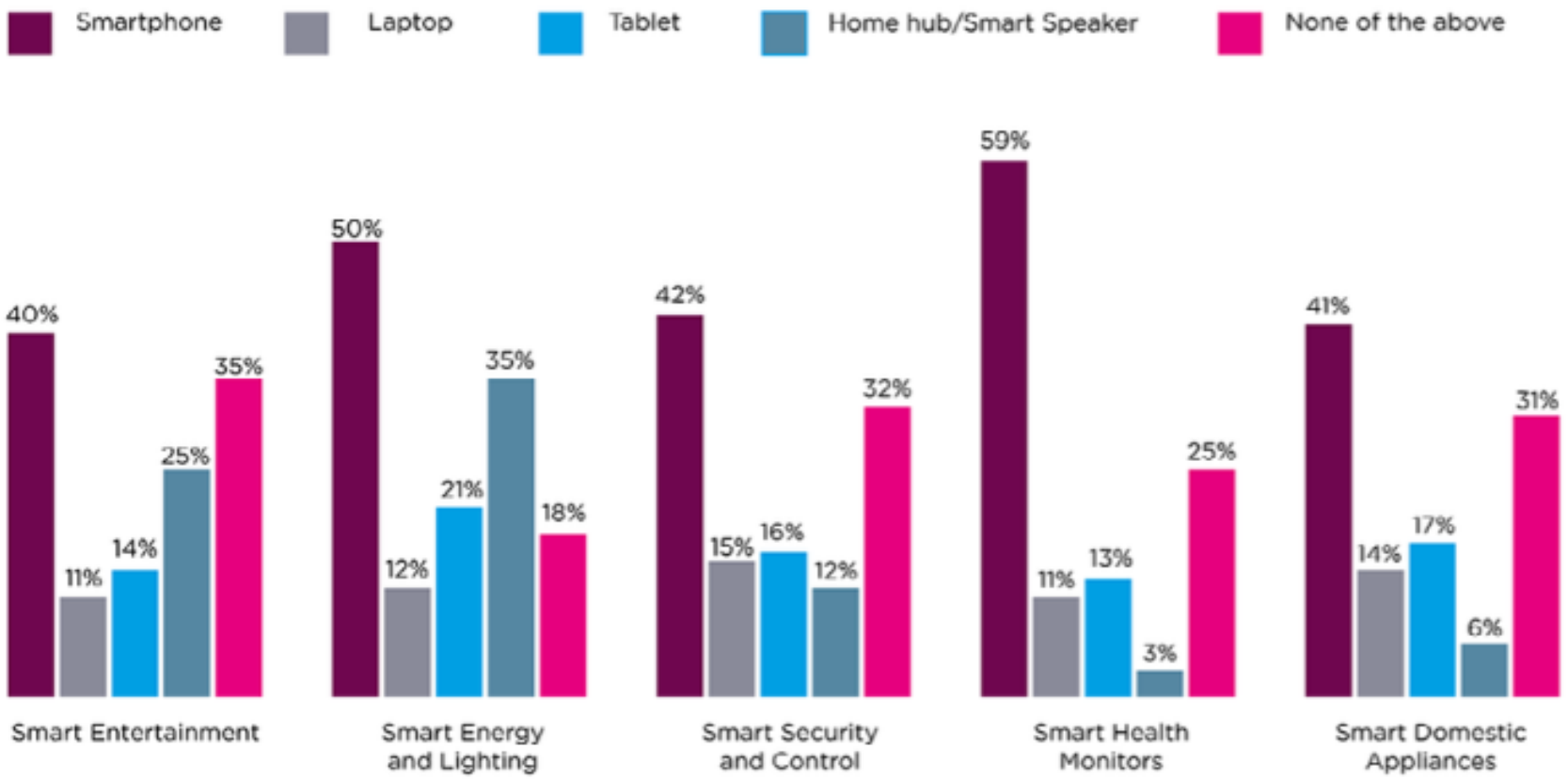
Technologies already in the field can deliver:

Annual carbon savings by 2030: 223,000 tonnes

Annual UK productivity gain in 2030: 1%

Annual UK GVA savings by 2030: £289m

The Connected Home – Connectivity



London Tech Week, Ministerial CEO Roundtable

Beyond data: how to unlock investment in digital energy technologies

- Clarity of destination on the policy white paper, on the framework, and specifically the central market landscape.
- Deepen innovation funding to support a whole systems approach.
- Commit to trialling in-market innovation by testing with a small number of citizens at first, then expand out.
- Conduct cross-sector sandboxing to stimulate cross sector innovation.
- Review the opportunities provided by digital twin technology.
- Be bolder in using government's own procurement processes.
- Unlock flexibility by committing to wholesale regulatory change and reform.
- Commit to review network and policy costs in the context of flexibility.
- Reduce taxes on green energy and rebalance by taxing fossil fuels more heavily.
- Recognise the benefits for vulnerable people through flexibility markets through lower systems costs and the ability to "bargain hunt".
- Provide firmer requirements for organisations to publish data.

techUK

Assessment of the Ecosystem & Recommendations

UK Innovation Ecoystem

techUK

How it acts as a barrier to clean tech adoption

- Pilots run too shortly and focus on tech, not the underlying busines models.
- Industry and academic collaboration needs to be more strategic and co-ordinated
- The UK R&D ecosystem needs to pivot to net zero.

Recommendations

- BEIS' R&D Roadmap should review of the innovation system to assess if it allows for net zero.
- Trials and pilots should run for longer to prove the business model and value propositions, as well as the technology.
- Departments should run outcome- and problem-based innovation challenges to crowd-source innovative solutions.
- Innovation bodies should consider platforms to share both successes and failures in a more transparent way so companies can glean better insights from funded projects.

Policy and Regulation

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How it acts as a barrier to clean tech adoption

- High level support for net-zero is not matched by day-to-day policies or regulatory decisions to pivot to net zero.
- Policy and regulation needs to move into ‘systems thinking’ – the idea of regulating transport, buildings and energy separately is holding back the clean tech sector

Recommendations

- We need a roadmap to net zero: an updated Clean Growth Strategy, Energy White Paper and Infrastructure strategy needs to be published rapidly.
- BEIS should establish a net zero delivery office to ensure enhanced collaboration and support regulatory alignment across Government.
- The Regulatory Horizons Council should establish a net zero tech taskforce to work with the tech sector to work through regulatory bottlenecks and legislative barriers.
- Regulators should deepen regulatory sandboxing by extending it into other sectors. Extend the funding available to regulators through channels such as the Regulator’s Pioneer Fund.
- Government departments should apply digital tech innovation impact assessments to new legislation to prevent any stifling of future innovation.
- Sponsoring departments should create a statutory duty on regulators to have a due regard to decarbonisation.

Finance and Investment

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How they act as a barrier to clean tech adoption

- Scaling up is hard for clean-tech start ups. The UK has too many exits and promising start ups are not becoming mid-sized companies.
- Launching new climate products remains hard for large businesses.
- Business culture and skills is not there yet in many sectors.

Recommendations

- Government should launch a call for evidence to explore incentive schemes to stimulate low-carbon investment in businesses, homes and the public sector.
- Departments and regulators should ensure measures are rolled out to overcome access to finance barriers – such as grants, low-interest loans, equity loans or green mortgages. Government should consider options for VAT reductions, tax offsetting and the entire suite of indirect tax measures that make energy reducing technologies more investable.
- Public financial support mechanisms, like loan guarantees, should be dedicated to new low-carbon technologies to de-risk and lower the cost of capital for early deployment.

Teodora Kaneva

teodora.kaneva@techuk.org

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[Making the UK a digital clean tech leader]

[The State of the Connected Home Report 2020]

Digitalisation of the Energy System

Dr Richard Dobson

21st October 2020

@EnergySysCat LinkedIn

About Energy Systems Catapult

Mission: **Unleash innovation and open new markets to capture the clean growth opportunity**

200 Innovation experts

Hubs in Birmingham and Derby

We work with Innovate UK

Established, overseen and part-funded by Innovate UK. Independent from Government. Not for profit

Bridge the gap between stakeholders in the sector

Supporting innovators

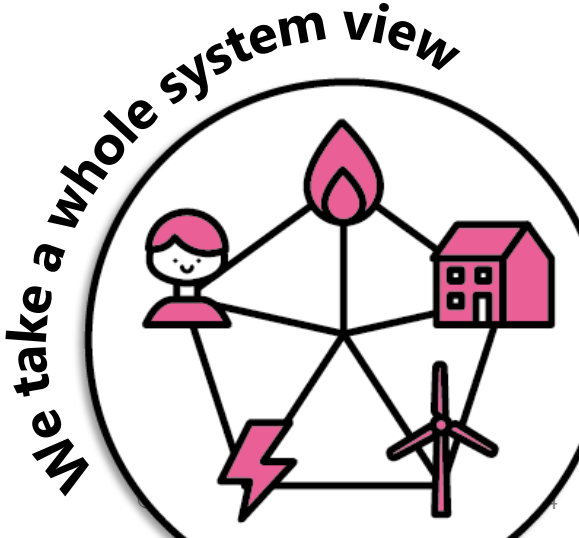
Research

Trials

Systems engineering

Digital

Modelling and simulation



A Modern Digitalised Energy System

CATAPULT Energy Systems

Digitalisation of the Energy System

- Optimise
- Ensure Resilience
- Unlock Value

Digitalisation

Digitalisation is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities;
it is the process of moving to a digital Industry

(Gartner IT Glossary)

Technology

People

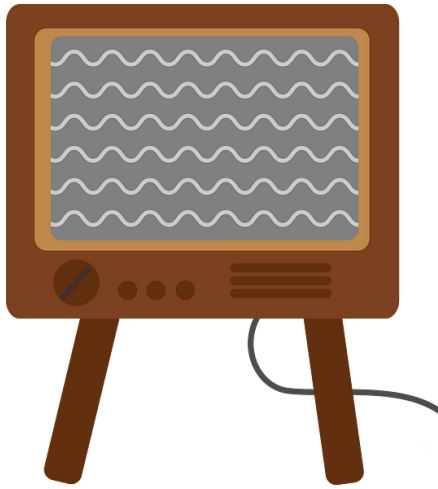
We can learn from other sectors…

Telecoms

- Much of the infrastructure for fixed line telecommunications was build by the early 1990s and was inherently analogue. Digitalisation offered greater efficiency and the ability to enhance services

Challenges

- Initially, support systems and culture did not keep up with network developments.
  - Digital islands created inefficiency in the sector
  - Large scale **digital transformation programmes** were initiated to address inequalities a number of which are still being implemented today
- Competing standards slowed innovation and increased costs
  - Industry collaboration resulted in global standards and widespread interoperability



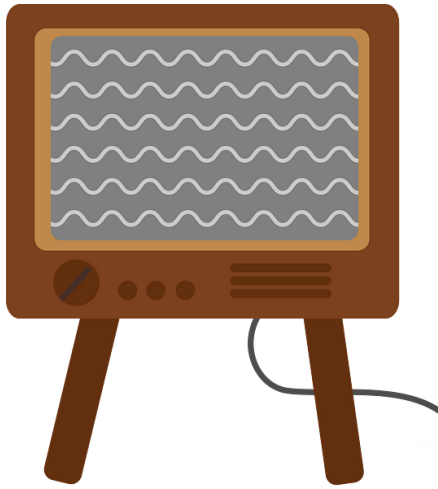
We can learn from other sectors…

Telecoms

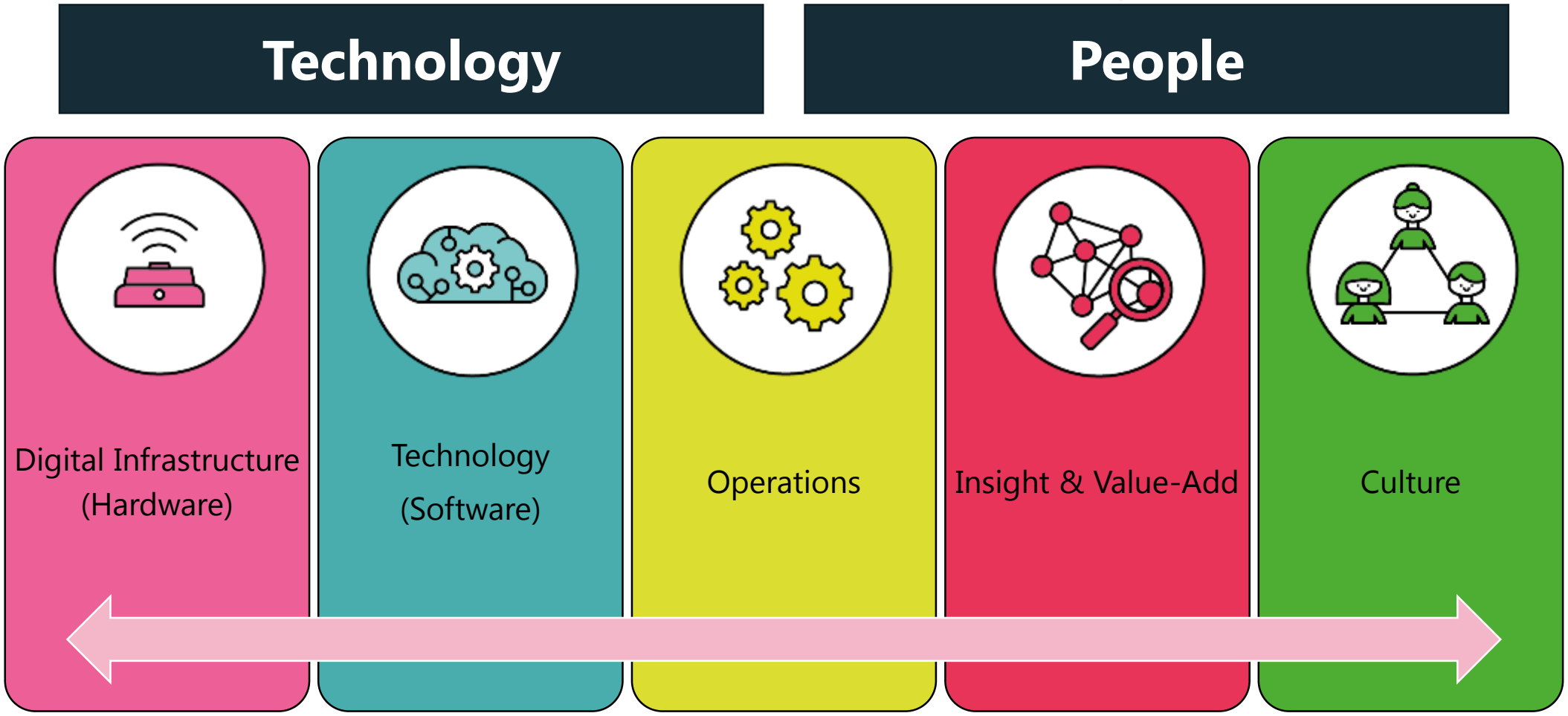
- Much of the infrastructure for fixed line telecommunications was build by the early 1990s and was inherently analogue. Digitalisation offered greater efficiency and the ability to enhance services

Benefits

- Digitalisation revolutionised operations
  - Remote monitoring and control enabled greater levels of **automation and efficiency**
  - Data informs **risk based maintenance and rapid fault identification & diagnosis**
- Innovative new products and services were delivered
  - **Consumer centric, converged services** improved customer experience



Digital Energy Fitness



Thank You

Dr Richard Dobson

Richard.Dobson@es.catapult.org.uk

Discussion:

How can markets, technology and digitalisation help meet the new challenges of a decarbonised energy system?

What are your thoughts? What are the gaps we've missed? What else should be considered?

Next steps

- Workstreams on markets, technology and data and digitalisation launched NOW!
- Working groups will meet over course of November.
- Online presentation of results at the end of November (details tbc but dates will be 25th – 27th November)
- If you'd like to be involved, please email the address below, stating the workstream you'd like to work on with us: FESbtg@nationalgrideso.com

For any other questions or comments, please email:
FESbtg@nationalgrid.eso.com

Thank you for your time and contributions today