Logging into OMBEA

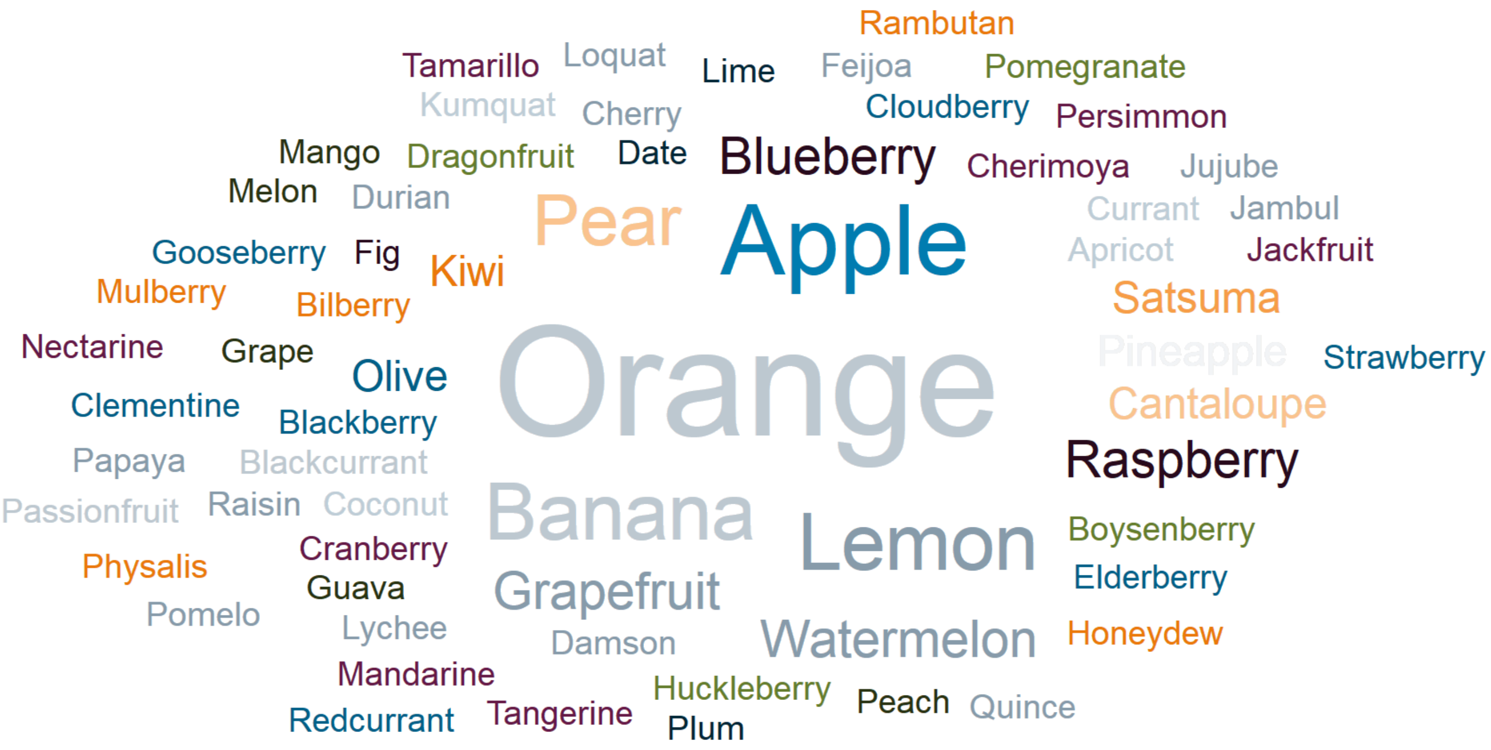
1. Go to http://ra.ombea/com

2. Enter room code

Jim Cardwell
Northern Powergrid

Identifying the value for customers both now and in the future

Where are the near-term opportunities for storage to improve system resilience? (please answer in 10 words or less)



How may storage be used to maximise sustainability in the energy system? (please answer in 10 words or less)

Rambutan
Tamarillo Loquat Lime Feijoa Pomegranate
Kumquat Cherry Cloudberry Persimmon
Mango Dragonfruit Date Blueberry Cherimoya Jujube
Melon Durian Pear Apple Currant Jambul
Gooseberry Fig Kiwi Apricot Jackfruit
Mulberry Bilberry Satsuma
Nectarine Grape Olive Orange Pineapple Strawberry
Clementine Blackberry Cantaloupe
Papaya Blackcurrant Raspberry
Passionfruit Raisin Coconut Banana Lemon Boysenberry
Physalis Cranberry
Guava Grapefruit Elderberry
Pomelo Lychee Damson Watermelon Honeydew
Mandarine Huckleberry Peach Quince
Redcurrant Tangerine Plum

The Knowledge Transfer Network

Driving Growth

Chris Bagley,

Head of Infrastructure

Cross-sectoral opportunities for batteries

4th September 2019, Newcastle

UK Government Landscape

Department for Business, Energy & Industrial Strategy

UK Research and Innovation

National funding agency investing in science and research in the UK

Combined budget of more than £6 billion, UKRI brings together the 7 Research Councils, Innovate UK and Research England

- HIGHER EDUCATION FUNDING COUNCIL hefce FOR ENGLAND
- Research England
- RESEARCH COUNCILS UK
  - Science & Technology Facilities Council
  - EPSRC Engineering and Physical Sciences Research Council
  - Arts & Humanities Research Council
  - BBSRC bioscience for the future
  - E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL
  - NERC SCIENCE OF THE ENVIRONMENT
  - MRC Medical Research Council
- Innovate UK
  - enterprise europe network — Business Support on Your Doorstep
  - Innovate UK Knowledge Transfer Network
  - CATAPULT

How it works

- Identifying needs and capabilities
- Expert advice & insights
- Events & Introductions
- Consortium building / Find partners
- Competition information / Reviewing proposals

INDUSTRIAL STRATEGY

The Faraday Battery Challenge

Part of the Industrial Strategy Challenge Fund

UK Research and Innovation

UK Research and Innovation

INDUSTRIAL STRATEGY

ISCF Faraday Battery Challenge

£274 million (2017-2021)

Advisory Group, Programme Board

Challenge Director

Research: £78m & Innovate: £88m & Scale: £108m

Research: £78m

- 'Application-inspired' research programme coordinated at national scale
- Creation of the **Faraday Institution** –responsible for coordination of research and training programmes
- Four initial projects announced Jan 2018 (£42m) – Battery Degradation, Multi-scale Modelling, Recycling, Solid State Batteries
- Five further projects (£55m total) announced Sep 2019 for: Next generation Li-ion cathodes; Electrode manufacturing; Next generation Na-ion batteries; Beyond Li-i

THE FARADAY INSTITUTION

Innovate: £88m

- Innovation programme to support business-led collaborative R&D with co-investment from industry
- Address technical challenges and build UK supply chain
- £38 million committed in **Round 1** (2017) to Collaborative R&D and Feasibility Study projects– projects addressing range of areas from cell materials to pack integration and BMS to recycling
- £22 million **Round 2** to 12 CR&D and Feasibility Study projects announced in June 2018
- **Round 3** announced June 2019 with £23 million awarded to 25 CR&D and Feasibility Study projects.

Scale: £108m

- Scale up programme to allow companies of all sizes to rapidly move new battery technologies to market
- Develop manufacturing tools and methods for mass production
- Demonstrate production-rate reliability and quality
- **CWLEP & WMG** building open-access scale up facility: **UK Battery Industrialisation Centre**
- Construction of the building well underway. Open March 2020.

UK BATTERY INDUSTRIALISATION CENTRE

The technical gaps

Cost

NOW: $130/kWh (cell)
$280/kWh (pack)
2035: $50/kWh (cell)
$100/kWh (pack)

Energy Density

NOW: 700Wh/l,
250Wh/kg(cell)
2035: 1400Wh/l,
500Wh/kg(cell)

Power Density/ Fast Charging

NOW:
3 kW/kg (pack)
2035:
12 kW/kg (pack)

Safety

2035:
Eliminate thermal runaway at pack level to reduce pack complexity

1st Life

NOW: 8 years (pack)
2035: 15 years (pack)

Temperature

NOW: -20˚ to +60˚C (cell)
2035: -40˚ to +80˚C (cell)

Predictability

2035:
Full predictive models for performance and ageing of battery

Recyclability

NOW:
10-50% (pack)
2035:
95% (pack)

Creating a cross sector battery supply chain

Aerospace

Key challenges:
Safety | Power

Grid

Key challenges:
Cost / Life

Construction

Key challenges:
Power density

Rail

Key challenges:
Life / Predictability

Marine

Key challenges:
Life / Volume

Cross-sector Battery Systems (CSBS) Group

The **CSBS** brings together a cross section of technology developers

Convened by the Knowledge Transfer Network (KTN) to explore new links and opportunities in order to promote innovation and collaboration

Still growing …

Mission and goals

- Foster & develop the UK supply chain for battery systems
- Identify cross-sector common user needs for battery systems
- Influence battery research to meet the needs of non-automotive applications
- Make it easier for UK battery systems users to find UK supply chain partners
- Enable better battery community networking in the UK
- Share knowledge and act as a hub for dissemination of group member activities
- Provide alternative markets for the UK battery systems sector

Some of the supply chain challenges across sectors as identified by CSBS

Fragmentation across the wide range of sectors:

- Scale of battery systems (few hundred Wh to hundreds of kWh)
- Volume & timing unclear
- Technical requirements different (& unclear)
- Market pull (/legislative push) inconsistent & difficult to gather

Which of these applications are best suited for batteries in the short term?

A) Rail

B) Marine

C) Aerospace

D) Defence

E) Buses

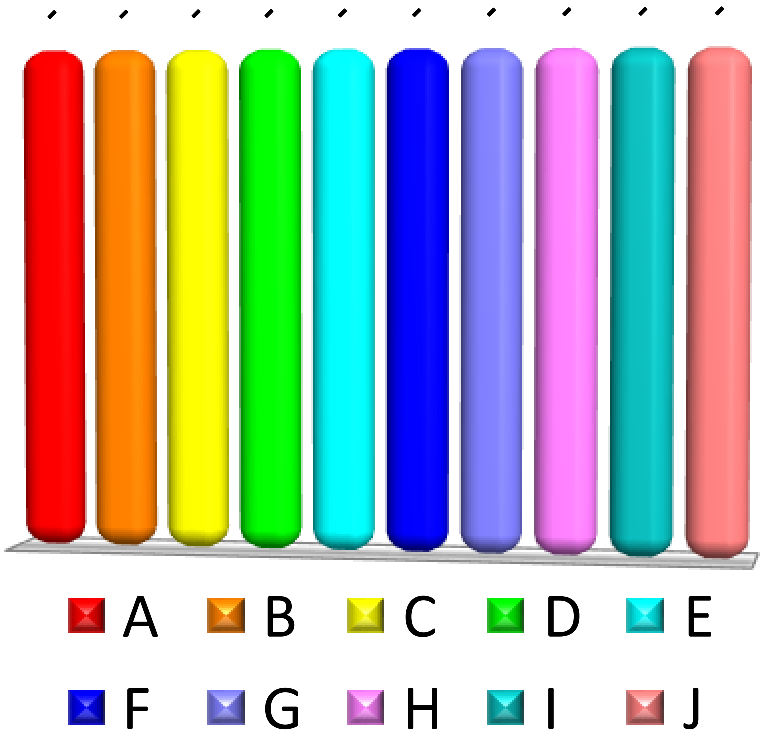
F) Trucks

G) Off-highway

H) Stationary

I) Medical

J) Industrial



Innovate UK
Knowledge Transfer Network
www.ktn-uk.org @KTNUK

Are there any missing?

(please answer in 10 words or less)

Pomegranate
Quince
Plum
Jackfruit
Gooseberry
Peach
Honeydew
Strawberry
Mango
Satsuma
Lime
Guava
Papaya
Jambul
Lemon
Raisin
Apple
Pomelo
Grapefruit
Cranberry
Redcurrant
Cherimoya
Fig
Rambutan
Apricot
Cloudberry
Physalis
Watermelon
Olive
Grape
Mandarine
Orange
Tamarillo
Blackberry
Kiwi
Cantaloupe
Persimmon
Nectarine
Pineapple
Raspberry
Mulberry
Melon
Boysenberry
Banana
Blueberry
Cherry
Jujube
Currant
Kumquat
Coconut
Bilberry
Pear
Blackcurrant
Huckleberry
Durian
Damson
Date
Feijoa
Passionfruit
Dragonfruit
Loquat
Lychee
Tangerine
Clementine
Elderberry

How can the CSBS group help?

eg. Networking events, online hub etc (please answer in 10 words or less)

Pomegranate
Quince
Plum
Jackfruit
Gooseberry
Peach
Honeydew
Strawberry
Mango
Satsuma
Lime
Guava
Papaya
Jambul
Lemon
Raisin
Apple
Redcurrant
Grapefruit
Cranberry
Pomelo
Cherimoya
Fig
Cloudberry
Physalis
Rambutan
Apricot
Watermelon
Olive
Grape
Mandarine
Tamarillo
Orange
Cantaloupe
Blackberry
Kiwi
Persimmon
Nectarine
Pineapple
Raspberry
Mulberry
Melon
Boysenberry
Banana
Blueberry
Cherry
Currant
Jujube
Blackcurrant
Kumquat
Coconut
Bilberry
Pear
Huckleberry
Damson
Date
Feijoa
Durian
Loquat
Passionfruit
Dragonfruit
Lychee
Tangerine
Elderberry
Clementine

Within the R&D community, do you think there is enough emphasis is placed on embedded energy cost and environmental impact? How is this/or could this be fed back from the consumer?

Pomegranate
Quince
Plum
Jackfruit
Gooseberry
Peach
Honeydew
Strawberry
Mango
Satsuma
Lime
Guava
Papaya
Jambul
Lemon
Apple
Raisin
Redcurrant
Pomelo
Grapefruit
Cranberry
Cherimoya
Fig
Cloudberry
Physalis
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Coconut
Bilberry
Pear
Blackcurrant
Huckleberry
Durian
Damson
Date
Feijoa
Passionfruit
Dragonfruit
Loquat
Lychee
Tangerine
Clementine
Elderberry

Is there an established route to develop personal IP that is readily accessible to industry and how aware are postgrads and postdocs of this? What would you like to see happen to facilitate IP development?

Pomegranate
Quince
Plum
Jackfruit
Gooseberry
Peach
Honeydew
Strawberry
Mango
Satsuma
Lime
Guava
Papaya
Jambul
Lemon
Raisin
Apple
Redcurrant
Grapefruit
Cranberry
Pomelo
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Coconut
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Pear
Blackcurrant
Huckleberry
Durian
Damson
Date
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Passionfruit
Dragonfruit
Loquat
Lychee
Tangerine
Clementine
Elderberry

innovatium

Inventors of carbon reducing technologies

TECHNOLOGY

PROCESS INTEGRATED ENERGY

STORAGE

ENERGY RECOVERY

Innovatium is a UK start-up that develops advanced technologies for evolving energy systems.

Energy is a precious commodity

New technology can overcome the barriers to an evolving energy system:

Consumer behaviour will determine the success of technology uptake

Recent History

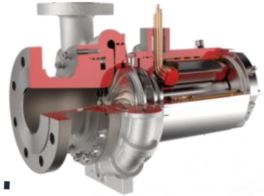
- Formed in July 2017, registered office in Windsor.
- Awarded LAES DSR Energy Storage Feasibility – Sep ‘17
- Opened office in Glasgow – Dec ‘17
- Presented at Integrated Energy Storage at The Shard – Dec ‘17
- Presented at the 1st UK-China Energy Storage Symposium in Beijing – Jan ’18
- Awarded Carbon Trust Industrial Energy Efficiency Competition – Jul’ 18
- Awarded BEIS UK-SK Smart Energy Funding – Sep’ 18
- Opened Maidenhead Project Office – Oct ’18
- Began Build of PRISMA LAES system – Apr’ 19

innovatium

Some Partners

Technology Providers	Subject Matter Experts	Engineering Contractors	Site User	Aggregator
University of Birmingham	wessington cryogenics	Doosan Babcock	Aggregate Industries	open energi – smart revenue generation
innovatium	TCL – Thames Cryogenics Ltd. – Total Cryogenic Solutions	mattei – Best Solutions in Compressed Air		Flexitricity
	C2 Technology			

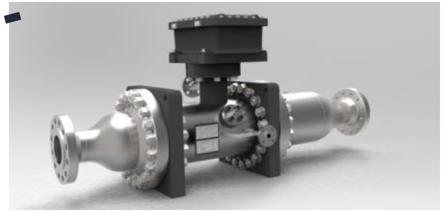
Design & Build Experience



50kw modular

~1mmscfd

Pr = 2:1 per stage



275kw modular

~13mmscfd

Pr = 2:1

innovatium

Peak **R**eduction **I**ntegrating the **S**torage and **M**anagement of **A**ir

PRISMA

Demand **R**esponse using **O**ff **P**eak **P**ower for **L**iquid **A**ir **E**nergy **T**echnology

Droplet

the 4th Utility

Compressed Air in industry is considered the “4th Utility” after electricity, gas & water

13% of ***ALL*** industrial electricity is used to make compressed air:

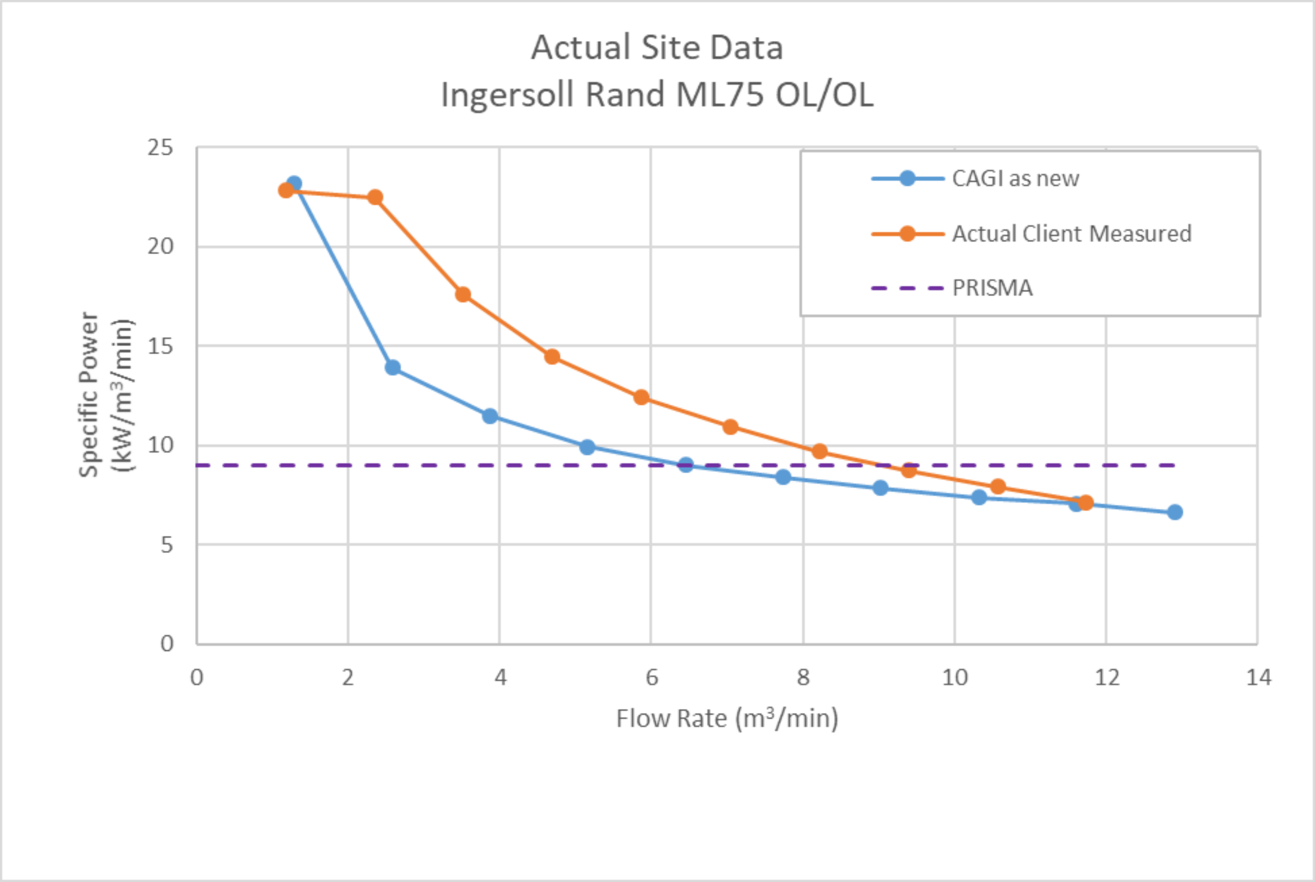
11,500 GWhr

equal to the all the energy generated by a nuclear power station each year

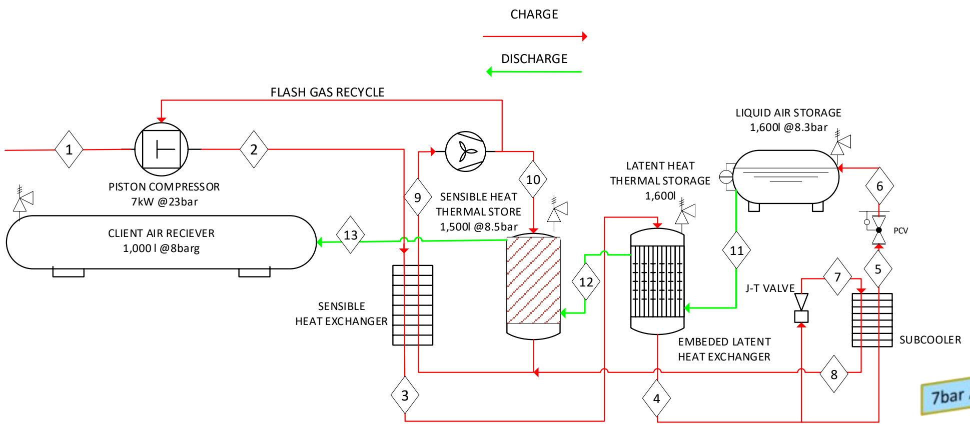
up to 60% savings

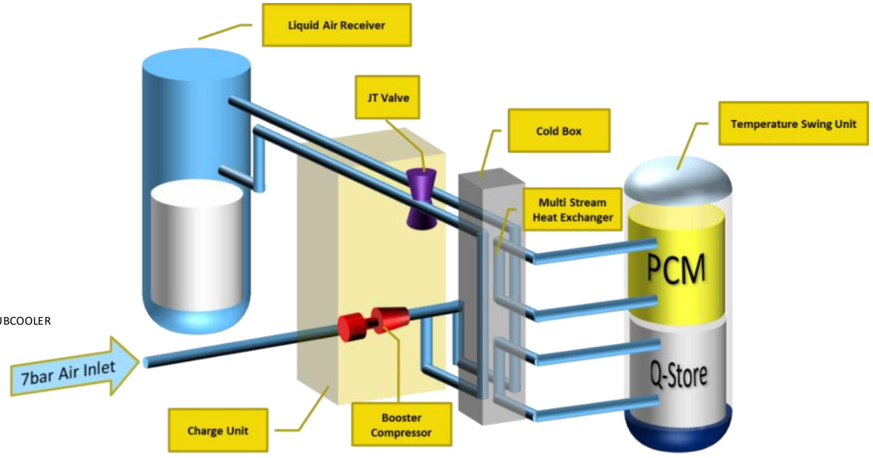
PRISMA improvements to a compressed air system can make a significant impact to energy and cost savings

Industrial Compressed Air



PRISMA General Arrangement





The PRISMA system is composed of 4 closely connected modules. Typical module dimensions are:

- Charge Air Module - L1500mm x W1200mm x H1500mm, mass ~ 1000kg
- Integrated Liquid Air, Latent & Sensible Stores - D1250mm x H3000mm, mass (filled) ~ 3000kg

PRISMA Advantage & Benefits

- Removes part load operation
  - Energy efficiency gains of up to 60%, reducing energy bills

- Corresponding reduction in carbon footprint

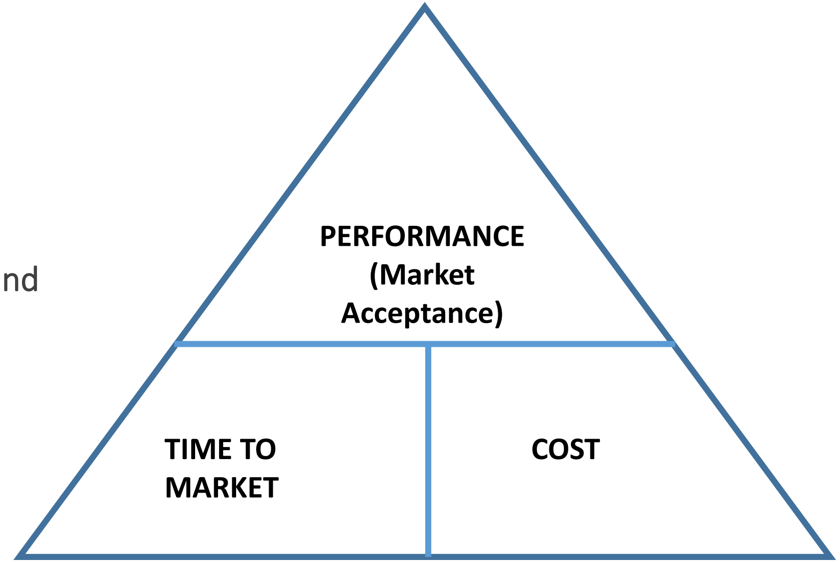
- Stores / discharges on-demand
  – Avoids 3hr daily peak ‘red-rate’ using off-peak energy

- Has at least 1.5 hours of air storage
  – Gives security of air supply and operational continuity

The Innovatium Way

Is your Project In Sync with Market Acceptance?

- Remove complexity – reduce capital cost
- Reduce losses – reduced operational cost
- Using existing technologies – reduces time to market and cost
- Robust client business case – acceptable performance
- Build a network of delivery partners – reduces cost



innovatium

Thank you

simon.branch@innovatium.co.uk

07593 302 667

SIEMENS
Ingenuity for life

Energy Storage Demonstrators: “learning by doing”

September 2019
Ian Wilkinson

Green Ammonia Energy Storage Demonstrator at the Rutherford Appleton Laboratory, UK

Siemens / GeoPura EV charging system at the Goodwood Festival of Speed 2019

SIEMENS
Ingenuity for life

Energy Storage Demonstrators: Learning by Doing

What is the role of storage in whole energy systems?

Rambutan
Tamarillo Loquat Lime Feijoa Pomegranate
Kumquat Cherry Cloudberry Persimmon
Mango Dragonfruit Date Blueberry Cherimoya Jujube
Melon Durian Currant Jambul
Pear Apple
Gooseberry Fig Kiwi Apricot Jackfruit
Mulberry Bilberry Satsuma
Nectarine Grape Pineapple Strawberry
Olive Orange
Clementine Blackberry Cantaloupe
Papaya Blackcurrant Raspberry
Passionfruit Raisin Coconut Banana
Lemon Boysenberry
Physalis Cranberry
Guava Grapefruit Elderberry
Pomelo
Lychee Damson Watermelon Honeydew
Mandarine
Huckleberry Peach Quince
Redcurrant Tangerine Plum

The UK's heat and transportation sectors remain dominated by fossil energy (storage)

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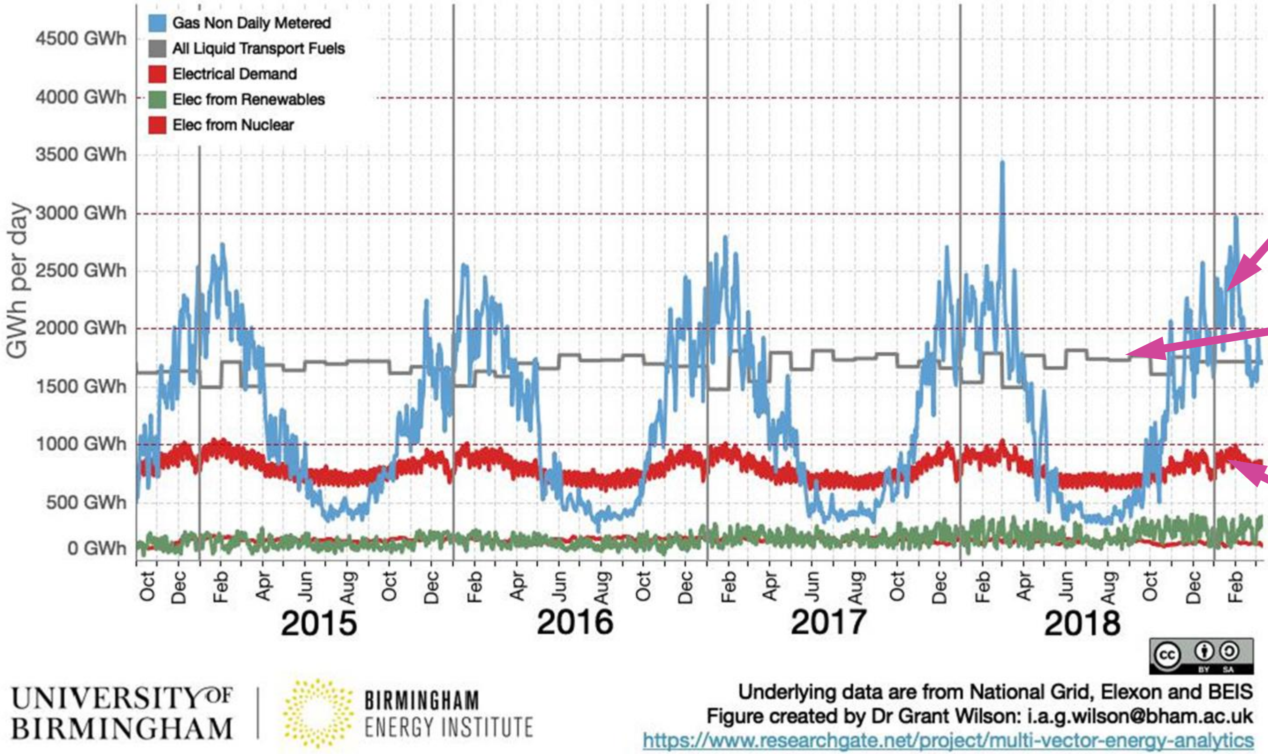

Natural gas (non daily-metered): useful proxy for space and water heating (blue line)

Liquid transport fuels, comprising aviation, diesel and gasoline (grey line)

Electricity generation (red line)

Source: "Multi-vector energy diagram Great Britain - daily resolution", analysis by Dr. Grant Wilson, reproduced with permission.

Rapid variations in hourly (power) demand make decarbonising heat particularly challenging

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Ingenuity for life

Figure 2

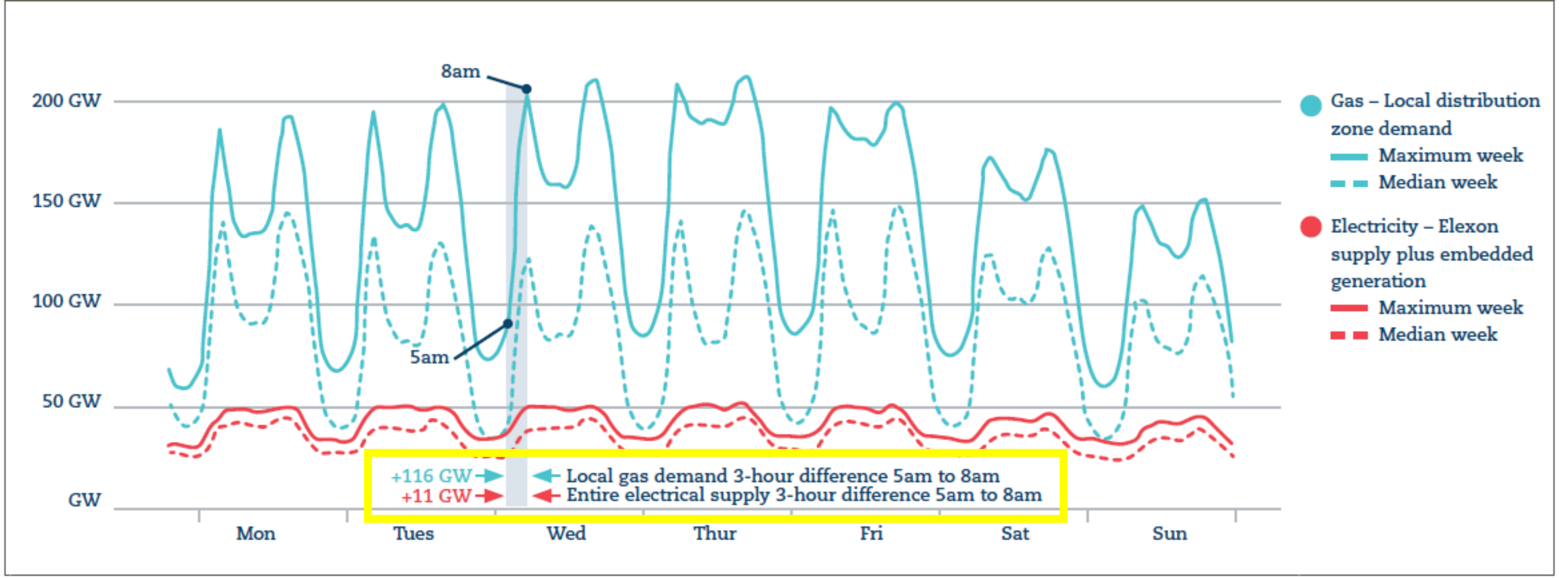
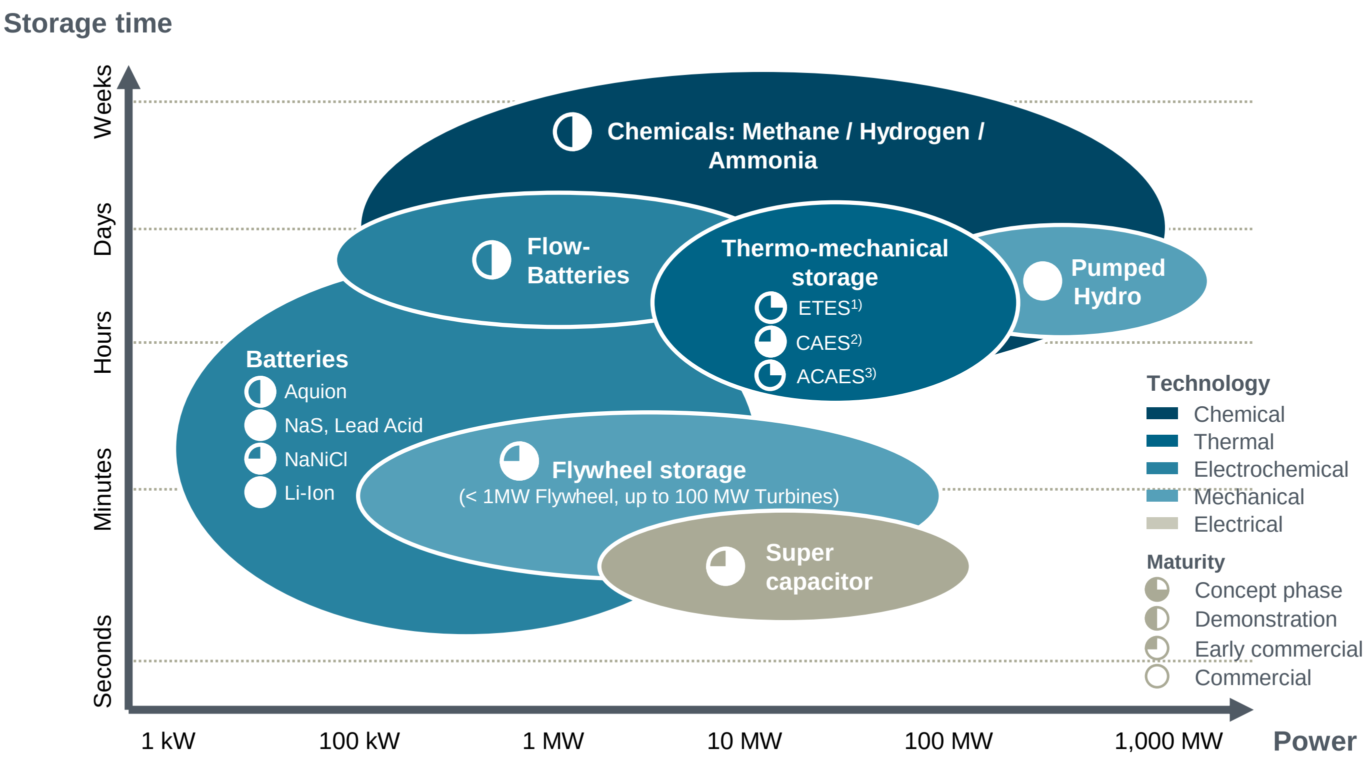


Figure 2: Britain's local gas demand and electrical system supply - median and maximum demand weeks. The week dating 22nd to 28th January is the median demand week for the 2017–2018 heating season. The week dating 26th February to 5th March represents the maximum demand week of the 2017–2018 heating season.

Source: "Challenges for the decarbonisation of heat: local gas demand vs electricity supply Winter 2017/2018", UKERC Briefing by Dr Grant Wilson, Dr Ramsay Taylor and Dr Paul Rowley; see http://www.ukerc.ac.uk/publications/local-gas-demand-vs-electricity-supply.html

A range of storage technologies are required to meet our (decarbonised) energy system needs



[1] Electro-Thermal Energy Storage [2] Compressed Air Energy Storage [3] Adiabatic Compressed Air Energy Storage

Discussion point

“It is difficult to conceive of a feasible whole-energy system that doesn’t involve chemical energy vectors – and this is true also of low (net zero!) carbon systems.”

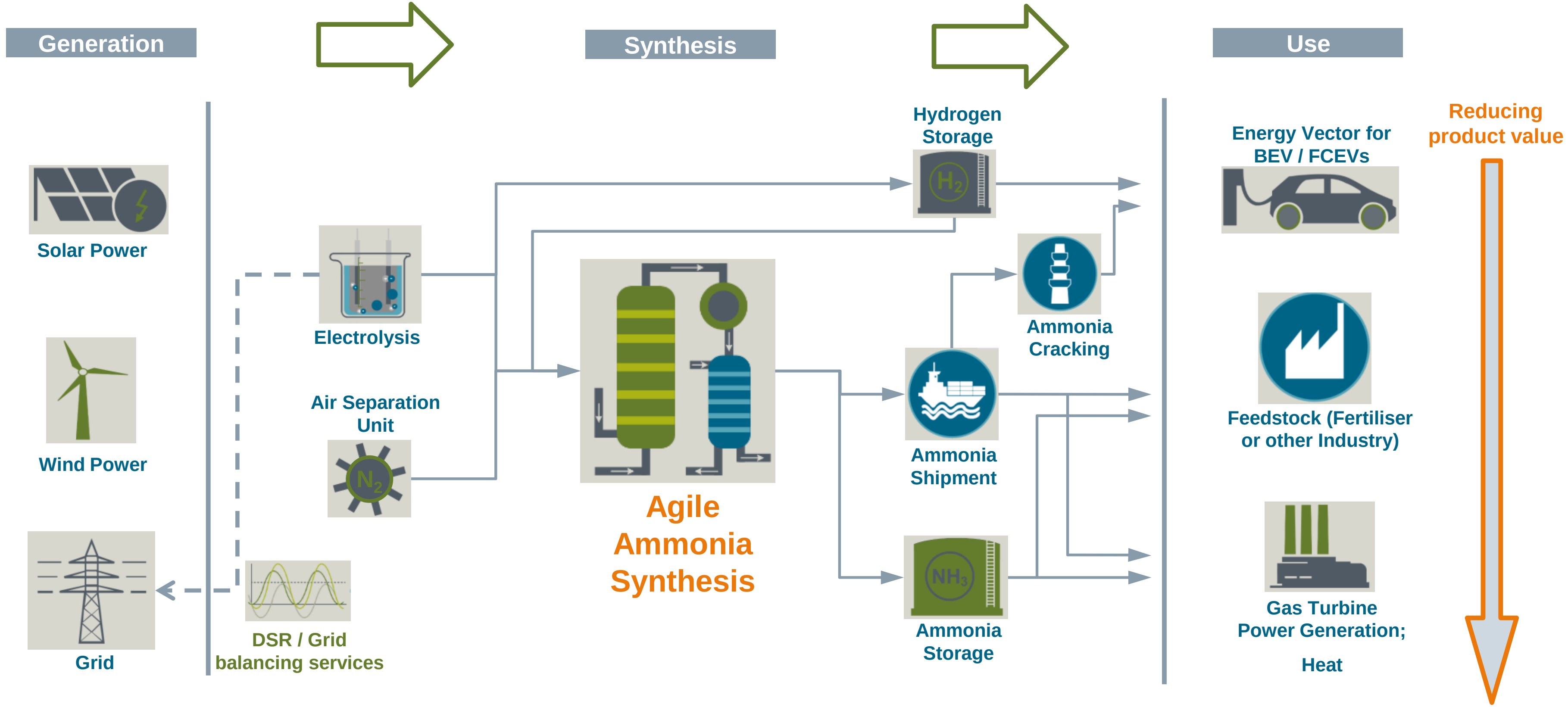
Energy Storage Demonstrators: Learning by Doing

Are there existing opportunities that haven’t been adequately explored?

Rambutan
Tamarillo Loquat Lime Feijoa Pomegranate
Kumquat Cherry Cloudberry Persimmon
Mango Dragonfruit Date Blueberry Cherimoya Jujube
Melon Durian Currant Jambul
Pear Apple
Gooseberry Fig Kiwi Apricot Jackfruit
Mulberry Bilberry Satsuma
Nectarine Grape Pineapple Strawberry
Olive Orange
Clementine Blackberry Cantaloupe
Papaya Blackcurrant Raspberry
Passionfruit Raisin Coconut Banana Lemon
Boysenberry
Physalis Cranberry
Guava Grapefruit Elderberry
Pomelo Lychee
Damson Watermelon Honeydew
Mandarine
Huckleberry Peach Quince
Redcurrant Tangerine Plum

Several potential markets exist for Green Ammonia: it is a carbon-free flexible asset

SIEMENS
Ingenuity for life



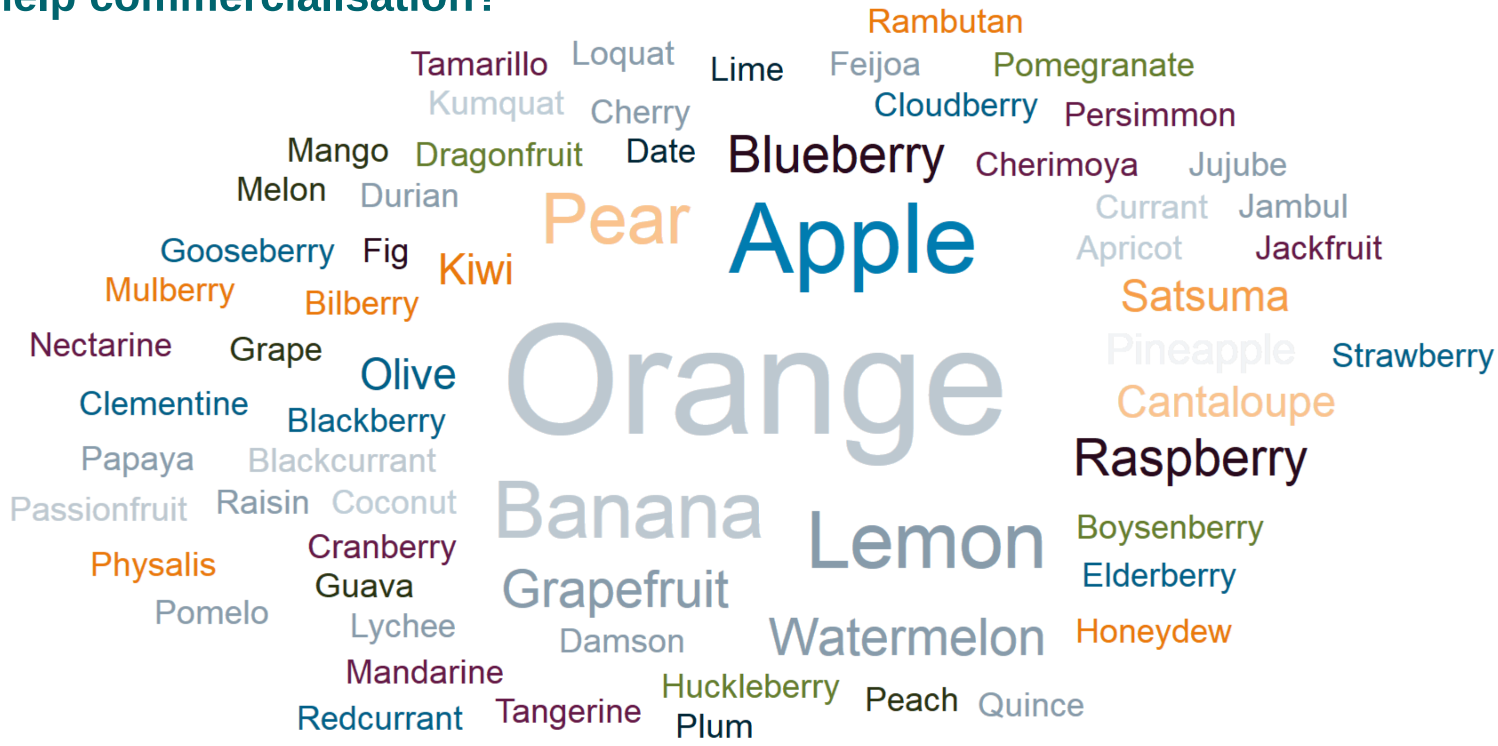
Making hydrogen power real in a very public way

Discussion point

“Achieving our emissions-reduction targets – in time – requires ***innovation*** *in energy storage (not necessarily invention), i.e. repurposing mature technologies to rapidly achieve the required scale of deployment.”*

Energy Storage Demonstrators: Learning by Doing

What aspects of storage technologies should R&D be targeting to help commercialisation?



Arguably, R&D should focus on sectors other than power, and on technologies that can rapidly be deployed at scale

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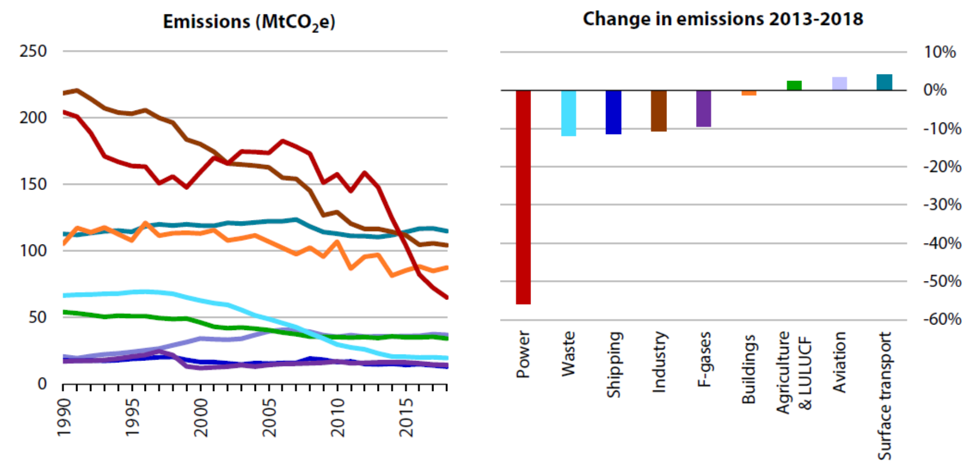
Figure 1.5. Trends in UK sectoral GHG emissions



Source: BEIS (2019) *2018 UK Greenhouse Gas Emissions, Provisional Figures*; BEIS (2019) *2017 UK Greenhouse Gas Emissions, Final Figures*; CCC calculations.
Notes: The chart on the right-hand side shows changes in sectoral emissions between 2013 and 2018 for all sectors except for Agriculture, LULUCF, Waste and F-Gases which cover the period 2013-2017; buildings emissions in this chart are temperature-adjusted.

Source: “Reducing UK emissions, 2019 Progress Report to Parliament”, UK Committee on Climate Change, July 2019

Demonstration systems can help speed-up the process of awareness, development and deployment

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Ingenuity for life

- Constructed at the Rutherford Appleton Laboratory, near Oxford, UK.
- Project supported by **Innovate UK**.

- Objective: to evaluate an all-electric synthesis and energy storage demonstration system based on Green Ammonia.

SIEMENS

UNIVERSITY OF OXFORD

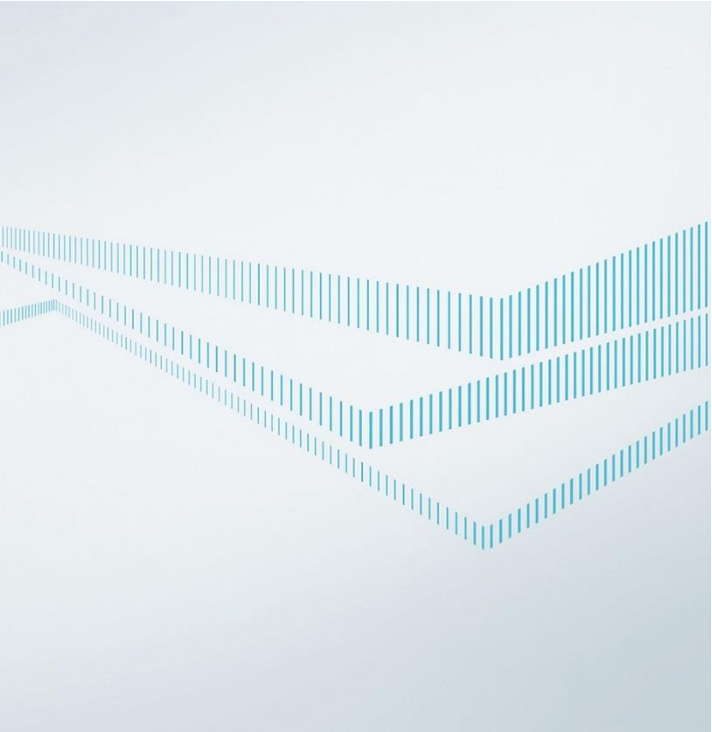
CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Science & Technology Facilities Council

Discussion point

"A bottom-up, "learning by doing" approach to decarbonisation, with a portfolio of system demonstrators, can speed-up the realisation of a feasible low-carbon whole energy system."

Thank you for your attention!



Dr. Ian Wilkinson
CT REE PXS

ian.wilkinson@siemens.com

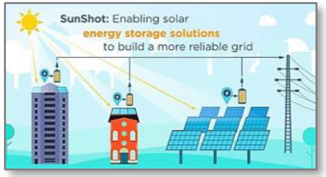
Energy Storage Demonstration and Commercialisation – A Doosan Babcock Perspective

4th August 2019
Douglas Spalding

Our Change to Low Carbon Energy Technologies

In a decade of energy transition Doosan is investing in low carbon technologies and solutions

1st battery energy storage system installed by Doosan GridTech at Snohomish PUD



Doosan storage and optimizer for Austin Energy SHINES project

Novel thermal storage with small scale CSP** – Demonstration technology assessment

2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019

Doosan develops bioenergy storage and conversion for fossil power

New VPP* and storage optimiser DG-DERO™ announced

Thermal energy storage for hybrid oil/solar concept in Saudi Arabia

Hydrogen offshore production and storage concept development

Doosan Babcock perspective of demonstration and commercialisation covers a range of technologies from new combustion systems to new energy systems and energy storage

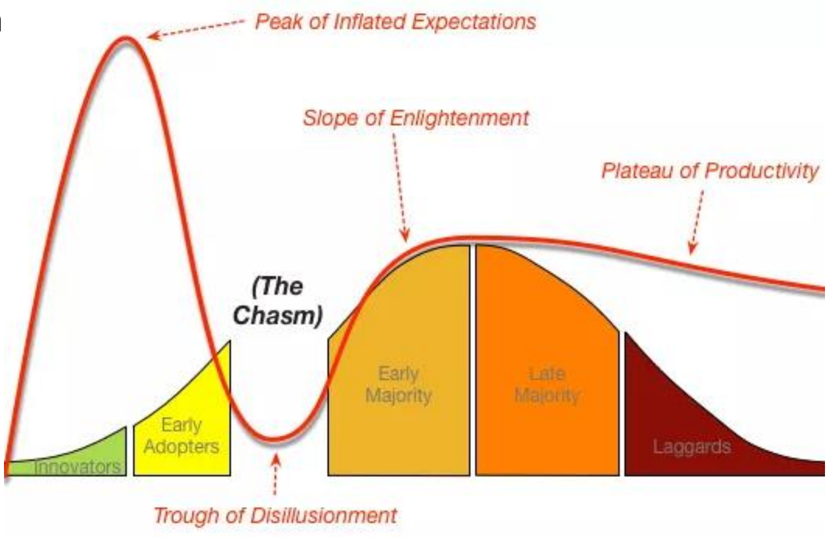
VPP - Virtual Power Plant*
*CSP ** - Concentrated Solar Power*

Technology Demonstration and Commercialisation – R&D Targeting?

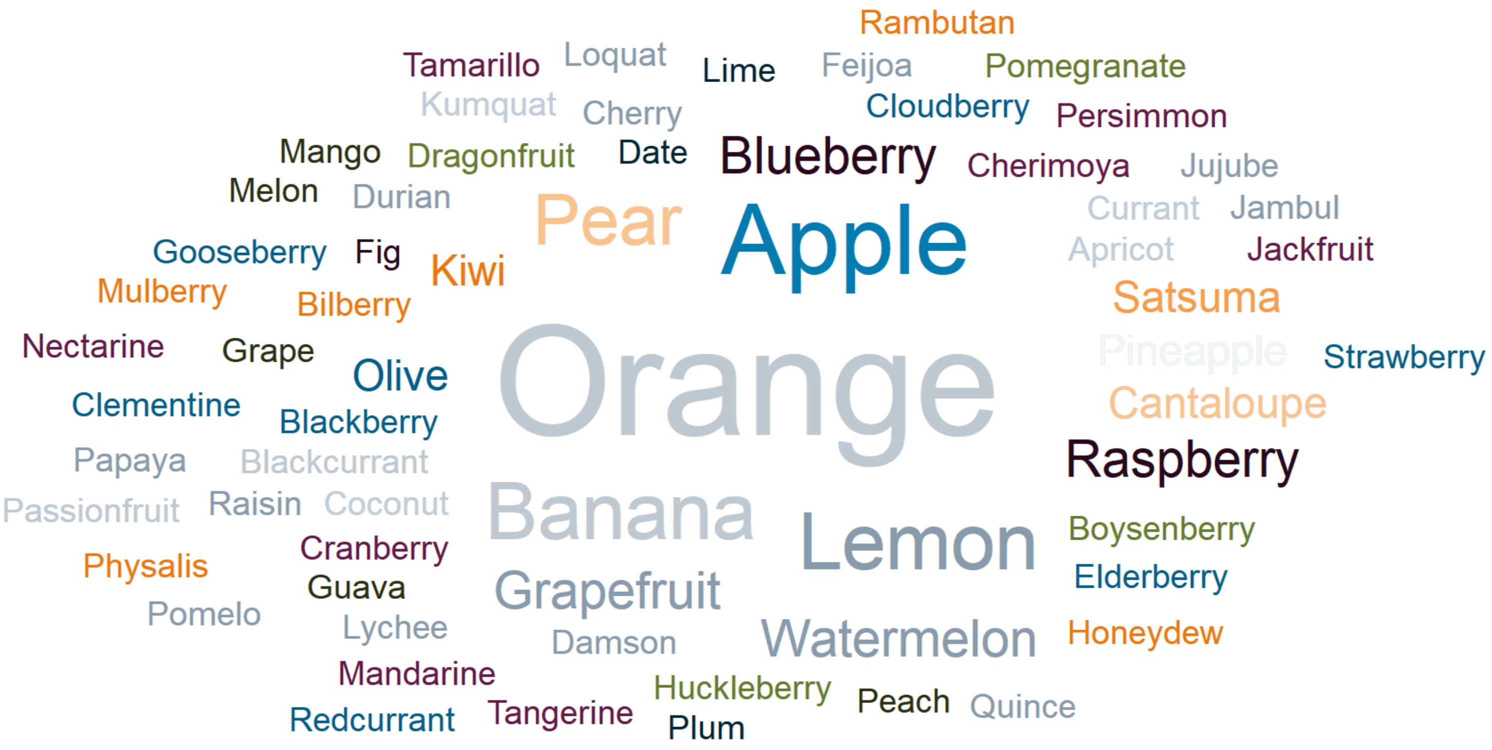
- Doosan Babcock's experience is that today's market applications need R&D targeting energy storage systems that,
  - Support system flexibility and can be delivered at larger scale (GWh) with fast response (<1ms) or smaller scale (sub MWh) but scalable/modular
  - Enhance whole energy system value (e.g. Power to X, with higher round trip efficiencies and energy densities)
  - Consider hybrid approaches that access more diverse revenue streams (e.g. large+small, different energy vectors - heat, power, hydrogen, oxygen)
  - That have digitalised solutions that can integrate and optimise system performance with storage across different energy vectors

Technology Demonstration and Commercialisation – Policy Barriers?

- Industrials can define market applications and undertake practical technology integration, but in today's disrupted energy markets finding viable storage solutions with academia can be problematic
- The challenge is wider than the policy barrier. Finding a commercialisation bridging strategy for the 'Chasm' is critical and involves,
  - Finding the right technology solution with academia (from scouting, identification to due diligence)
  - Identifying with academia the right technology requirements for the right application
  - Engaging an appropriate 'Chasm' institute (e.g. NCESI)
  - Accelerating academic and industrial engagement (e.g. KTPs, Open innovation challenges and 'Collabor-atories')
  - Defining policy requirements that make storage commercialisation and deployment viable



What types of new technologies (large, small, hybrid or digitalised) might deliver effective new systems with higher round trip efficiencies and greater viability?



How can academia help industry with ‘Chasm’ bridging strategies for more effective and viable storage solutions to overcome deployment barriers?

Rambutan
Tamarillo Loquat Lime Feijoa Pomegranate
Kumquat Cherry Cloudberry Persimmon
Mango Dragonfruit Date Blueberry Cherimoya Jujube
Melon Durian Pear Currant Jambul
Gooseberry Fig Kiwi Apple Apricot Jackfruit
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Nectarine Grape Olive Orange Pineapple Strawberry
Clementine Blackberry Cantaloupe
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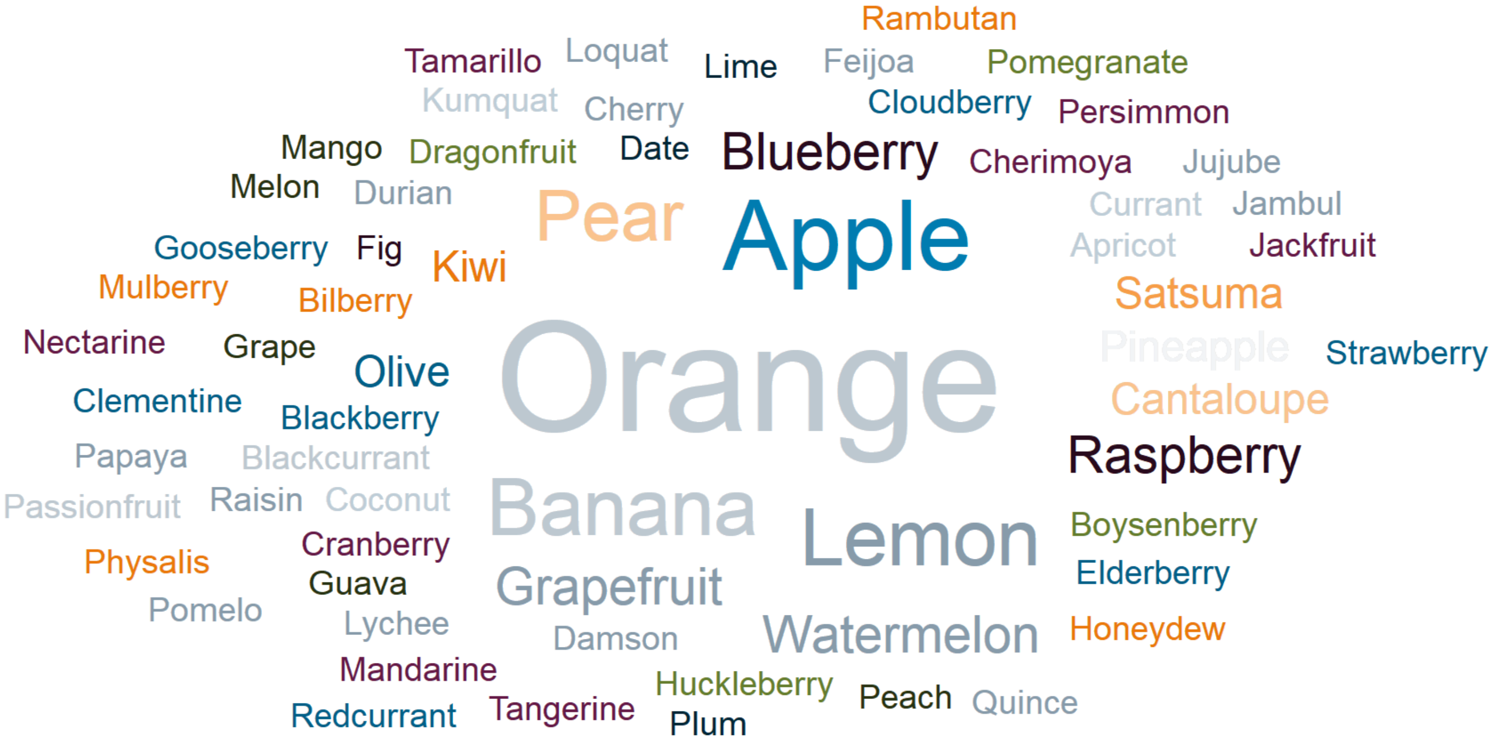
Physalis Cranberry Elderberry
Guava Grapefruit
Pomelo Lychee Damson Watermelon Honeydew
Mandarine
Redcurrant Tangerine Huckleberry Plum Peach Quince

How are open innovation, crowd-sourcing or hackathons applied?



Technology Demonstration and Commercialisation – Our Questions?

R&D Targeting -

- What types of new technologies (large, small, hybrid or digitalised) might deliver effective new systems with higher round trip efficiencies and greater viability?

Policy Barriers -

- How can academia help industry with ‘Chasm’ bridging strategies for more effective and viable storage solutions to overcome deployment barriers?
- How are open innovation, crowd-sourcing or hackathons applied?
- More specifically, what policy/regulatory solutions are needed to,
  - Reward strategic storage for enhanced renewable production/security of supply across deregulated and transparent energy markets? (e.g. power, heat and transport)
  - Drive viable commercial propositions and demand? (e.g. rewarding green hydrogen storage for heat)
  - Deliver a paradigm shift in storage deployment if there is additional cost to the end user? (e.g. Power to X with FCEV, V2G)

Thank you

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UKES2019

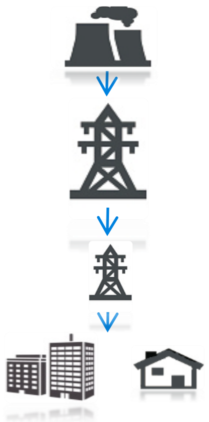
ENERGY STORAGE – UK GOVERNMENT POLICY

Nicky Herbert, Policy Advisor, Smart Energy Team
BEIS

September 2019

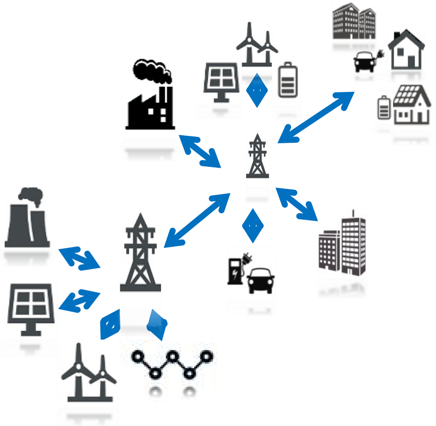
Our energy system is undergoing fundamental change (Digitalisation, Decarbonisation, Decentralisation)

Yesterday



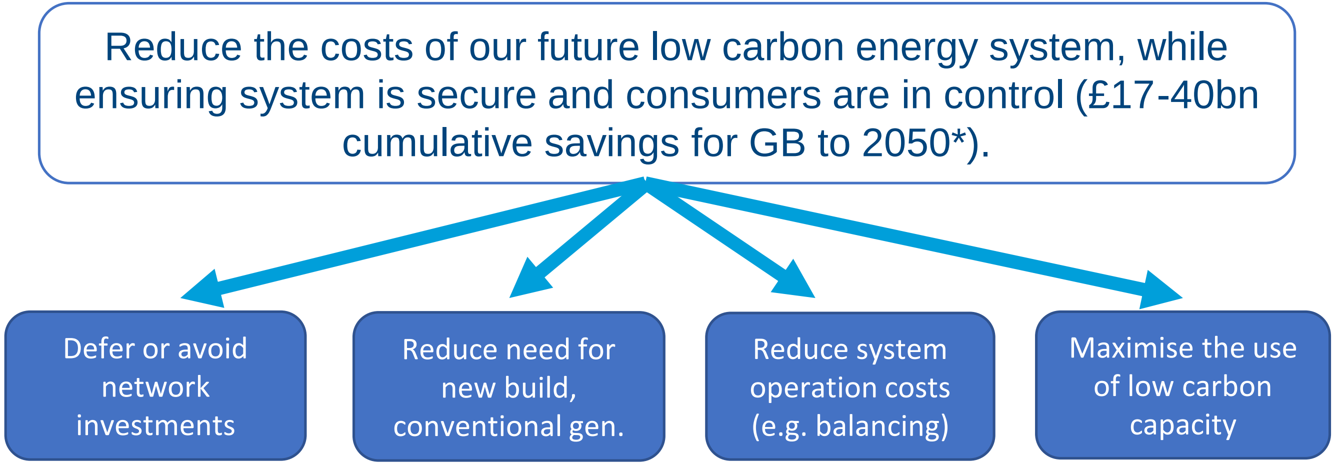
- Carbon intensive
- Centralised generation
- Predictable supplies

Emerging System – increased interactions



- Low carbon
- Interconnectors
- More distributed
- Storage
- Demand side response
- Electric vehicles/heat
- Big data & AI
- Smart grids

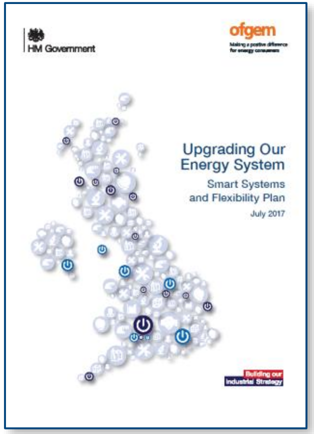
System Benefits

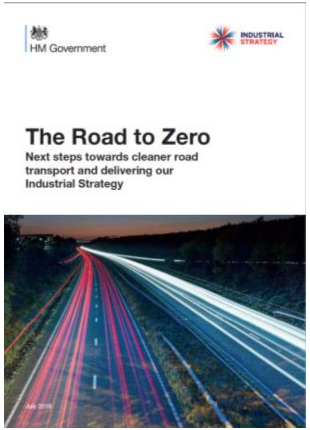


Source: DECC Least regret flexibility project (2016)

**Cost savings in DECC Least-regret flexibility project reflects the benefits of all flexibility options, i.e. not just storage and DSR but also interconnection and flexible CCGTs*

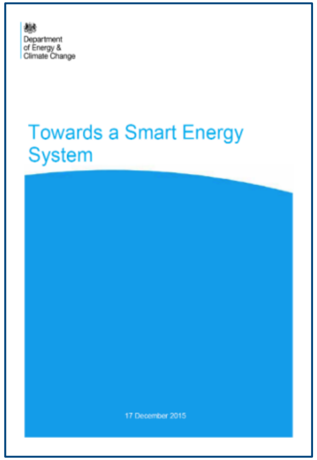
Policy Drivers

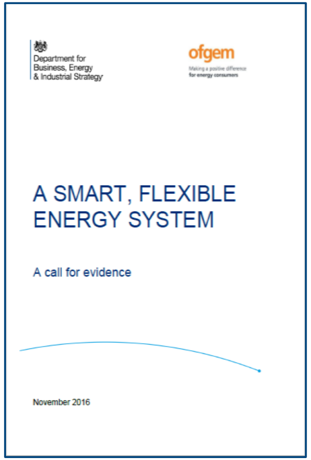


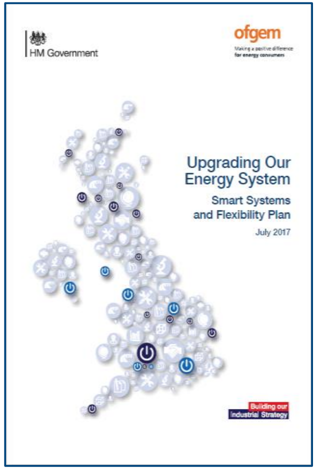


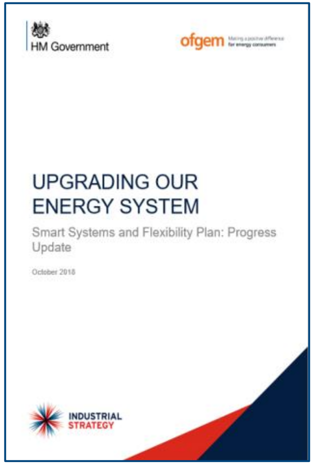
Smart Systems and Flexibility Plan

- 2015 - working towards a smart energy system
- 2016 - A smart, flexible energy system: Call for evidence
- 2017 – The Smart Systems and Flexibility Plan
- 2018 – The Smart Systems and Flexibility Plan: Progress Update









Smart Systems and Flexibility Plan: Key Facts

- Original plan published Jul 2017.
- Purpose was to enable the transition to a smarter/flexible system.
- 29 actions for Government, Ofgem and/or industry.
- Progress update published 16th October 2018, GGBW.
- Nine new actions for Government, Ofgem and industry.
- Implemented over half of the total 38 actions now.
- Remaining actions to be implemented by 2022.

Smart Systems and Flexibility Plan: Actions

Removing barriers to smart techs – inc. storage

Create a best in class regulatory framework for smart technologies, such as storage, by removing regulatory barriers to a level playing field.

Smart homes and businesses

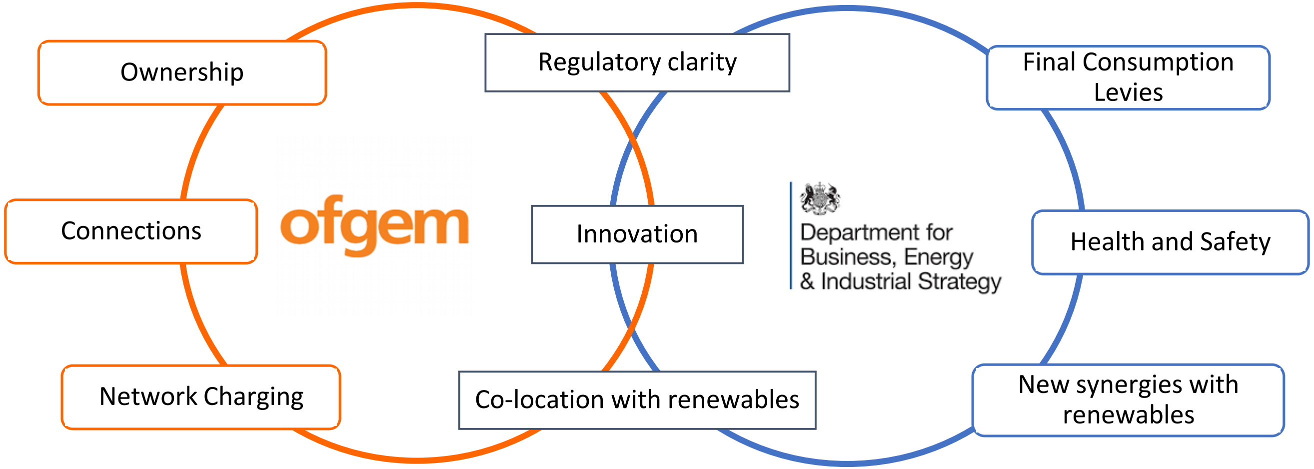
Enable consumer participation in demand side response and incentivise and reward specific energy use. Comprised of four buildings blocks: smart meters, half-hourly settlement, smart appliances, smart tariffs.

Markets that work for flexibility

Ensure that flexibility from storage and demand side response are fairly rewarded for the value they provide to the energy system. Primarily by reforming markets and enable revenue

Smart Systems and Flexibility Plan: Actions

Our aim is to **create a level playing field, so that energy storage can compete fairly** with other forms of flexibility and more traditional energy solutions



BEIS Energy Innovation Programme

- We use innovation support to help:
  - Drive down costs & optimise performance of low carbon technologies;
  - Bring new low carbon technologies to market or closer to commercialisation;
  - Support development of low carbon technology supply chains;
  - Support development of standards in low carbon technologies;
  - Leverage private sector R&D investment.

BEIS Smart Energy Innovation

Smart Energy Innovation Programme:
(up to £70m budget)
www.gov.uk/guidance/funding-for-innovative-smart-energy-systems

Energy Storage Competitions (up to £20m)
Focused on cost reduction of larger scale technologies

Demand Side Response & Reduction Competitions (up to £20m)
Engaging domestic & commercial consumers with innovative DSR and demand reduction applications

Vehicle-to-Grid Competition (up to £18m + £12m OLEV)
Innovative technology and business approaches to harness vehicle-to-grid

Flexibility Markets Competitions (up to £4.6m)
Innovative approaches to value and trade flexibility at local levels

Smart Meter Application Competitions (up to £8m)
Smart Meter Load Control and Smart Energy Savings Programmes

International Collaboration Competitions (up to £9m)
UK-South Korea - £3m (+£3m South Korea)
UK-Canada - £6m (+$10m Canada)

Storage at Scale Competition - Overview

- **£20m available** – supporting up to 3 large-scale, innovative demonstration projects of non-commercialised technologies at technology readiness levels of 6 or above.
- Projects could result in lower capital or operating costs to the traditional storage technologies, or improved capacity, sustainability and response rates at a comparable cost.
- Electricity energy storage projects with a minimum output power of 30 MW (or minimum capacity of 50 MWh) and power-to-x technologies with a target minimum input power of 5 MW.

Contacts:

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