

# ERA ENERGY RESEARCH ACCELERATOR

At the forefront of energy transformation



## ‘ERA – What is it?’

### Professor Martin Freer, ERA Director



Delivered by

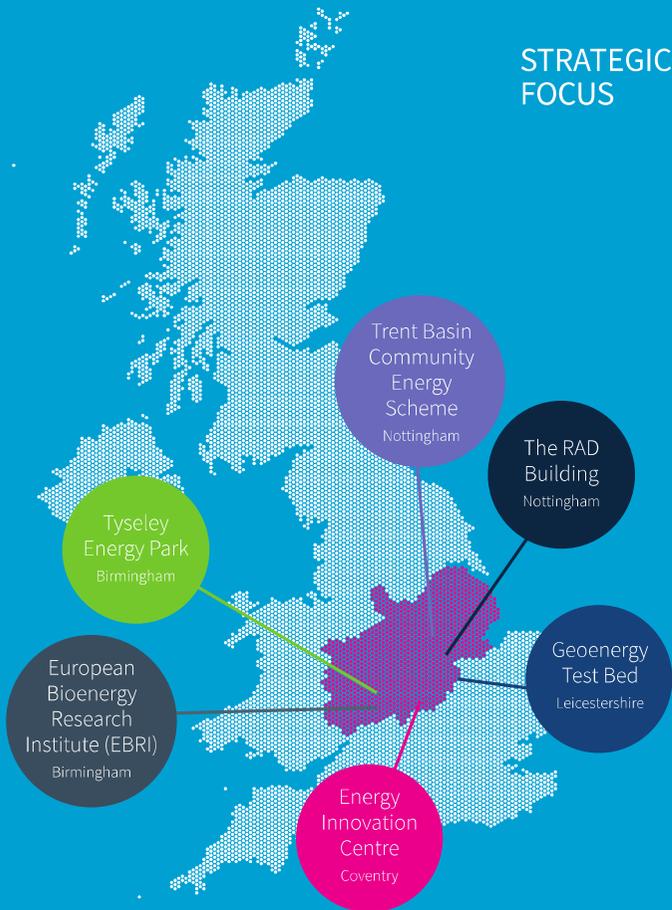


Funded by



# ERA facts and figures

<p><b>£120m</b></p> <p>CO-INVESTMENT COMMITTED From over <b>40 INDUSTRIAL PARTNERS</b></p>	<p><b>£60m</b></p> <p>Capital funding via INNOVATE UK</p>
<p><b>9</b></p> <p>Key Midlands partners</p>	<p>INVESTING IN OVER <b>30</b> new R&amp;D facilities</p>
<p>More than <b>400</b></p> <p>ACADEMICS</p>	<p>Over <b>1,000</b></p> <p>RESEARCHERS</p>



## STRATEGIC FOCUS

<p>Energy Transformation</p>	<p>End Use Energy Demand</p>
<p>Energy Storage</p>	<p>Energy Integration</p>

## SKILLS EXPERTISE

- **£2.5m** pump priming for an ERA Doctoral Training Partnership
- **3 cohorts** established
- **£2.5m** addressing future industry needs through **challenge-based PhD projects**
- Developing **future leaders** in low carbon energy

<p>With 25,000m<sup>2</sup> of space, the <b>RAD Building</b> is the UK's largest working laboratory built to Passivhaus standards</p>	<p>The <b>GeoEnergy Test Bed</b> has <b>11 boreholes</b>, each drilled to depths of up to 285m</p>	<p>The <b>TCR demonstrator at Tyseley Energy Park</b> is capable of processing 80 kg of waste per hour</p>	<p>More than <b>100 businesses</b> have taken part in EBRI's bioenergy masterclasses</p>	<p>Over <b>20 companies</b> work with the Energy Innovation Centre at any time</p>	<p>The <b>2.1 MWh Tesla battery</b> at Trent Basin is the largest community energy battery in Europe</p>
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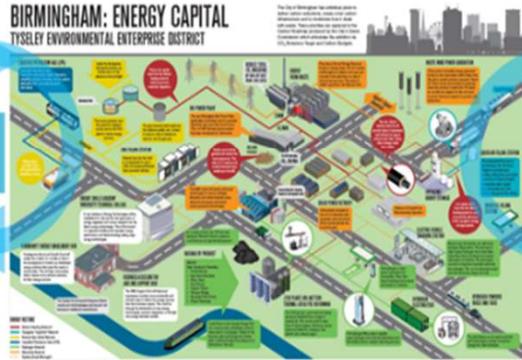
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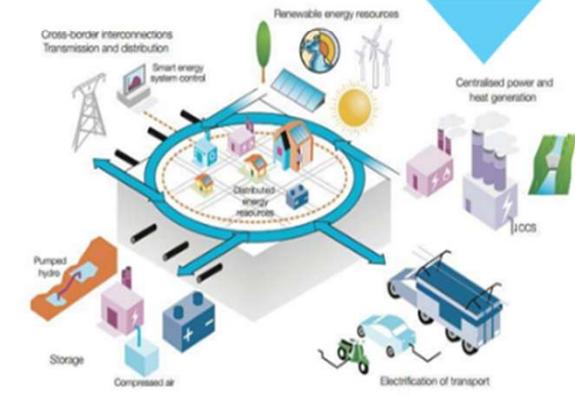
# Fundamental R&D



# Demonstration and validation



# Manufacturing and production



# Energy Research Accelerator

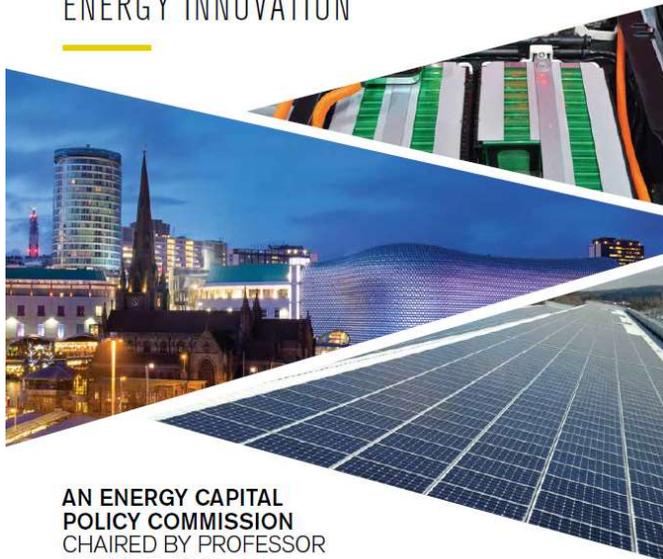


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# Regional Policy

**POWERING WEST MIDLANDS GROWTH**  
A REGIONAL APPROACH TO CLEAN  
ENERGY INNOVATION



**AN ENERGY CAPITAL  
POLICY COMMISSION**  
CHAired BY PROFESSOR  
SIR DAVID KING

#ENERGYINNOVATIONCOMMISSION  
WWW.ENERGYCAPITAL.ORG.UK/ENERGYINNOVATIONCOMMISSION



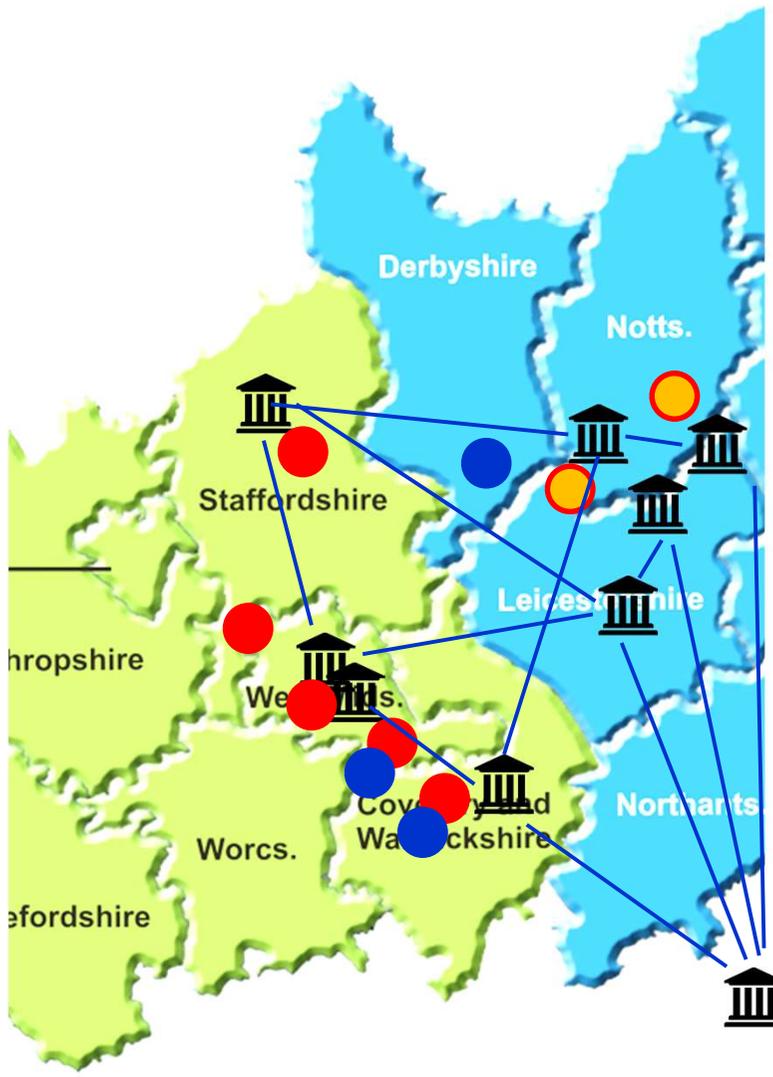
## Midlands: Energy from Waste and the Circular Economy



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# UK Research and Innovation

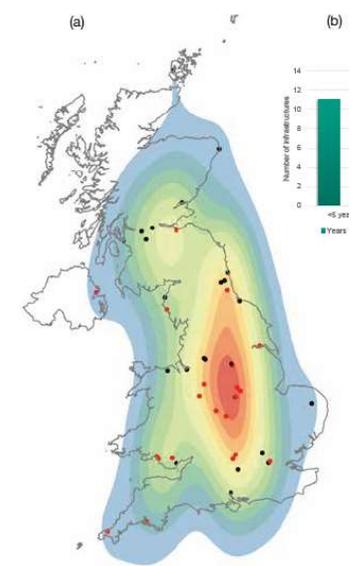


## UKRI INFRASTRUCTURE ROADMAP

INITIAL ANALYSIS OF INFRASTRUCTURE QUESTIONNAIRE RESPONSES AND DESCRIPTION OF THE LANDSCAPE



### Chapter 7: Energy sector



# ERA - 4 areas of research



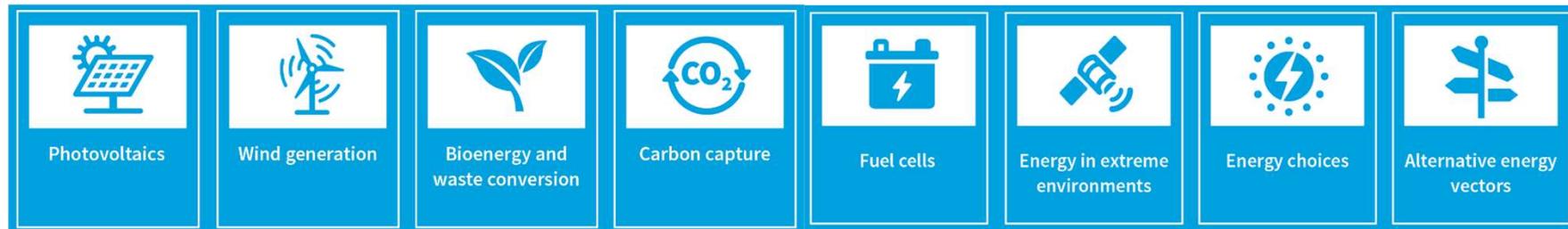
Innovate has funded 25 capital projects across these 4 areas since May 2016.



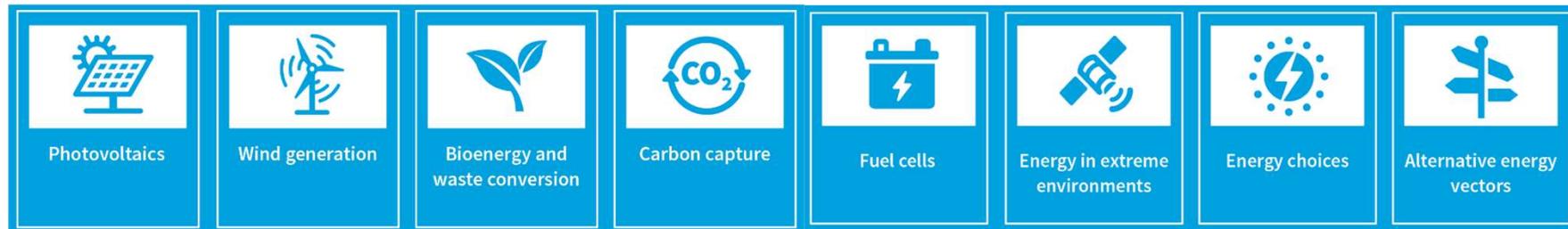
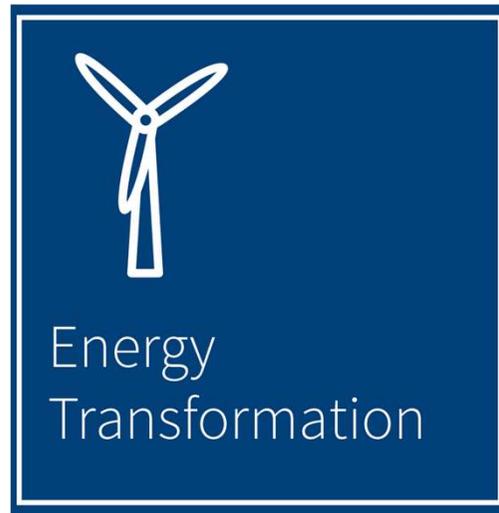
# ERA - 4 areas of research



# ERA - Energy Transformation



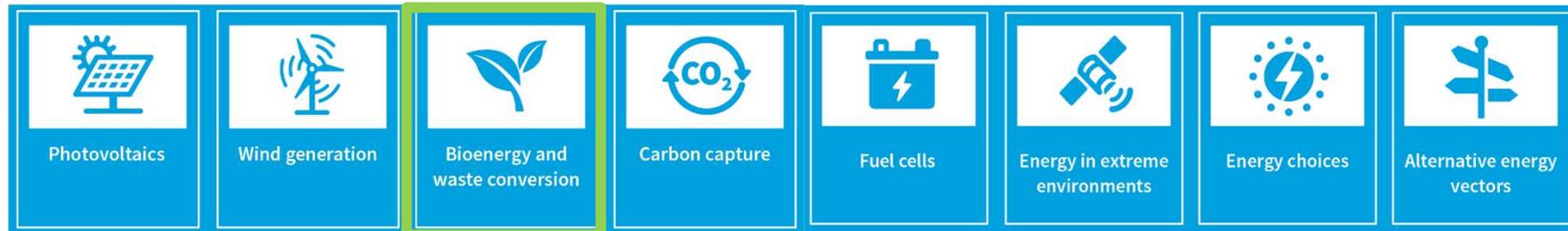
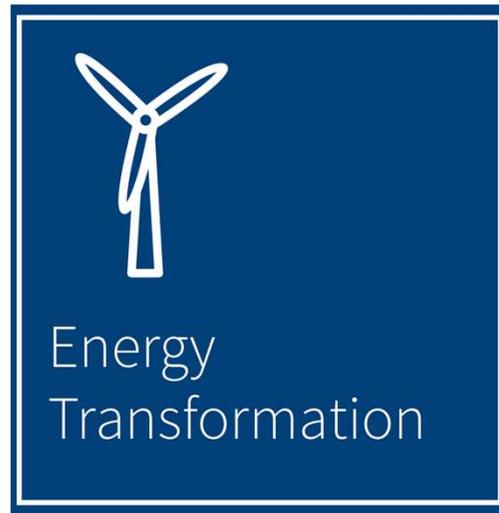
# ERA - Energy Transformation



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# ERA - Energy Transformation



## Waste to Energy

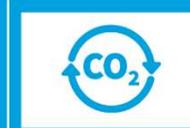


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# ERA - Energy Transformation



 Photovoltaics	 Wind generation	 Bioenergy and waste conversion	 Carbon capture	 Fuel cells	 Energy in extreme environments	 Energy choices	 Alternative energy vectors
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## Waste to Energy – Hydrothermal Carbonisation (HTC) and Pyrolysis Technologies

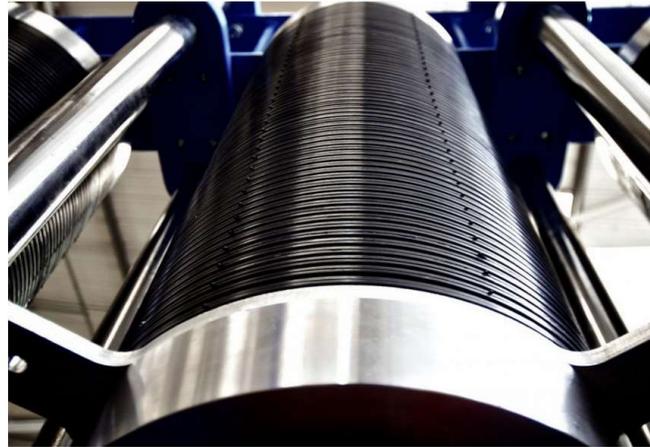


# ERA - Energy Transformation

**UK HYDROGEN & FUEL CELL RESEARCH CAPABILITY DOCUMENT**

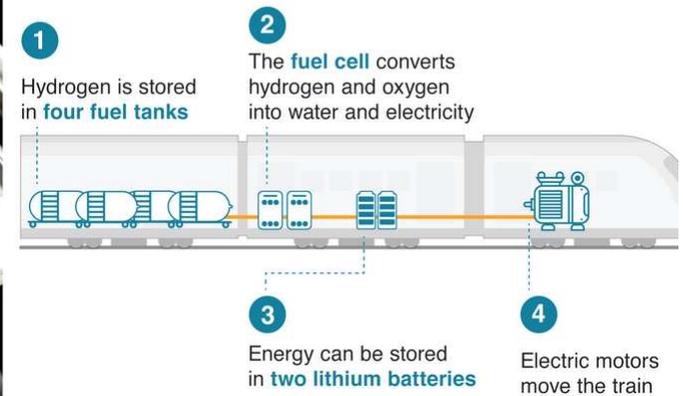
January 2019

ITM Power installing grid balancing hydrogen bus refuelling station in Birmingham  
Apr 10, 2018



Specialist in integrated hydrogen energy systems ITM Power is installing a 3MW electrolyser for refuelling a fuel cell electric bus network in Birmingham, UK.

## How a zero-emission train works



Photovoltaics    Wind generation    Bioenergy and waste conversion    Carbon capture    Fuel cells



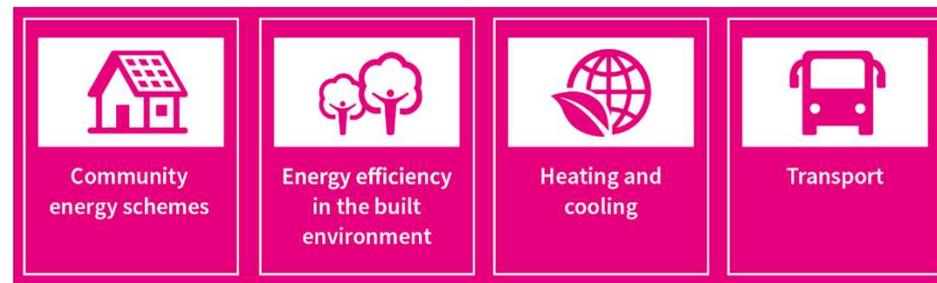
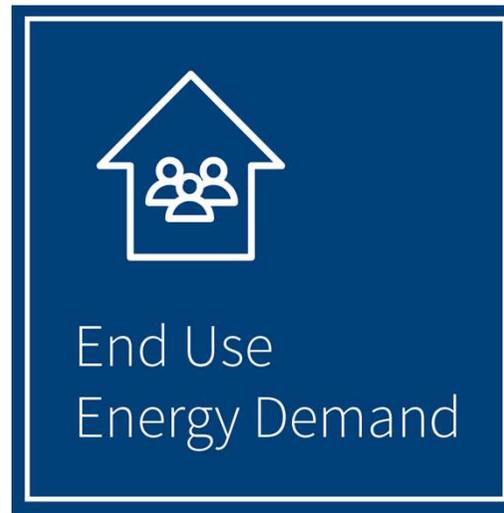
## Hydrogen



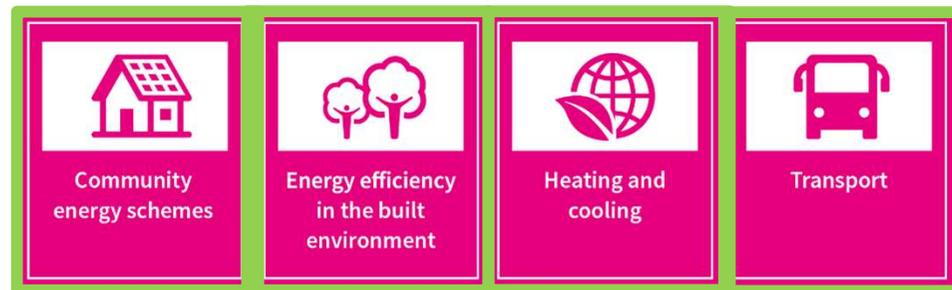
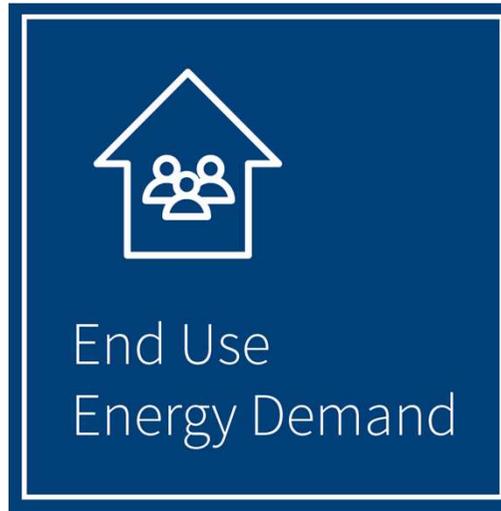
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# ERA - End Use Energy Demand



# ERA - End Use Energy Demand



Community Energy Project, Trent Basin, Nottingham

# ERA - End Use Energy Demand



- 240 affordable homes.
- Integrated Heat & Power microgrid.

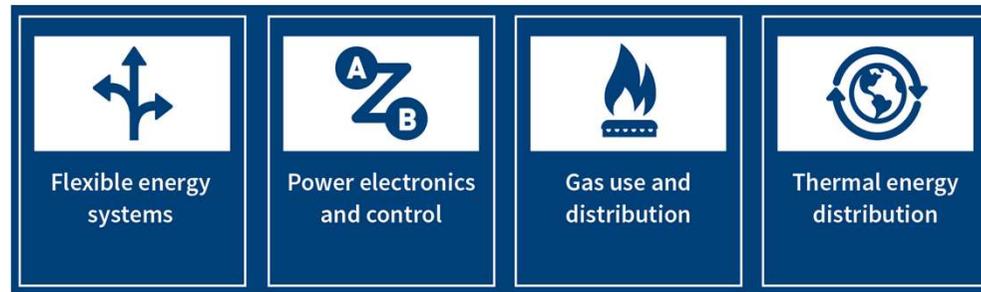
 <p>Community energy schemes</p>	 <p>Energy efficiency in the built environment</p>	 <p>Heating and cooling</p>	 <p>Transport</p>
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- Lighthouse project.
- Nottingham City Council, Private Developer, Univ of Nottingham.

Community Energy Project, Trent Basin, Nottingham



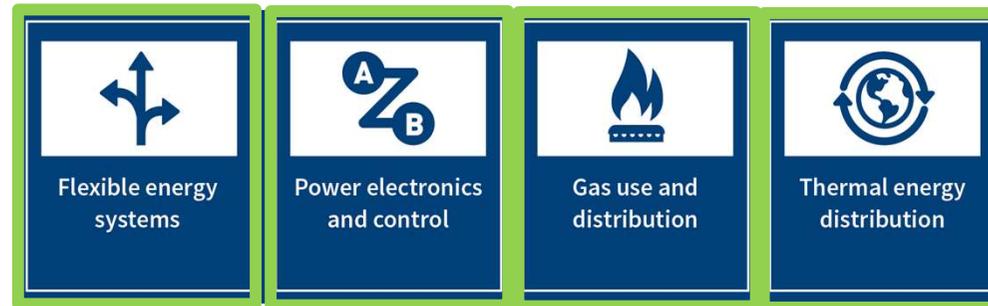
# ERA - Energy Integration



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# ERA - Energy Integration



Tyseley Energy Park, Birmingham





# ERA – Energy Innovation Zones



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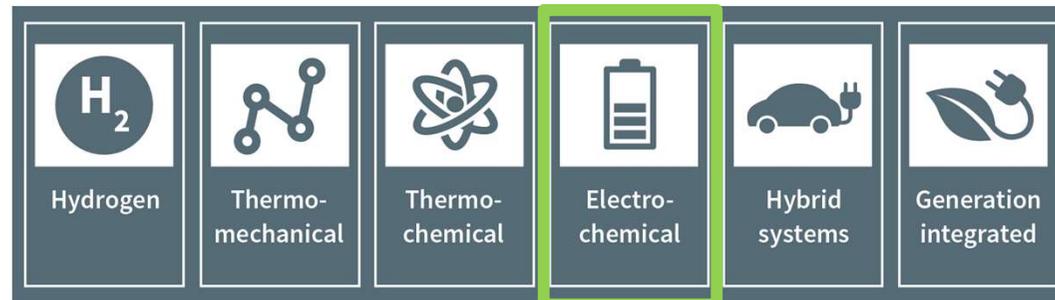
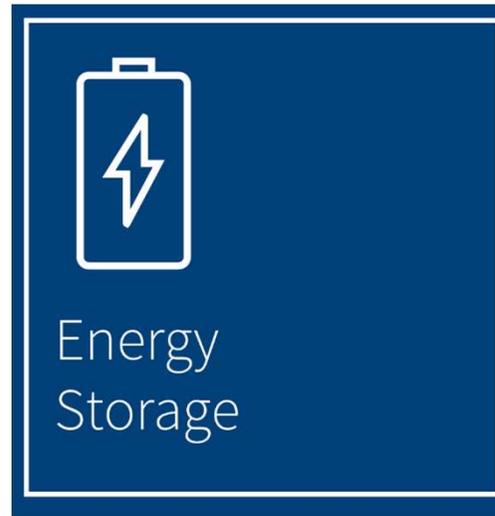
# ERA – Energy Innovation Zones



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# ERA - Energy Storage



**Battery system modelling and 2nd life**

# ERA - Energy Storage



<p>H<sub>2</sub></p>	
Hydrogen	Thermo-mechanical

Battery systems



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# ERA - Energy Storage



**Centre for Renewable Energy Systems Technology (CREST)**

University home > Research > Centre for Renewable Energy Systems Technology (CREST) > Research > Energy Storage

### Energy Storage

**CREST Homepage**

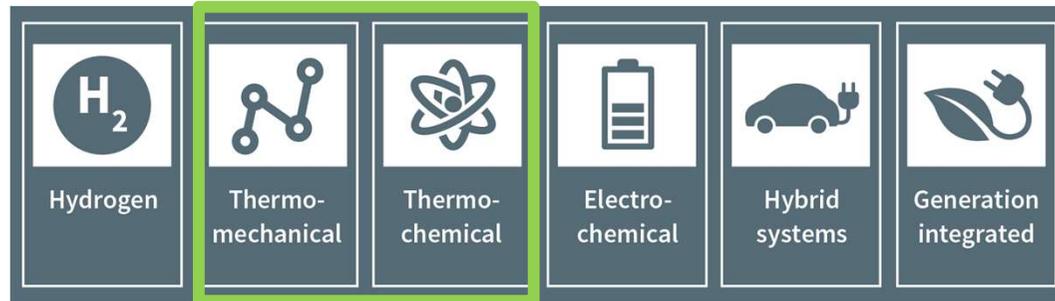
**About**

**News and events**

**Research**

- Energy Storage
- Networks & Systems
- RE for Development
- PV Materials & Devices
- Applied Photovoltaics
- Wind and Water Power
- Multi-scale Energy Systems
- SUPERGEN

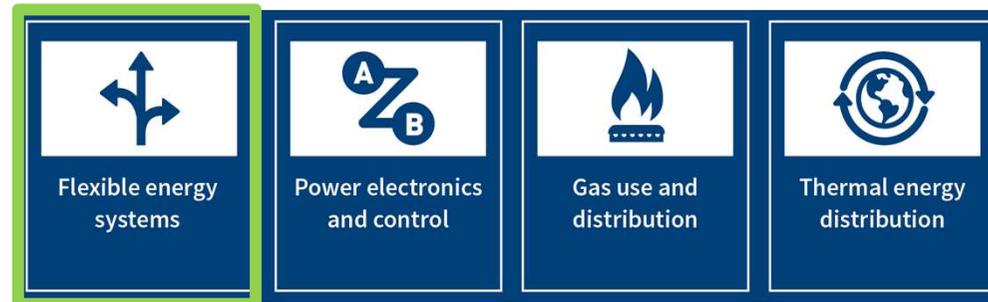
The increased role for energy storage in a low carbon energy services supply system is now recognised both in the UK and internationally. The evolving electrical generation mix, more wind, solar and tidal that is likely to be at the core of a future energy supply system will include a greater proportion of less predictable and time varying renewables in conjunction



## Battery system modelling and 2nd life



# ERA - Energy Integration



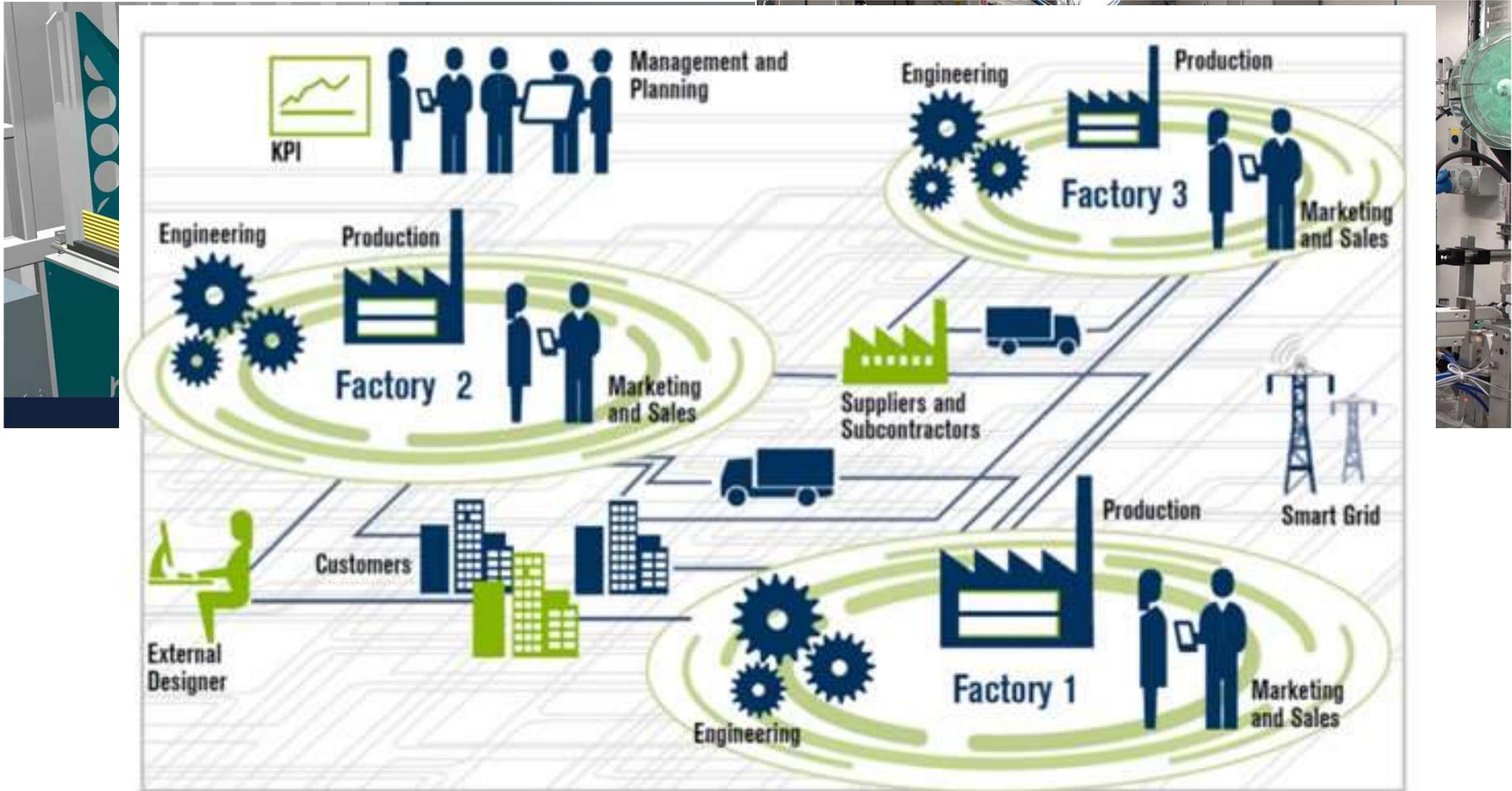
**“Factory in a Box”  
(Manufacturing Automation)**



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# ERA - Energy Integration



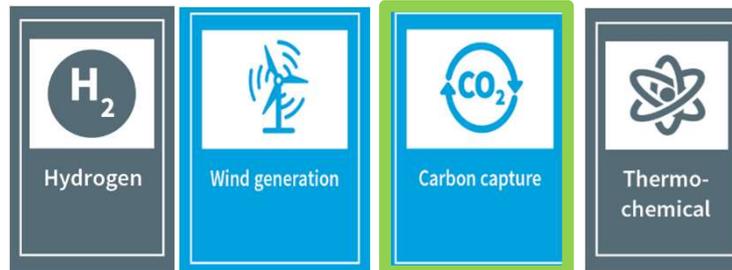
Source: Hewlett-Packard 2013



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# ERA – RAD Building



**Developing solid adsorbents for post-combustion capture of Carbon  
Hydrogen research and Energy Storage**



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