Hardtech and high-value manufacturing

Some UK policy perspectives

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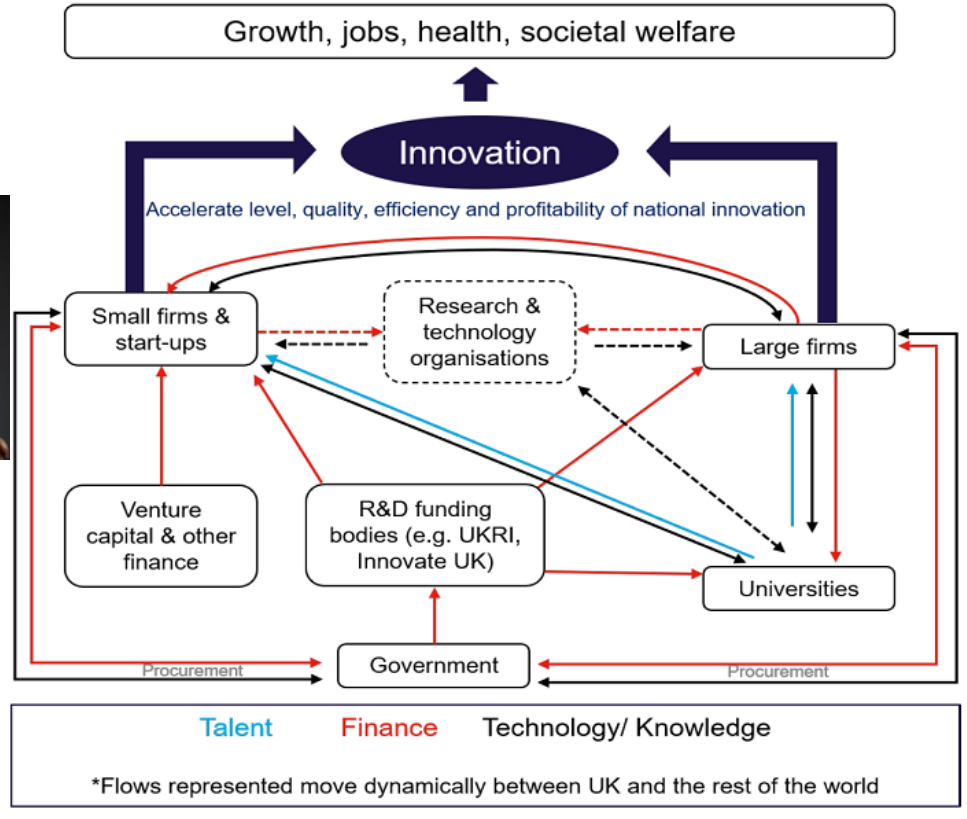
Innovation Ecosystem



Some UK strengths and opportunities

Talent & Development:

- The UK is home to **four of the top 10 universities in the world**.
- We draw in proportionally more **internationally mobile R&D** than other large countries, with almost 15% of UK R&D investment financed from abroad and about half of R&D performed in UK business is in overseas-owned businesses.
- Generous UK **R&D tax relief** to support innovation

Finance:

- The UK is **Europe's leading nation for venture capital** and second most significant global hub, with £22 billion of venture capital deployed in 2022.
  - 96% of Venture Capital investment into UK companies goes into UK companies with fewer than 50 employees.
  - In 2021 an estimated £135 million of venture capital was committed to **UK Quantum technology startups**.
  - Across all of Europe, the UK has more than 25% of start-up companies that are valued at more than £1 billion, and the UK has **created 115 Unicorns** – more than France and Germany combined.

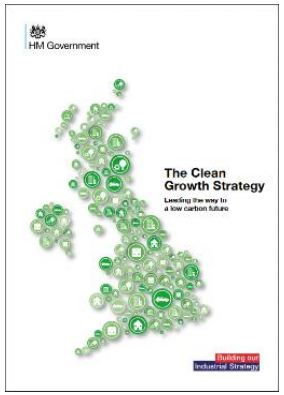
Growth & Knowledge Transfer:

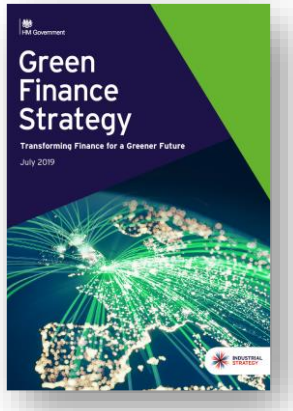
- In 2021, R&D performed by UK businesses continued to grow, expanding by £2.9 billion **to £46.9 billion in 2021**, an increase of 6.7%
- The UK has the **2nd best intellectual property (IP) protection in the world**, according to the US Chamber of Commerce International IP Index.
- Spinouts: In 2020 UK and US universities had comparable outcomes, both creating just over **2 spinouts per £100m of research income.**

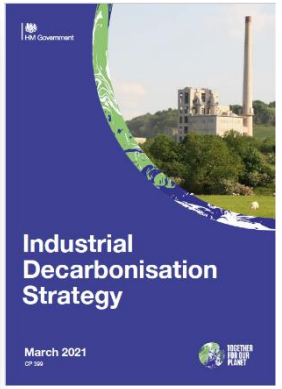
How do we achieve Net Zero?

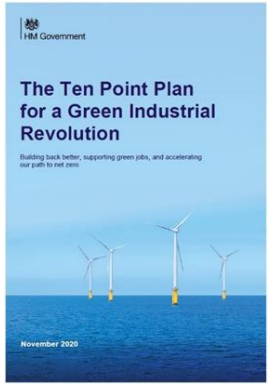
- The UK has set out ambitious plans to reduce emissions across key sectors of the economy – including **an Energy White Paper, Transport Decarbonisation Plan, Industry Decarbonisation Strategy, Hydrogen Strategy, and Heat and Building Strategy**.

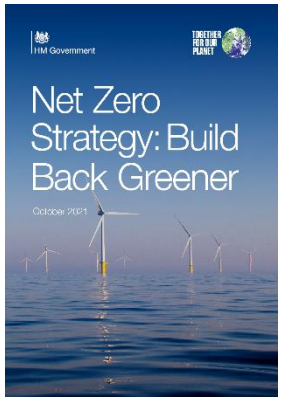
- A comprehensive **Net Zero Strategy**, setting out the government's vision for transitioning to a net zero economy was published in October 2021. This outlines measures to transition to a green and sustainable future, helping businesses and consumers to move to clean power, supporting hundreds of thousands of well-paid jobs and leveraging up to £90 billion of private investment by 2030.











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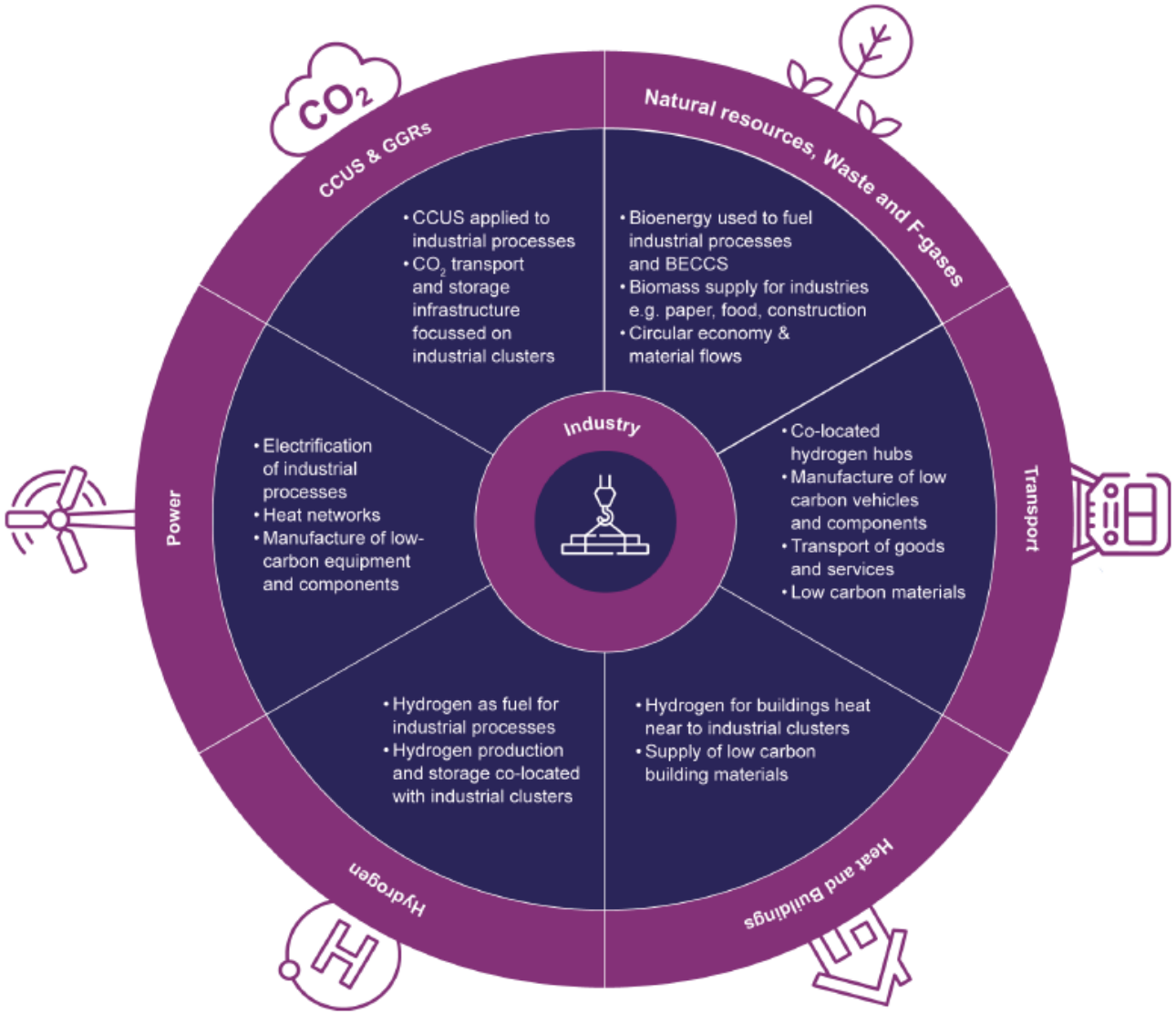
Research & Innovation – Industrial Decarbonisation

- Next decade is critical for trialling solutions best suited to different industries/contexts and to reach maximum energy and resource efficiency levels.
- More expensive decarbonisation options roll out from 2030s onwards with deep decarbonisation becoming the norm across UK industry.
- Three categories of innovation identified:
  1. Resource and energy efficiency
  2. Fuel switching
  3. Carbon Capture, Utilisation and Storage (CCUS)

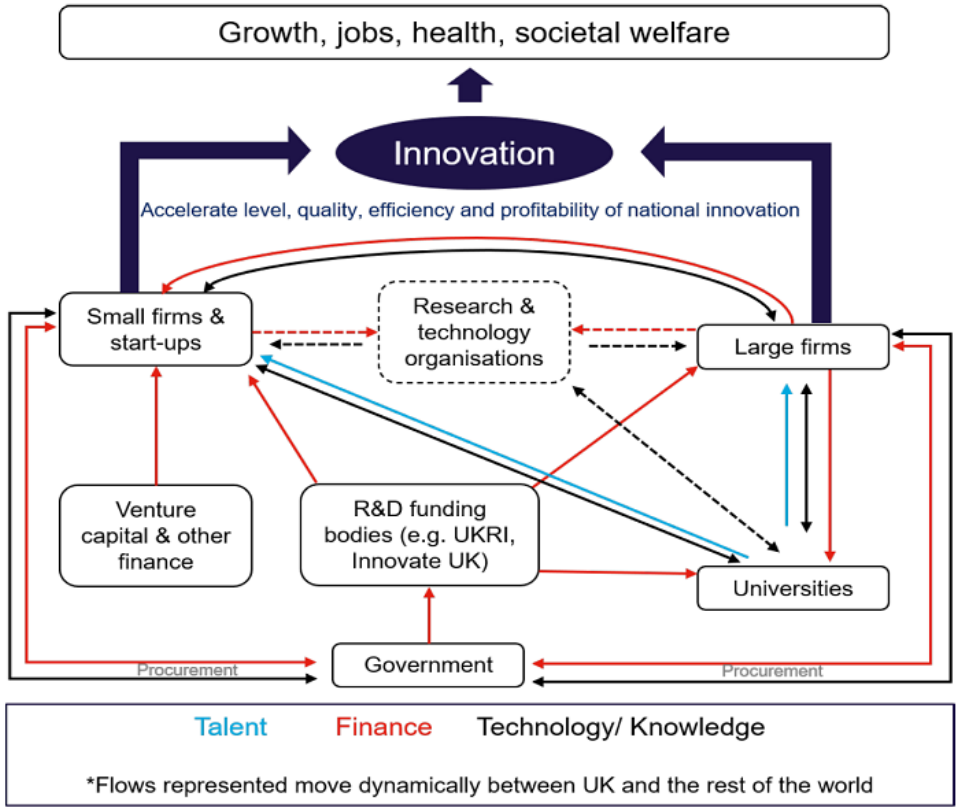


UK Innovation Strategy

Leading the future by creating it

https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it

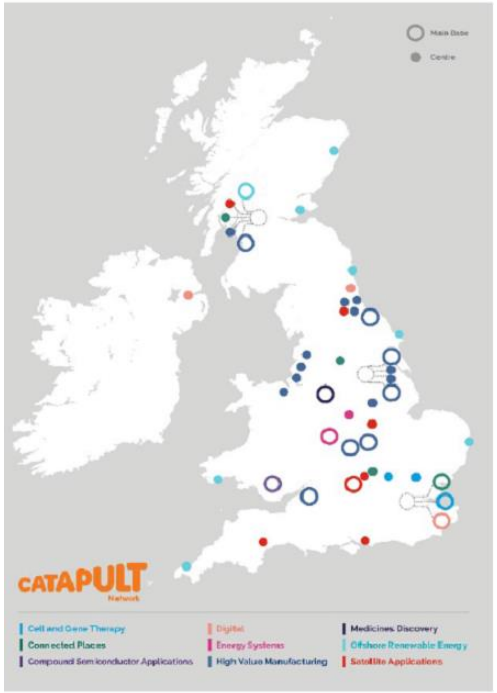
The Innovation Ecosystem



UK Quantum Strategy

Call for Evidence

Closing date: 10 March 2022



UK Manufacturing Investment Prospectus

A document to showcase the brilliance and innovation of the UK's manufacturers, and the policies which demonstrate government commitments to businesses.

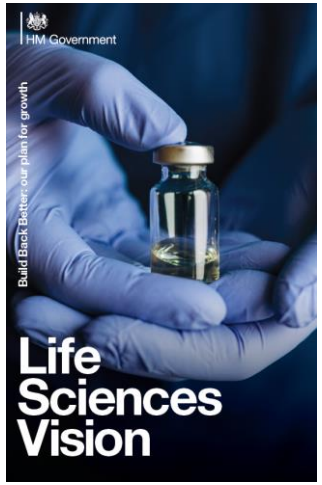
Advanced Research + Invention Agency ARIA

The Advanced Research + Invention Agency

Inspiring and empowering scientists to push the limits of the possible and create a better future for the UK and the world.

Backed by £800M. Launching soon. More information on our origins here.

UKRI Innovate UK KTN



ADVANCED PROPULSION CENTRE UK

AEROSPACE TECHNOLOGY INSTITUTE

Manufacturing – 1 – Zero-Emission Aviation

Some outputs from Government's £15m FlyZero research programme, seeking options for zero-emission flight by 2030:

Concept aircraft using liquid hydrogen combustion, which could carry 279 passengers - with zero emissions - direct from London to Los Angeles.

The potential to move to longer-range zero-emission aircraft also allows the concentration of new infrastructure to fewer international airports, accelerating rollout and tackling emissions from long haul flights.

Comparison of the zero-carbon emission energy sources considered by the FlyZero project:

	Battery	LH_2 Fuel Cell	LH_2 Combustion	Gaseous H_2	Ammonia
CO_2 Emissions	🟢	🟢	🟢	🟢	🟢
NOx Emissions	🟢	🟢	🟡	🟡	🔴
Contrails	🟢	🟡	🟡	🟡	🟡
Fuel Volume	🔴	🟡	🟡	🔴	🟡
Fuel+Propulsion System Mass	🔴	🟡	🟢	🔴	🔴
Airport Infrastructure	🟢	🔴	🔴	🟡	🟡

https://www.ati.org.uk/news/one-stop-zero-carbon-emission-global-flight/

https://www.ati.org.uk/wp-content/uploads/2021/10/FZ_0_6.1-Primary-Energy-Source-Comparison-and-Selection-FINAL-230921.pdf

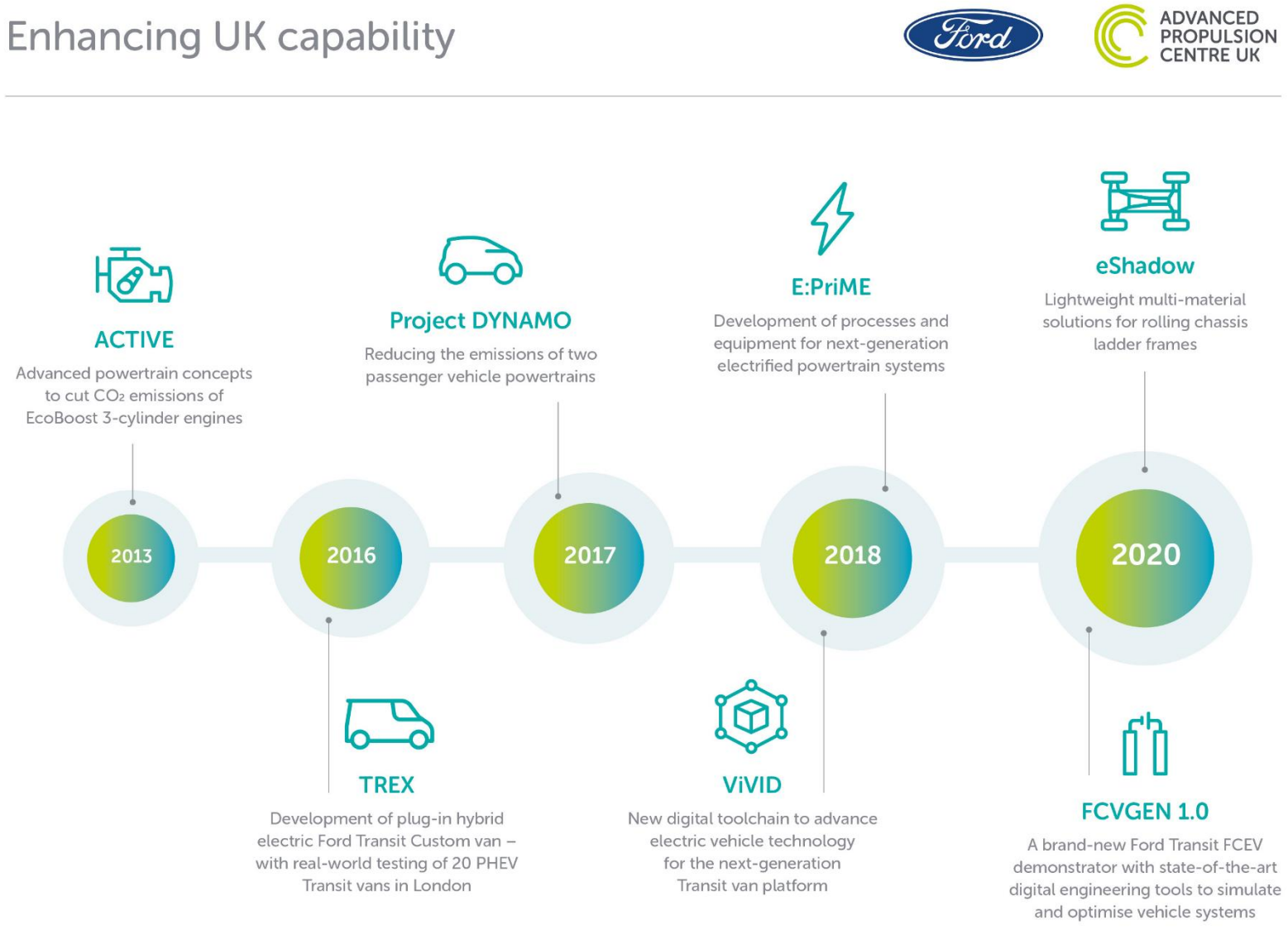
Department for Business, Energy & Industrial Strategy

Manufacturing – 2 – Automotive

Collaborative R&D, focused on priority areas and informed by future technology roadmaps developed by the Advanced Propulsion Centre, providing £1bn of investment over 10 years through public-private partnership

Ford's recent announcements to base its e-Drive production plant in Halewood, Merseyside, is just one of a series of carbon-cutting projects delivered through collaborative R&D.

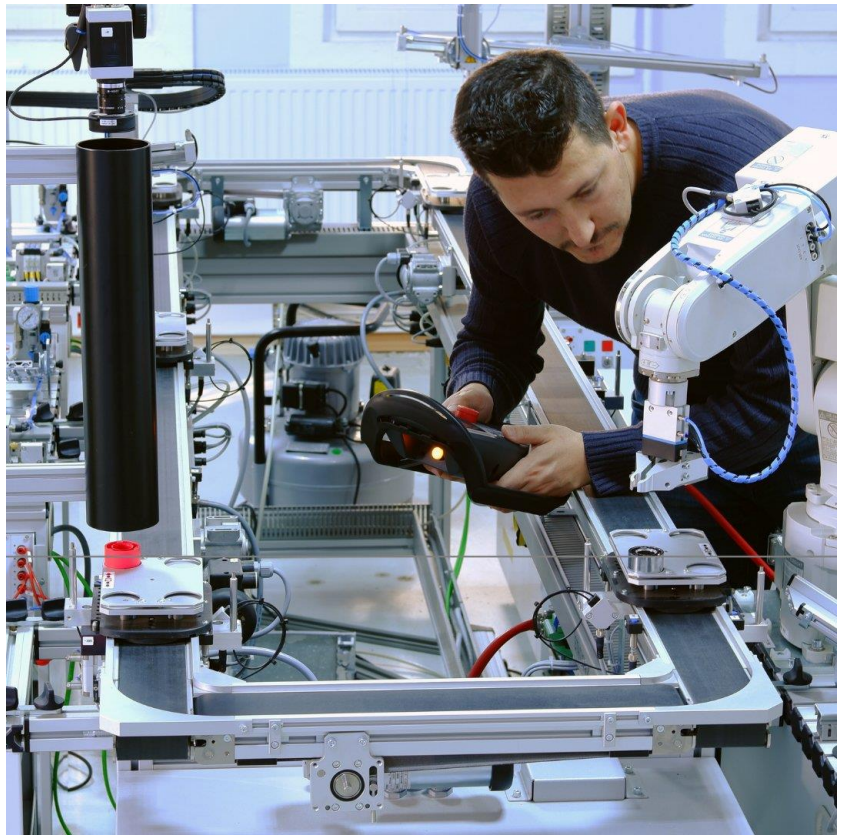
For example, E:PriME enabled Ford to develop a pilot facility for e-Drives, creating the capability and processes for the high-volume manufacturing of next-generation low-emission technology that will be in operation in Halewood.



https://www.apcuk.co.uk/ford-recognise-the-expertise-and-capability-they-have-in-the-uk-says-director-julian-hetherington/

Manufacturing – 3 – Made Smarter

Manufacturing is the third-largest industry and the third-largest direct greenhouse gas-emitting sector of the UK economy



Over 80% of industrial companies' carbon dioxide emissions are created through the supply chain.

Made Smarter is enabling innovation in manufacturing, and helps makers keep their competitive edge, with digital tools that let people make an everyday difference to their business

Funding competition

Made Smarter Innovation: Industry Ready Robotics & Automation

UK registered organisations can apply for a share of up to £6 million for late-stage robotics and automation innovation projects. This is to develop industrially ready solutions deployable within manufacturing processes in factories.

Competition closes: Wednesday 5 April 2023 11:00am

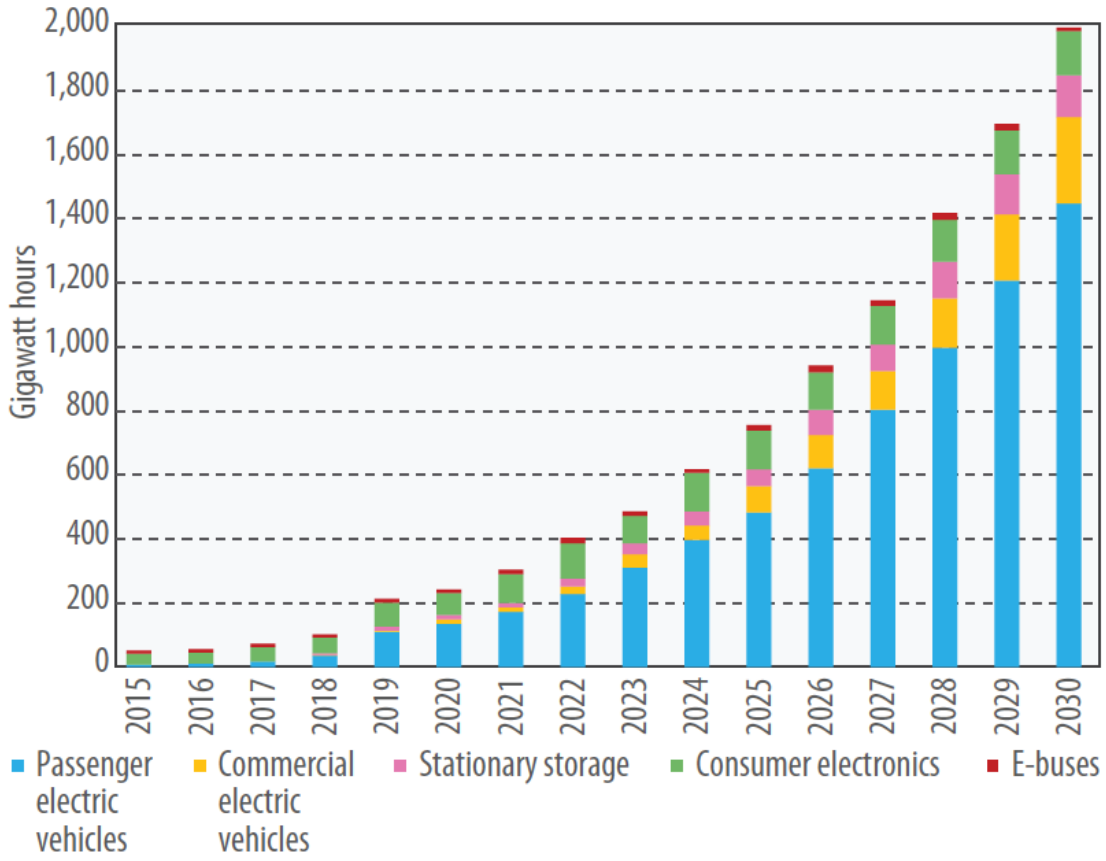
https://apply-for-innovation-funding.service.gov.uk/competition/1437/overview/

Department for Business, Energy & Industrial Strategy

Case Study: Batteries: Macro trends are clear - but scenarios are not…

Figure 2

Uses of lithium-ion batteries in the world, 2015–2030



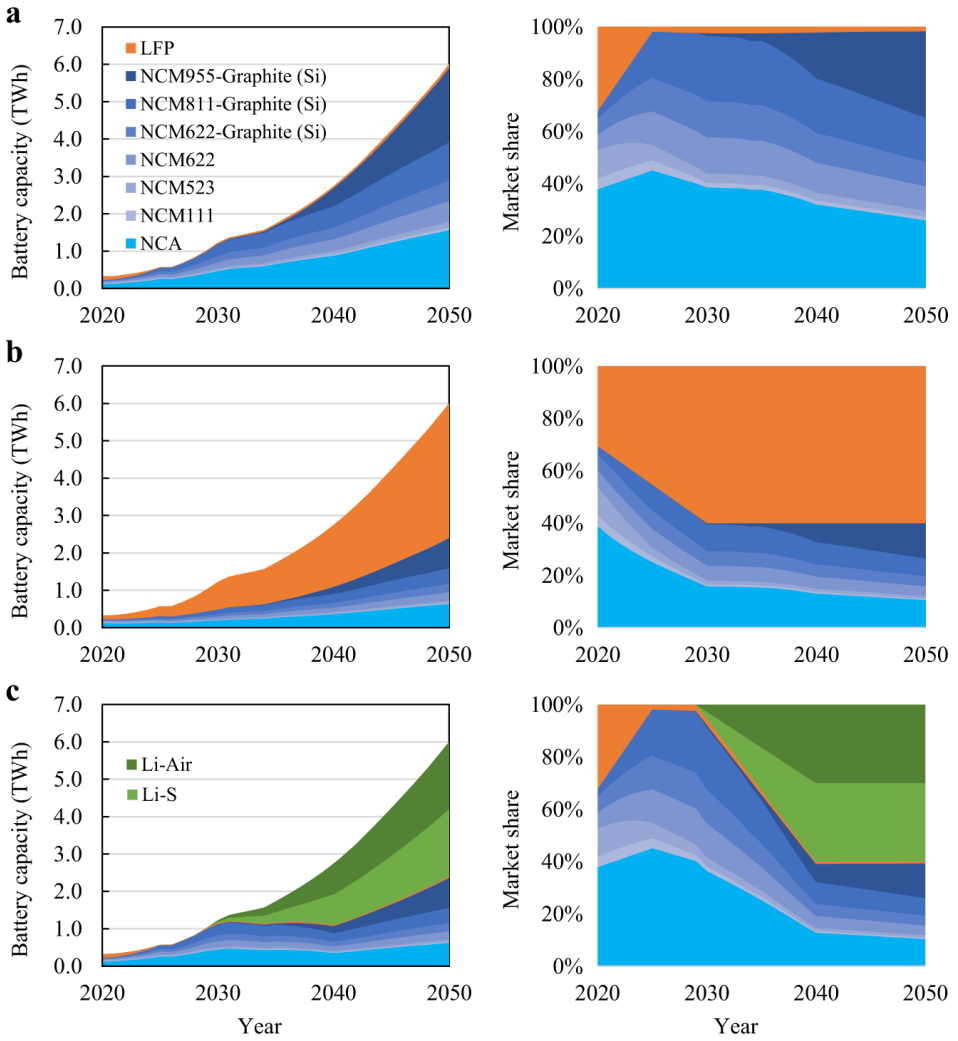
Source: Wang (2020).

Three scenarios to meet IEA Stated Policies (STEP) lithium-based automotive batteries

NCX

LFP

Li-S/Air



Xu, C *et al.* Future material demand for automotive lithium-based batteries. *Commun Mater* **1,** 99 (2020).

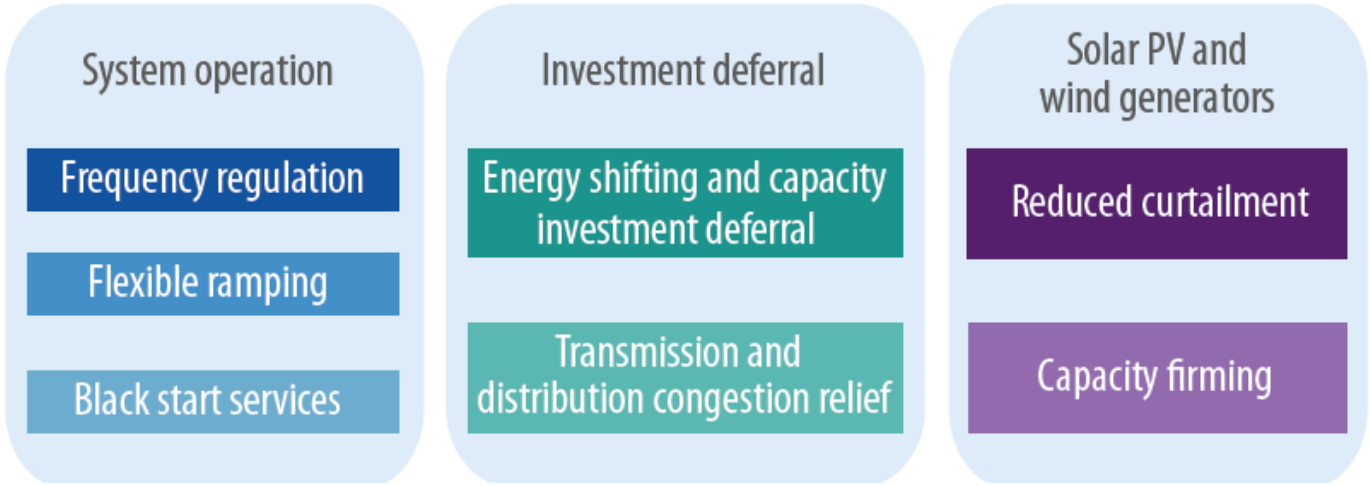
UK Policy Drivers for Battery Demand

Improve the affordability of EVs	Accelerate the provision of charging infrastructure	Support supply chain & manufacturing industry	Preparing the energy system for large-scale EV adoption	Provide regulatory certainty to consumers & OEMs	Invest in the workforce of the future

2022 2023 2024 2025 2026 2027 2028 2029 2030 2035

- All new cars and vans to deliver significant zero emission capability from 2030 to 2035
  - All new cars and vans to be 100% zero emission at the tailpipe from 2035
- At least 2,500 high powered chargers across the strategic road network by 2030
  - At least 6,000 high powered chargepoints across the strategic road network by 2035

How battery storage systems help the electrical grid



Source: UN DESA, adapted from IRENA (2019).

Conclusions

Thank you

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UK Innovation Strategy |
UK Net Zero Research & Innovation Framework |
UK Research & Innovation / Innovate UK |
UK Critical Minerals Strategy |
The Advanced Research + Invention Agency

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