



IEA Technology Collaboration Programme

COUNTRY REPORT

United Kingdom

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Alt' Delegate - Dr. Jonathan Radcliffe (University of Birmingham)

XC99, Seville, 20-21 May 2025

UK - Population & Demographic

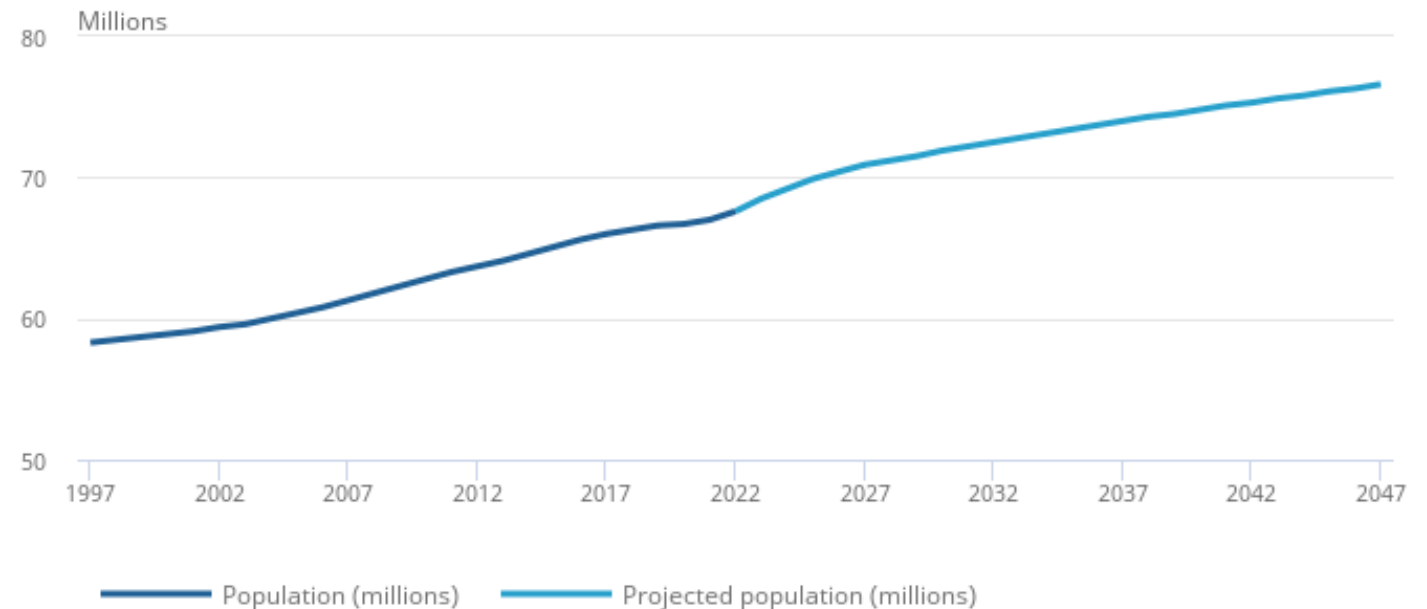
The United Kingdom consists of the countries of England, Wales, Scotland and Northern Ireland.

Latest mid-year population estimate (2023):
➤ 68.3 million



Figure 1: UK population is projected to rise to 72.5 million by mid-2032 and to 76.6 million by mid-2047

UK population estimates, mid-1997 to mid-2022, and projections to mid-2047

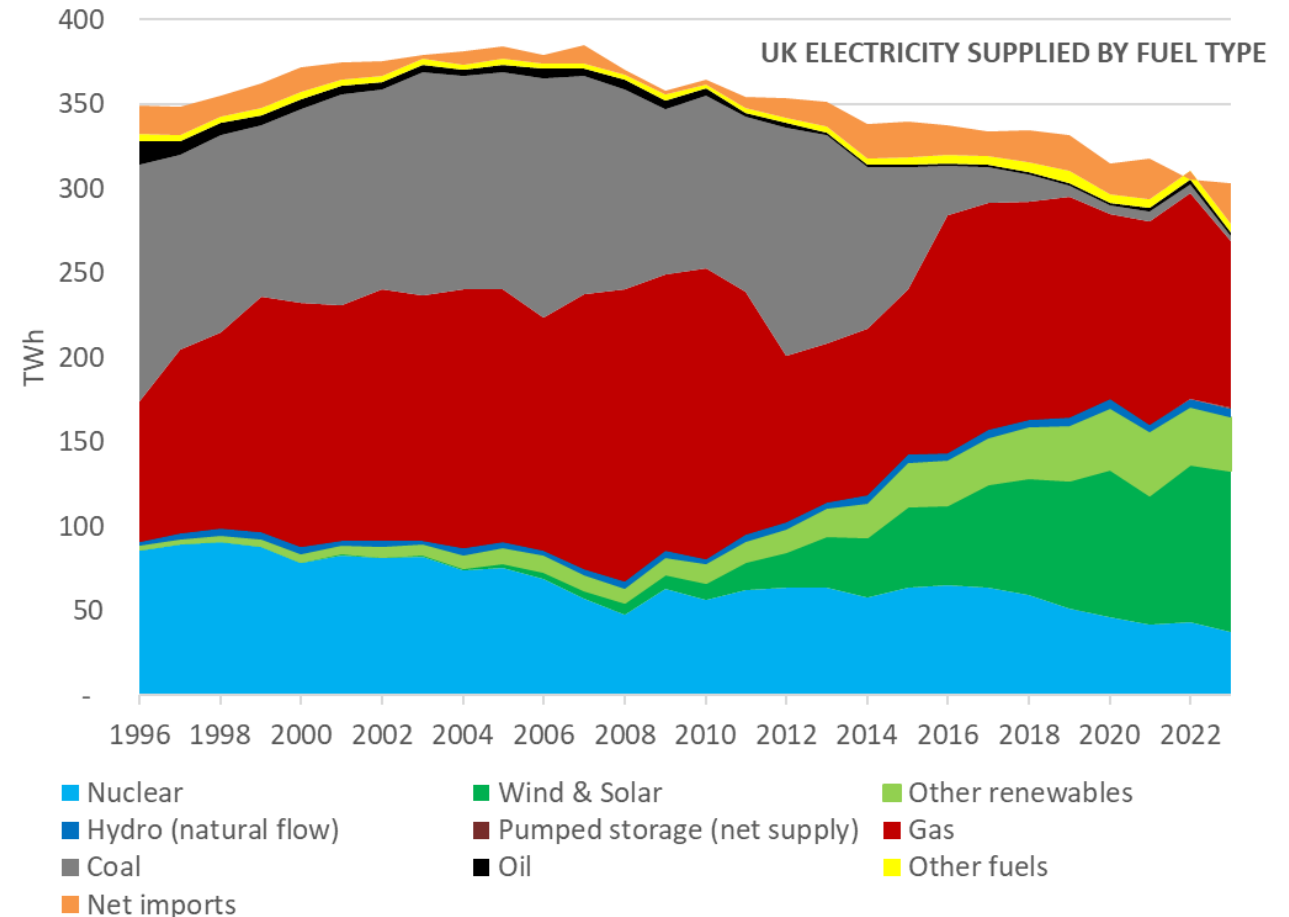
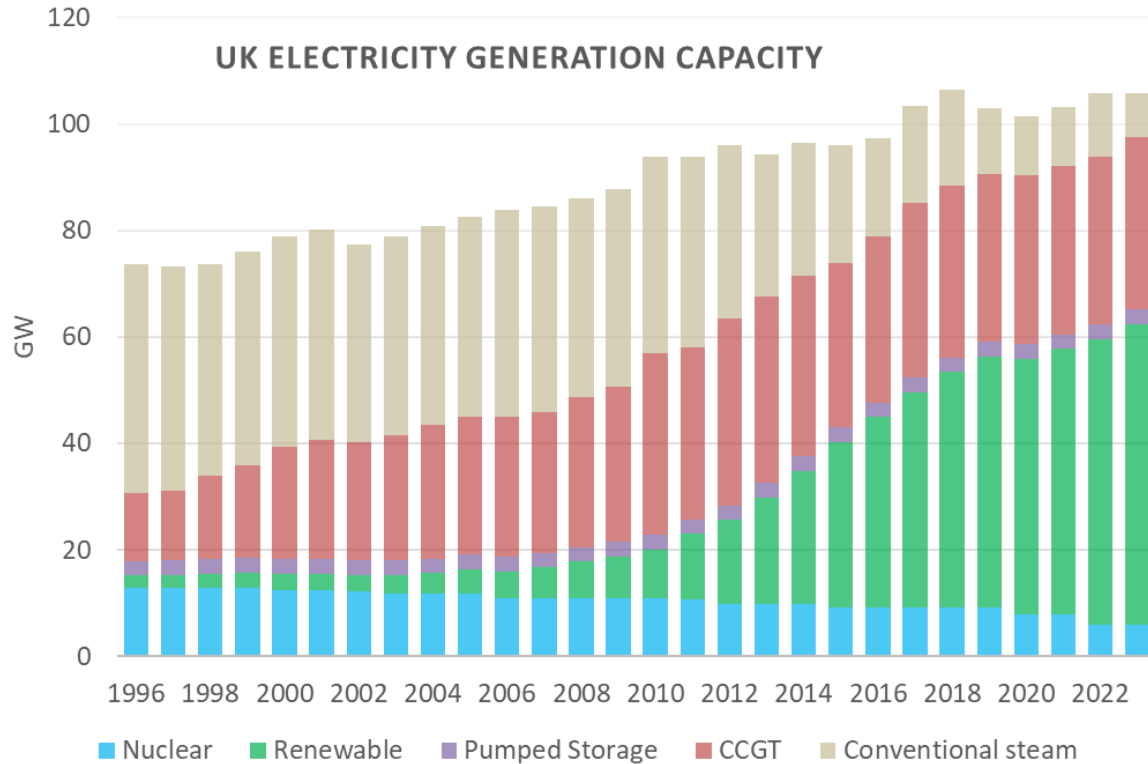


References:

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2022based>

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/mid2023>

Country Specific Information



Installed capacity for electricity generation in the UK increased gradually between 1996 and 2018, from 73.6 GW to 101.2 GW. In 2019 and 2020, total capacity fell following the closure of several large coal-fired plants, and the mix of plants shifted towards different renewable technologies.

Reference: <https://www.gov.uk/government/statistics/uk-energy-in-brief-2024> (2024)

NESO Pathways to Net Zero (2024)

Figure EC.01: Annual consumer demand in Holistic Transition by fuel and sector

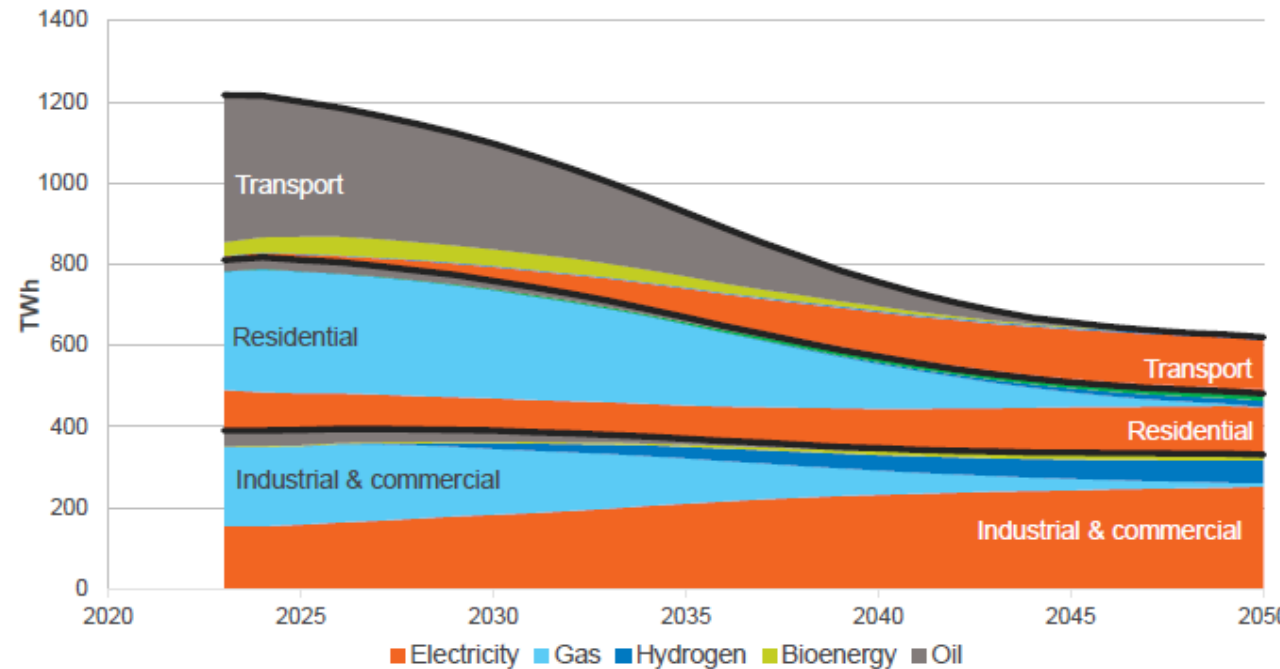
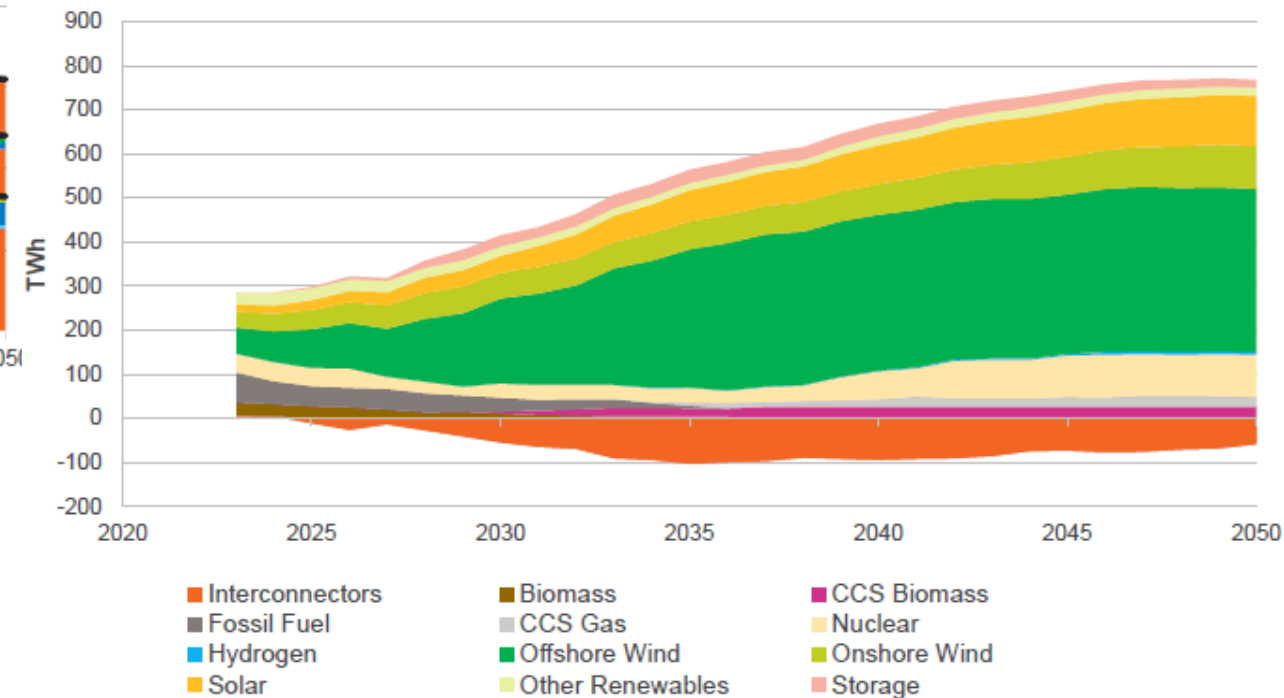


Figure ES.08: Electricity output by technology in Holistic Transition



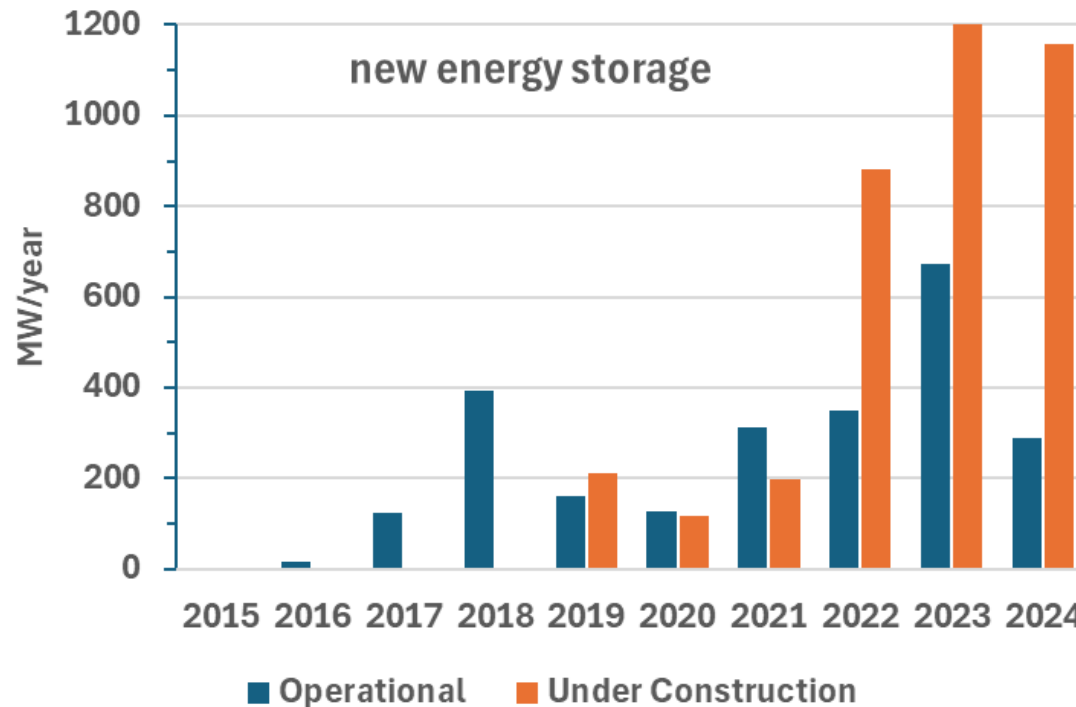
National Energy System Operator (NESO) pathways for strategic network planning, “seeks to identify credible, strategic routes to net zero.”

<https://www.neso.energy/publications/future-energy-scenarios-fes>

Energy Storage Landscape

■ Capacity

- Most recent public data (Q4 2024) has 8.1 GW of electricity storage is operational: 2.8 GW of pumped hydro storage + 5.3 GW of battery storage (likely an underestimate as data lags actuals).
- c. 5 GW of battery storage is under construction.

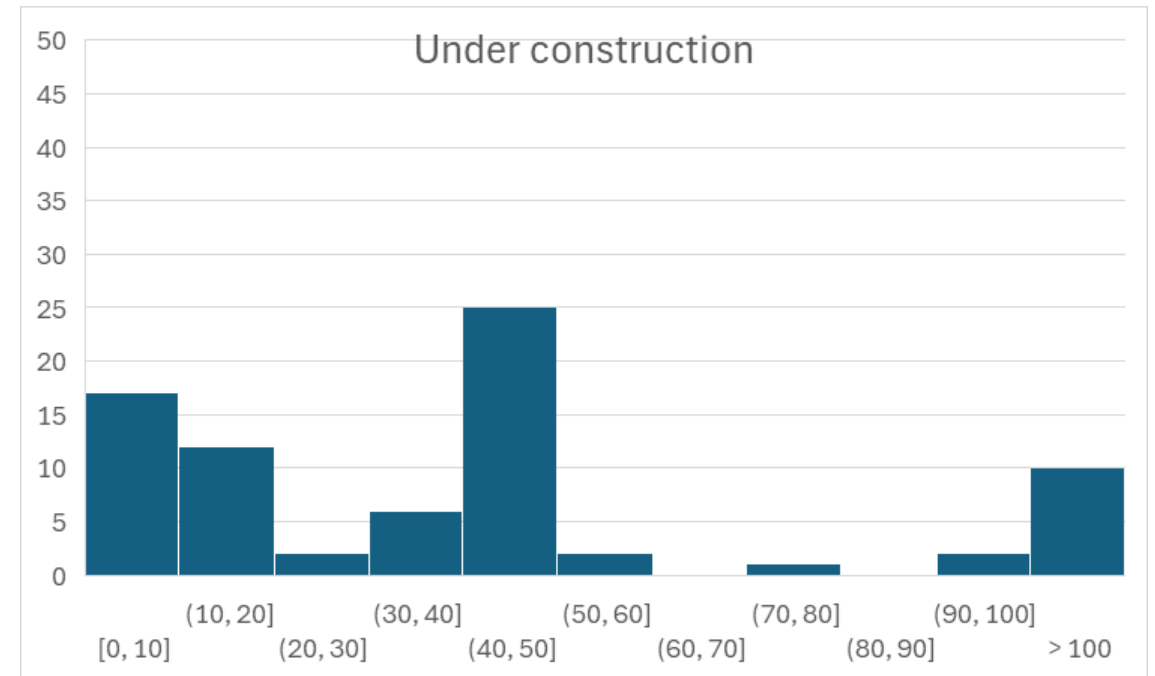
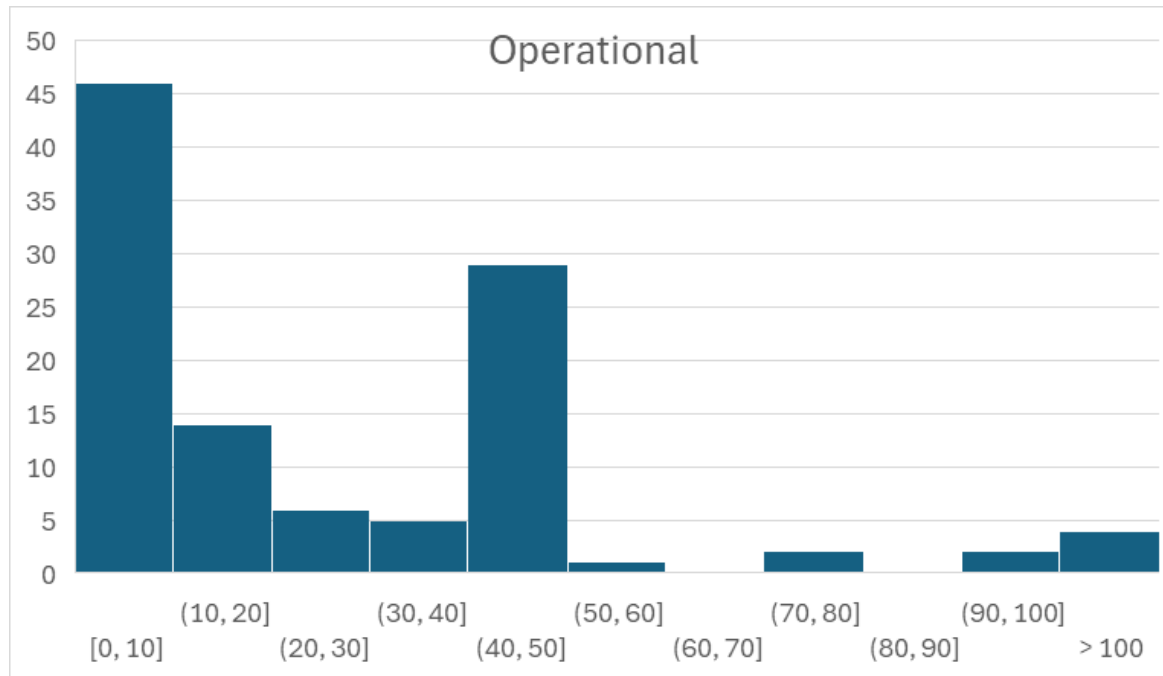


Renewable Energy Planning Database, Department for Energy Security & Net Zero (January 2025)
<https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract>



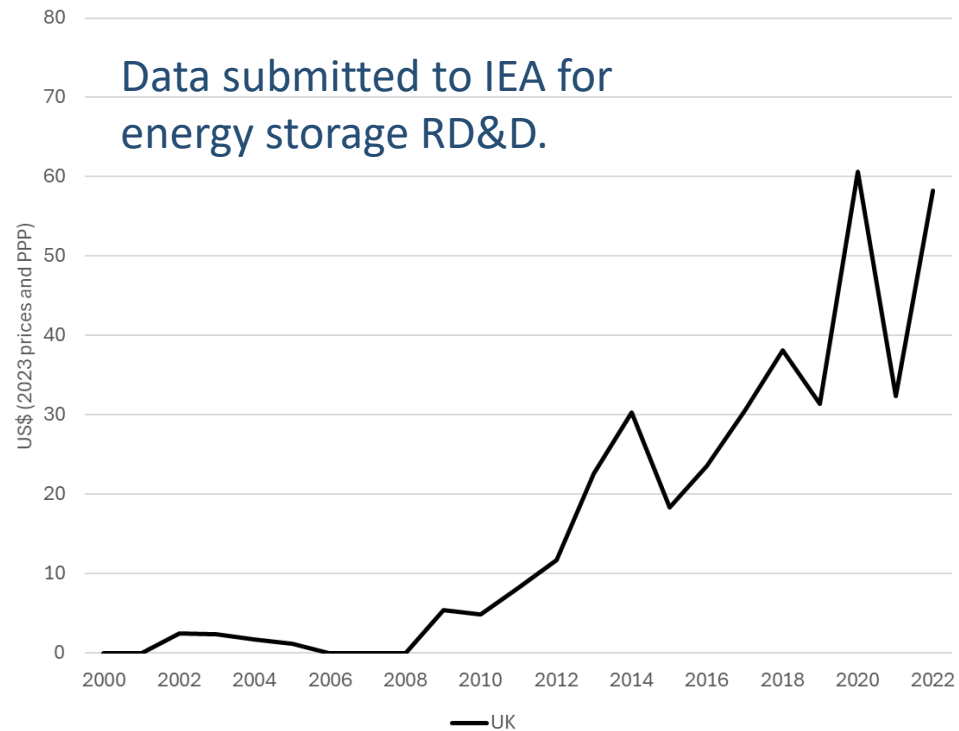
Capacity profile of energy storage

- Shift to larger units under construction, with ten >100 MW, four existing large units are PHS.

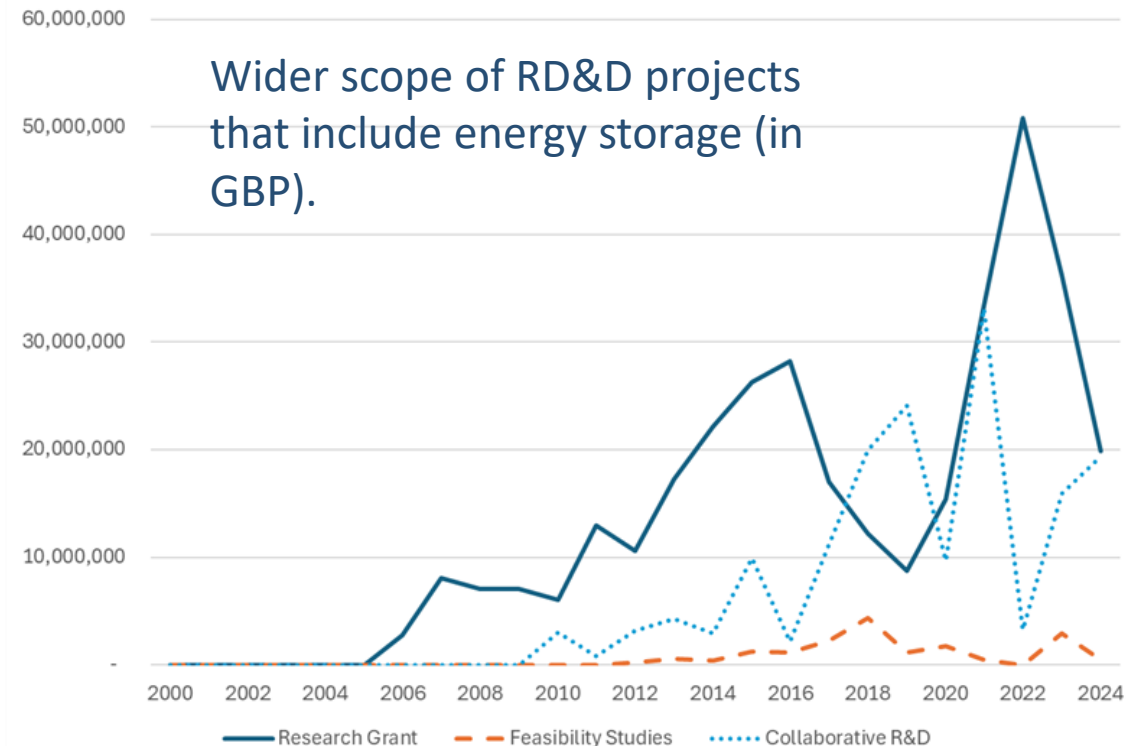


RDD: Innovation Support

- Energy storage RD&D funding over the last 15 years from various sources: Research Councils, Innovate-UK, Ofgem, Govt departments, other govt agencies



Source: IEA statistics; <https://wds.iea.org/>



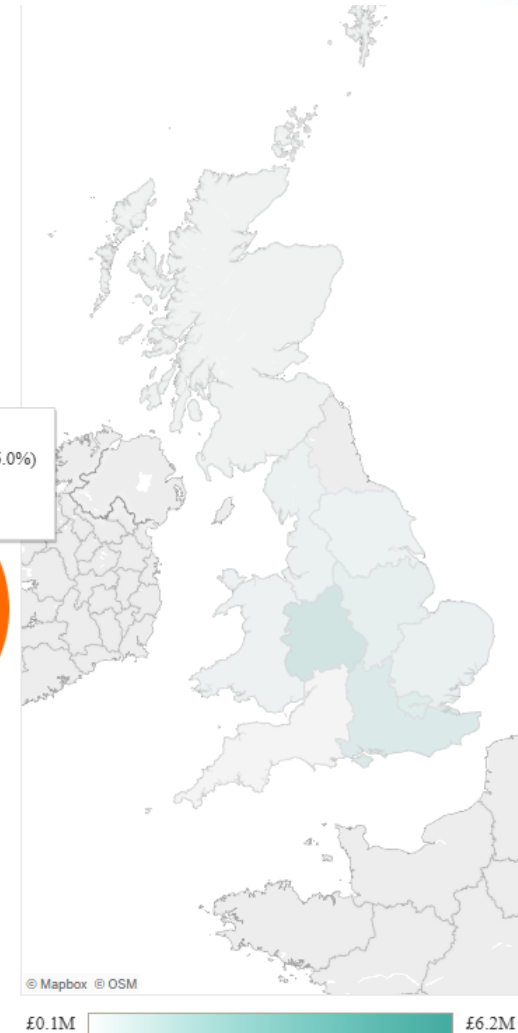
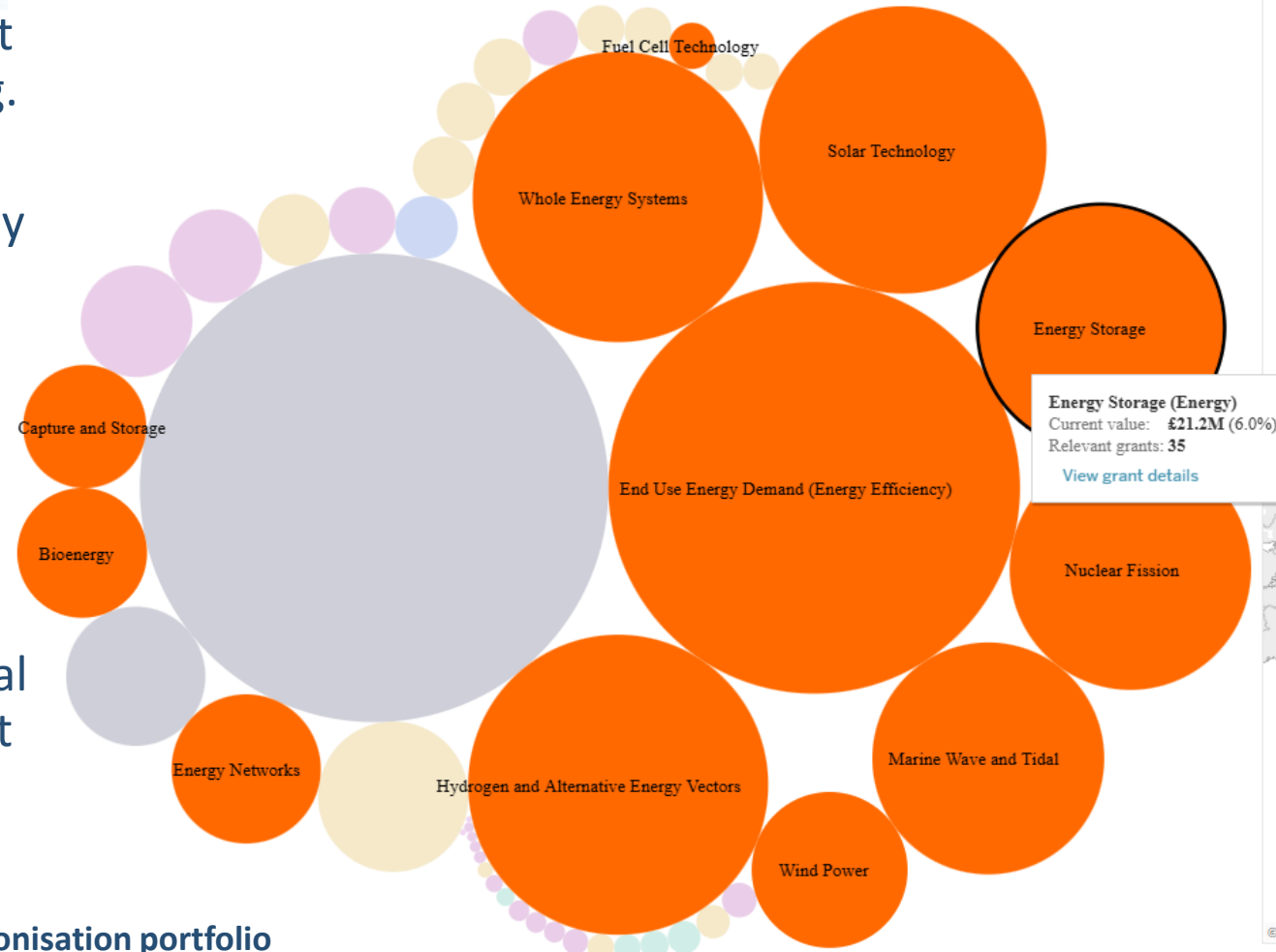
Source: UKRI data; <https://gtr.ukri.org/>

Research funding for energy storage

- Energy storage is a key part of energy research funding.
- As of November 2024, 35 research projects on energy storage, value £21.2 m.

Recent call:

- Interseasonal energy storage beyond hydrogen (£9 million, UKRI)
- UltraStore – the Faraday Institution Transformational Challenge on ultra-low cost long duration energy storage solutions



UK Research Councils Energy and Decarbonisation portfolio

<https://public.tableau.com/app/profile/epsrccdatateam/viz/VisualisingourPortfolio/VoP>
https://public.tableau.com/shared/23YYN2DJ9?:display_count=n&:origin=viz_share_link

UKRI call: <https://www.ukri.org/opportunity/critical-mass-programmes-to-drive-a-sustainable-future-invitation-only/>

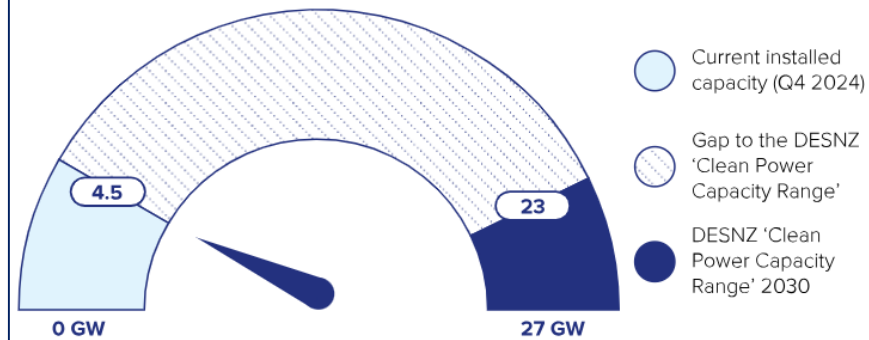
UK Government's Clean Power 2030 Action Plan

“In a typical weather year, the 2030 power system will see clean sources produce at least as much power as Great Britain consumes in total over the whole year, and at least 95% of Great Britain’s generation”

<https://www.gov.uk/government/publications/clean-power-2030-action-plan>

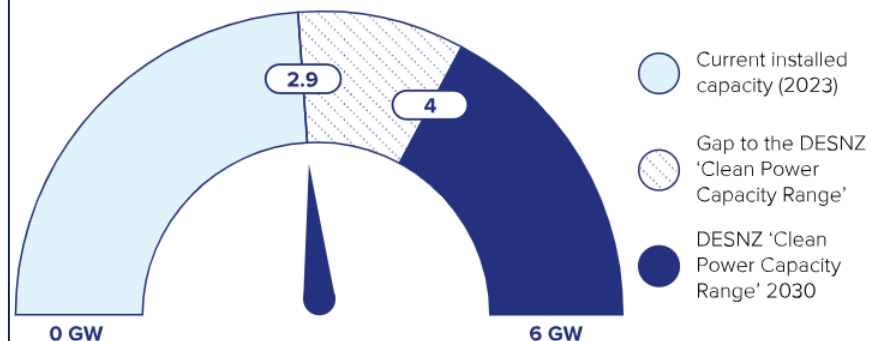
Battery Storage

Current installed capacity compared to the DESNZ ‘Clean Power Capacity Range’ in 2030 (GW)



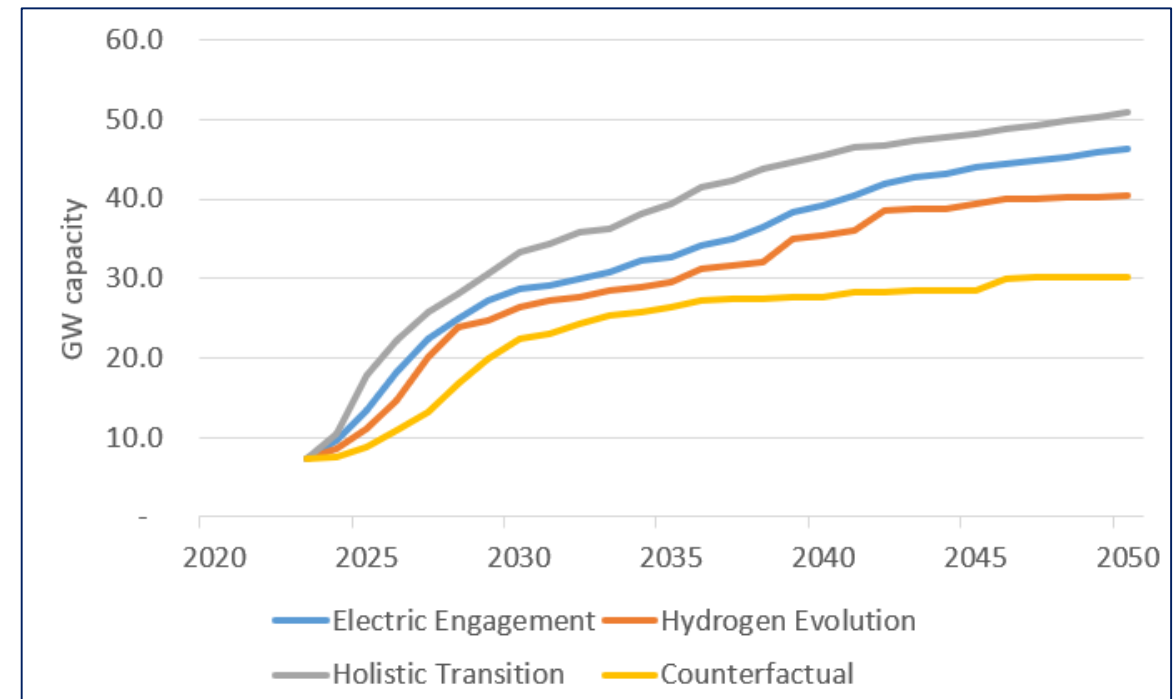
Long-duration electricity storage

Current installed capacity compared to the DESNZ ‘Clean Power Capacity Range’ in 2030 (GW)



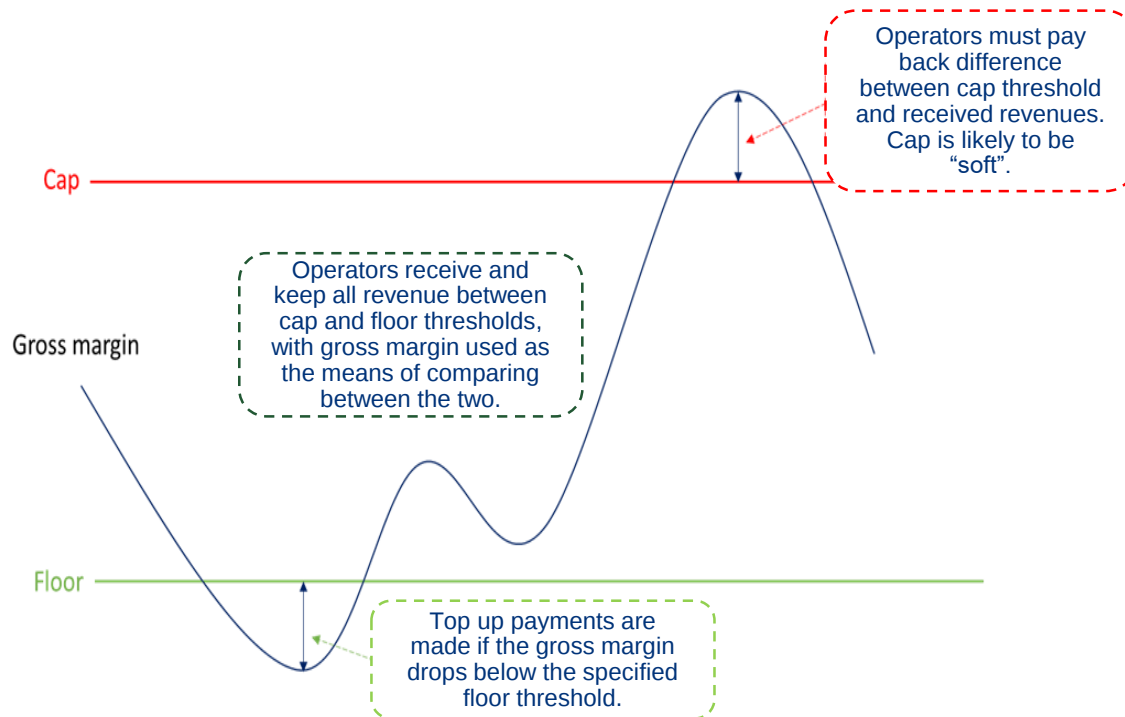
NESO finds that ES capacity increases 7x by 2050 in some pathways.

<https://www.neso.energy/publications/future-energy-scenarios-fes>



Government Policy: Long-duration electricity storage

Cap and floor support mechanism opens 2025



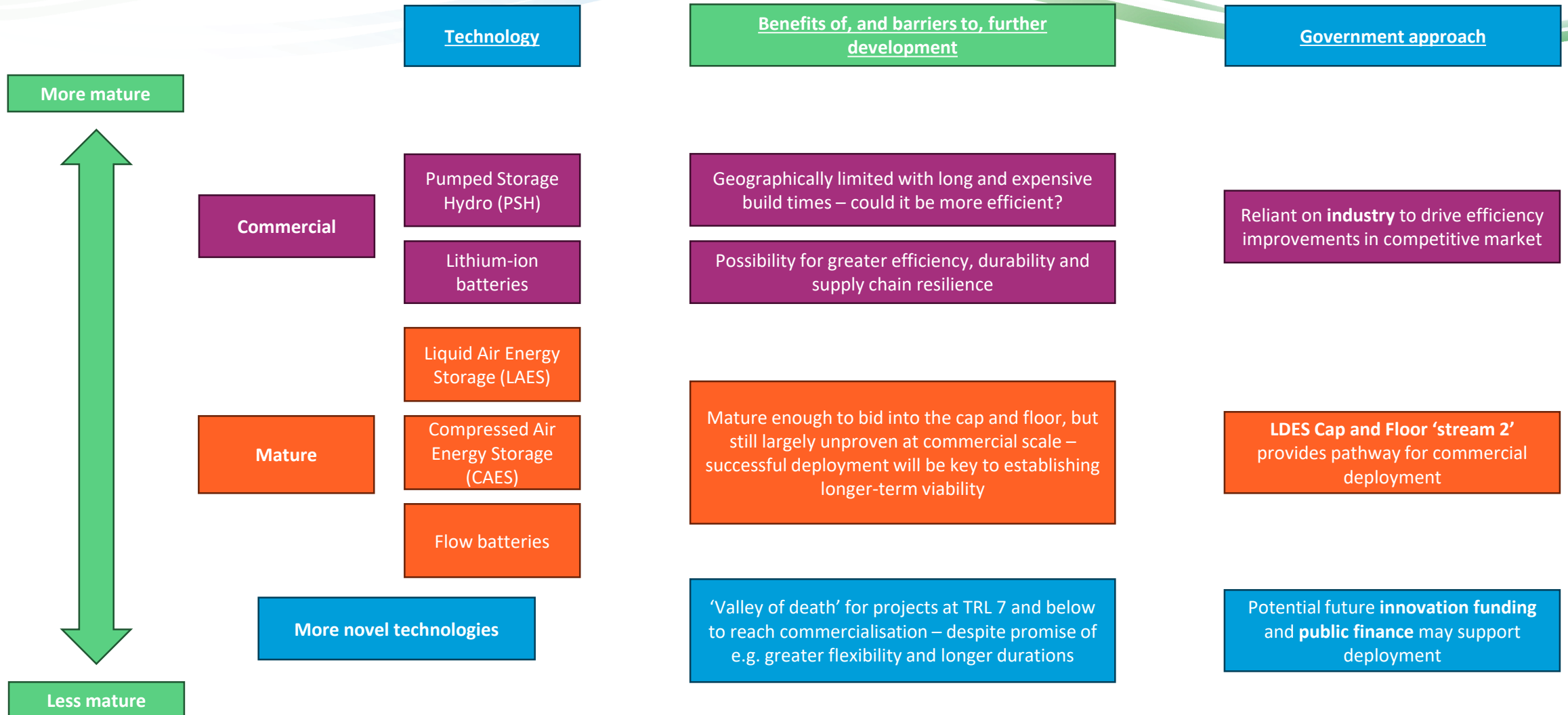
Key parameters:

- Any technology with Technology Readiness Level 8 or 9 can apply, but must be rated at 100MW (50MW for TRL 8) or above, and be able to discharge continuously at full power for eight hours or longer
- For the first window (closing in June), projects need planning permission (for 2033) or evidence they can deliver by 2030

Key dates:

- 8 April 2025: window one opens
- 9 June 2025: window one closes
- Q3 2025: eligibility assessment (pass/fail)
- Q4 2025-Q1 2026: cost-benefit analysis (considering construction costs, system benefits etc.)
- Q1 2026: Ofgem decisions about second window
- Q2 2026: final cap and floor 'contracts' awarded
- 2030/33: target dates for commissioning

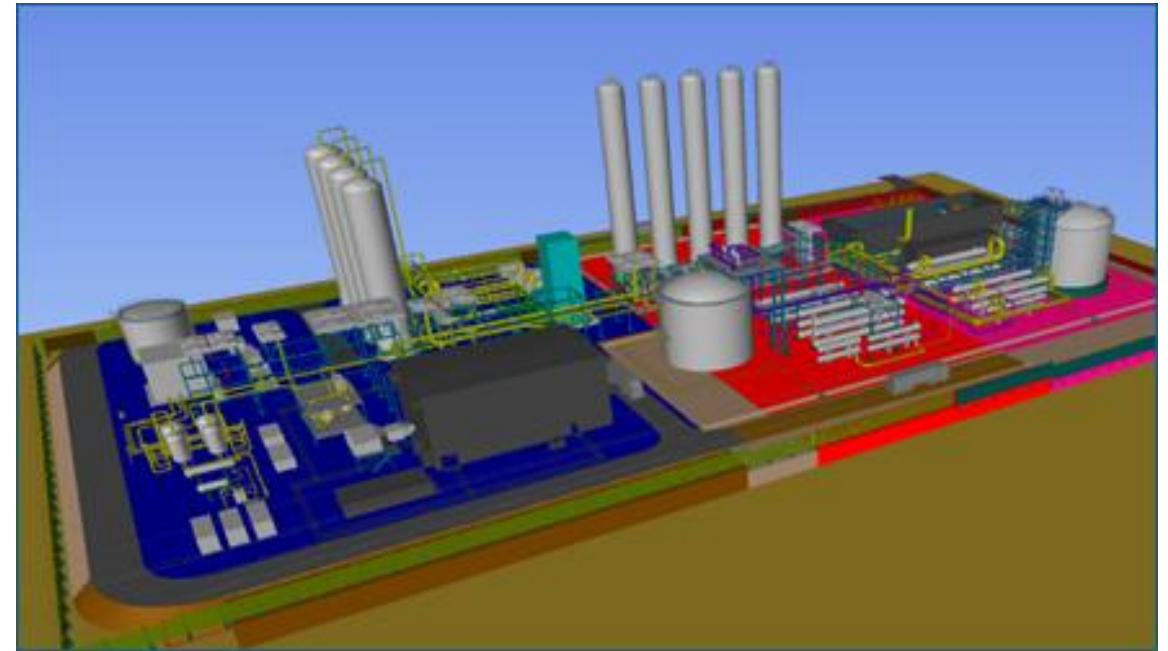
Government Policy: Future Technological Development



- **Consultation on potential changes to Boiler Upgrade Scheme**
 - Includes proposals to support air-to-air heat pumps and alternative electric heating technologies such as heat batteries. Consultation closes 11th June 2025.
- **The Department for Energy Security & Net Zero (DESNZ) is exploring the role heat batteries could play in the future through studies like the Homes for Net Zero Trial**
 - Initial findings expected in late 2025.
- **Officials in the Department engaging positively with the UK heat battery industry to better understand the suitability and performance of the systems.**

Highview – CRYOBattery

- Technology: Liquid Air Energy Storage (LAES)
- Highview power was awarded £10m funding under the DESNZ Storage at Scale programme
- In 2024, Highview Power received £300m in investment from UK Infrastructure Bank (UKIB – now National Wealth Fund), Centrica, and others.
- The investment will enable the construction of one of the world's largest long duration energy storage facilities in Carrington, Manchester, using Highview Power's proprietary LAES technology.
- Once complete, it will have a storage capacity of 300 MWh and an output power of 50 MW per hour for six hours.



StorTera – Single Liquid Flow Battery

- Technology: Lithium sulphur based single liquid flow battery
- Description:
 - High energy density
 - Long life (over 30 years)
 - Efficient (round trip efficiency more than 90%)
 - Low-cost manufacturing
 - Sustainable raw materials
 - Modular system
- First of a kind demonstrator currently being deployed and tested in Edinburgh, Scotland



Advanced Distributed Storage for Grid Benefit (ADSorB)

- Partners: University of Sheffield (lead), Loughborough University, University of Nottingham (demonstrator site), and Mixergy (SME)
- Technology: Two domestically focused heat storage technologies serving both space heating and hot water:
 - Phase change materials for intra/inter-day storage
 - Thermochemical storage for longer durations
- Project description: Manufacture, characterisation, installation and iterative development of the storage and control technologies with real-world demonstration.





IEA Technology Collaboration Programme

The Energy Storage TCP

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