



IEA Technology Collaboration Programme

# COUNTRY REPORT United Kingdom

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ExCo 31 May/ 1 June 2023

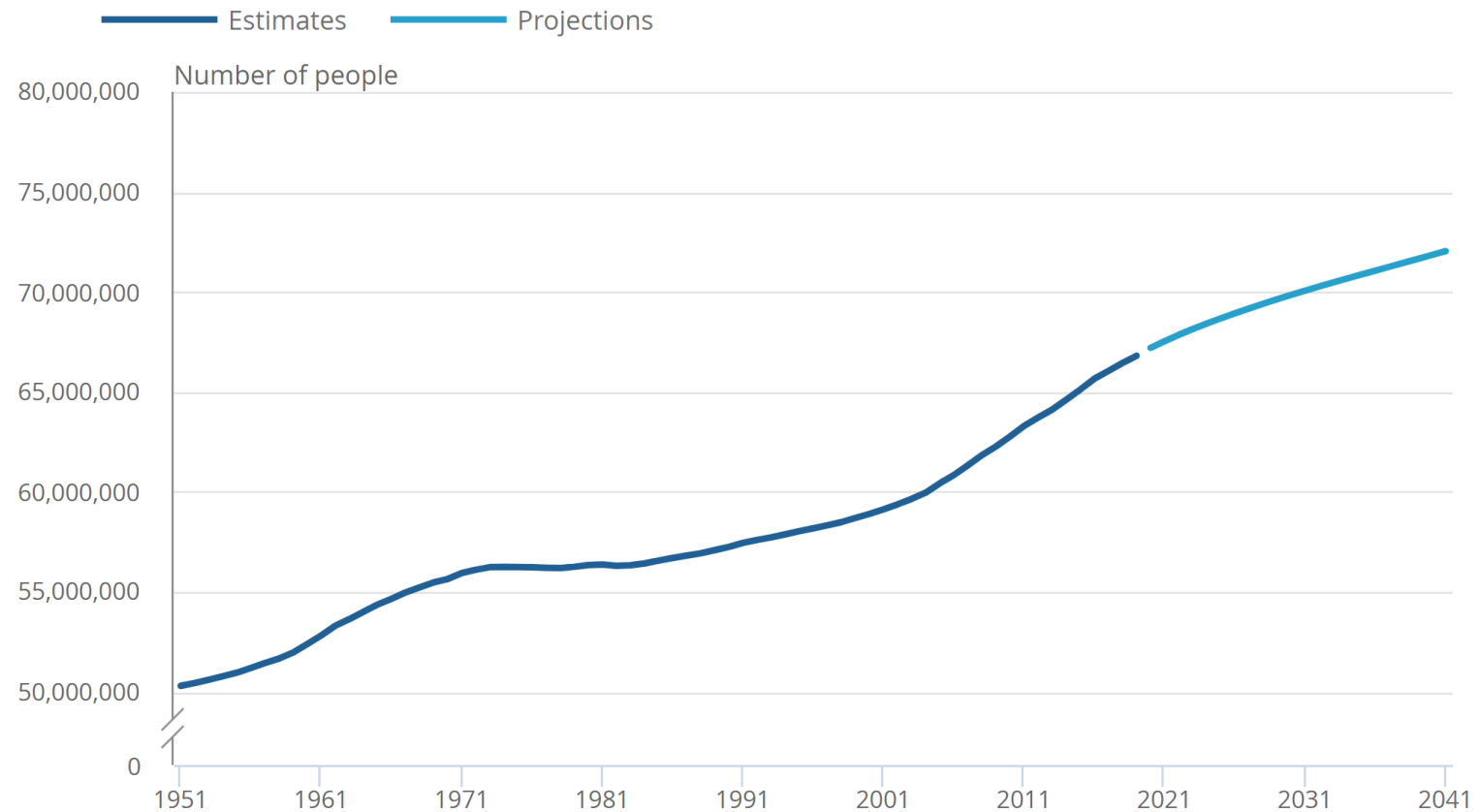
# UK - Population & Demographic

- UK population
- Latest mid-year estimate (2020):
- 67,081,000

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



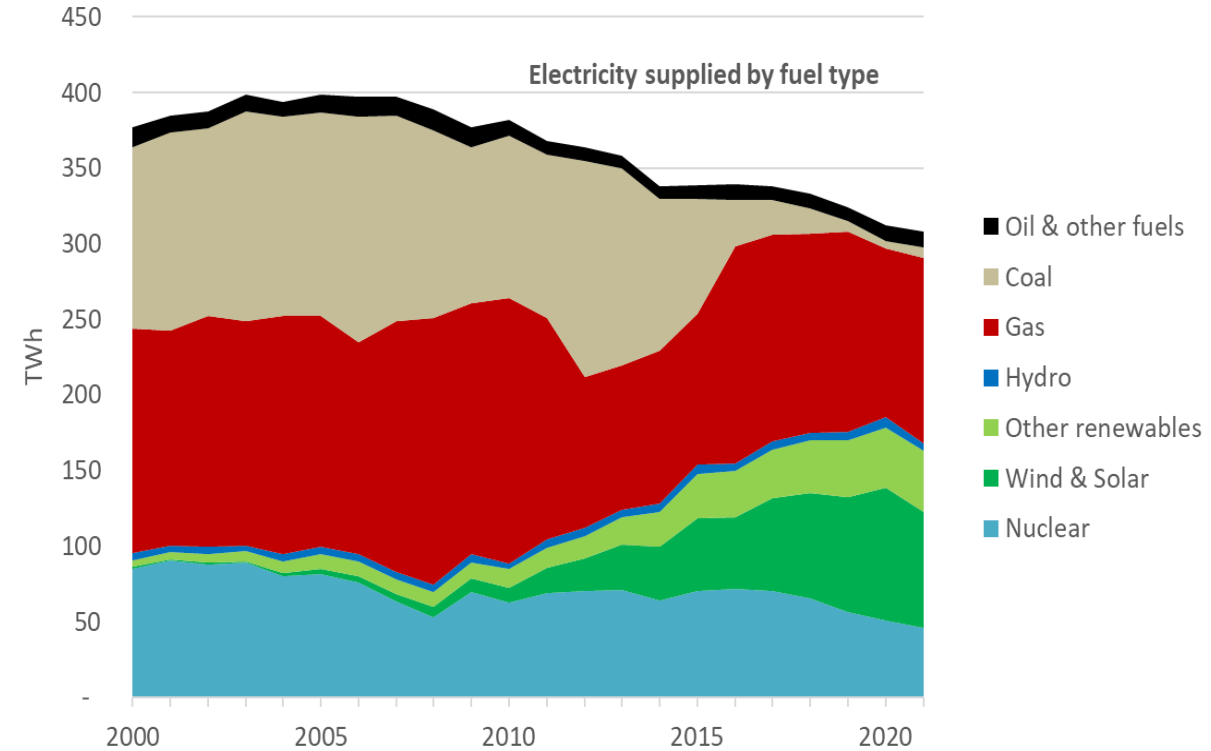
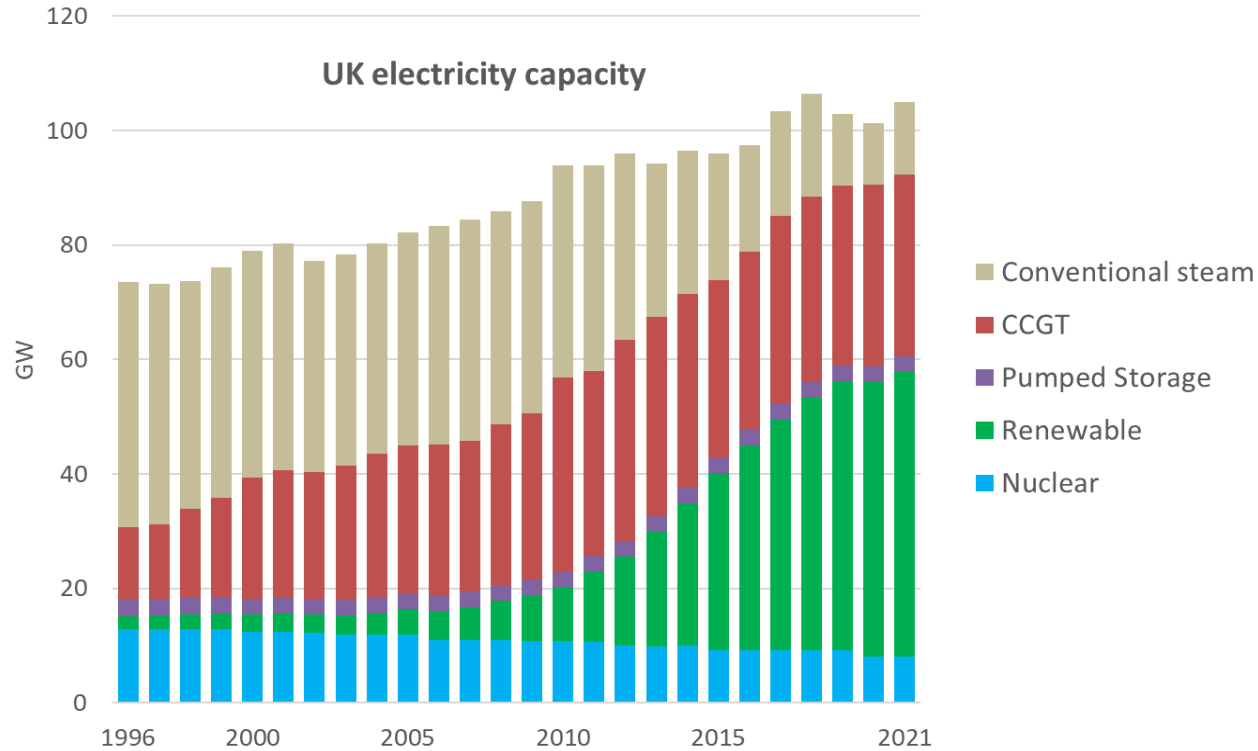
UK population estimates and projections, mid-1951 to mid-2041



**Reference:**

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/articles/overviewoftheukpopulation/2020>

# Country Specific Information

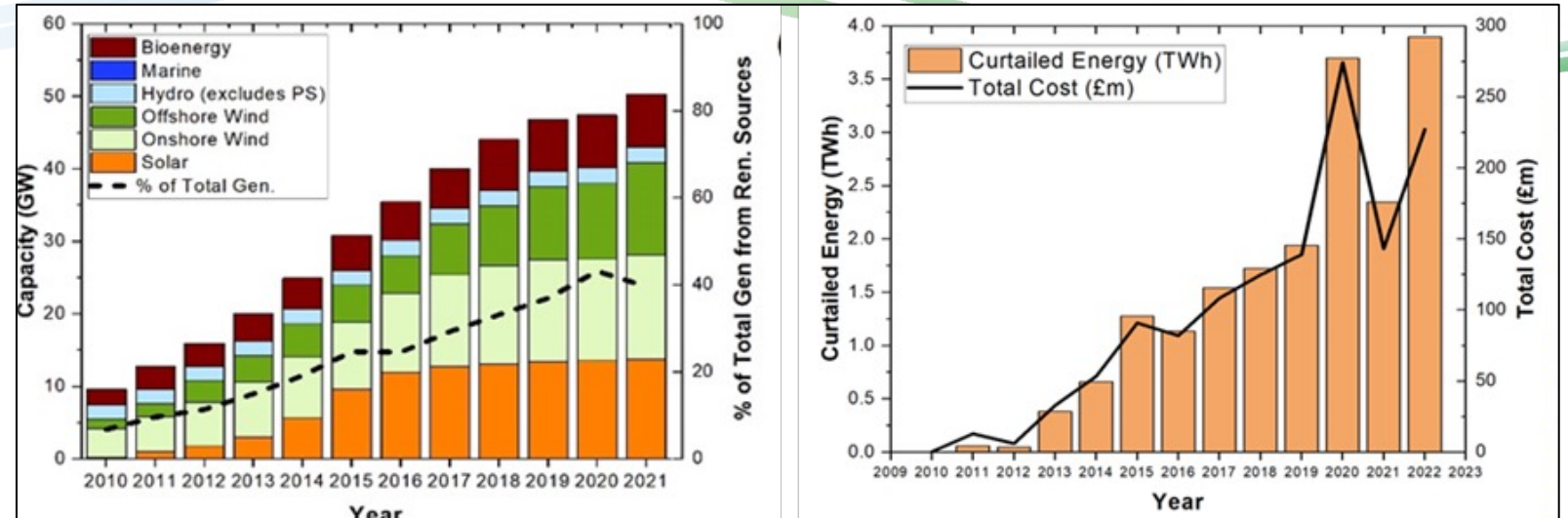


Installed capacity for electricity generation in the UK increased gradually between 1996 and 2018, from 73.6 GW to 101.2 GW. In 2019 and 2020, total capacity fell following the closure of several large coal-fired plants, and the mix of plants shifted towards renewable different technologies.

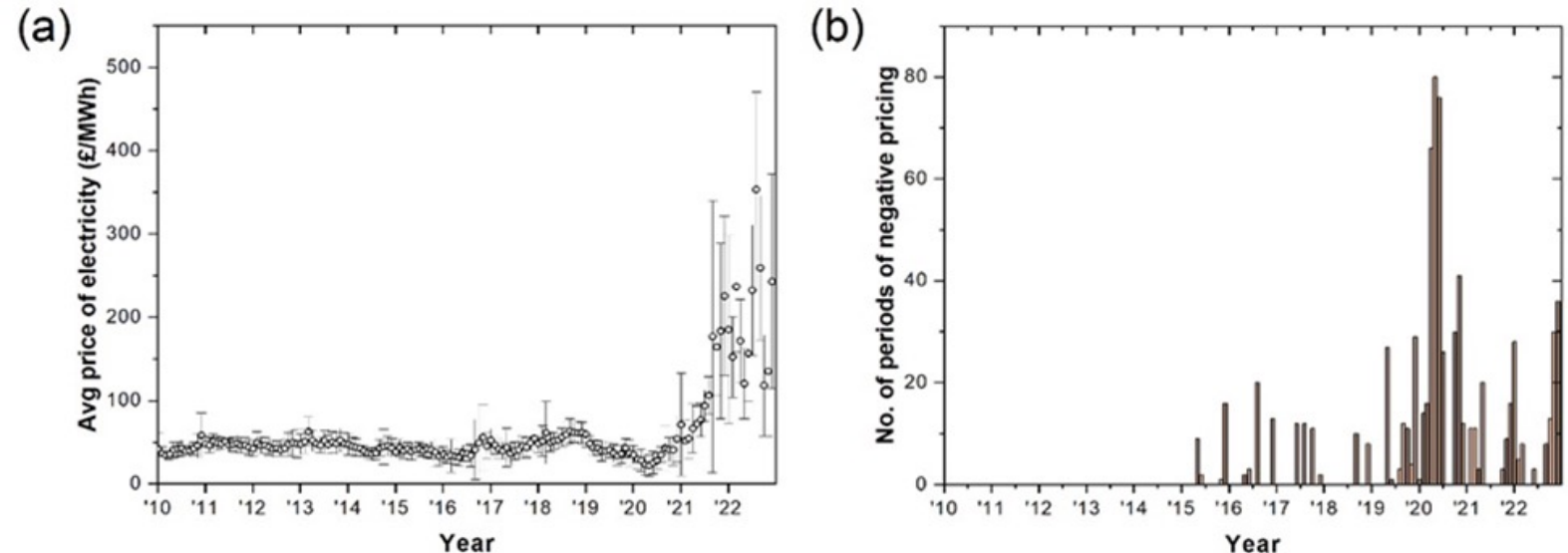
Reference: <https://www.gov.uk/government/collections/uk-energy-in-brief> (2022)

# Electricity market adapting

- **Opportunities for storage opening up:**
  - RES and curtailed energy increasing



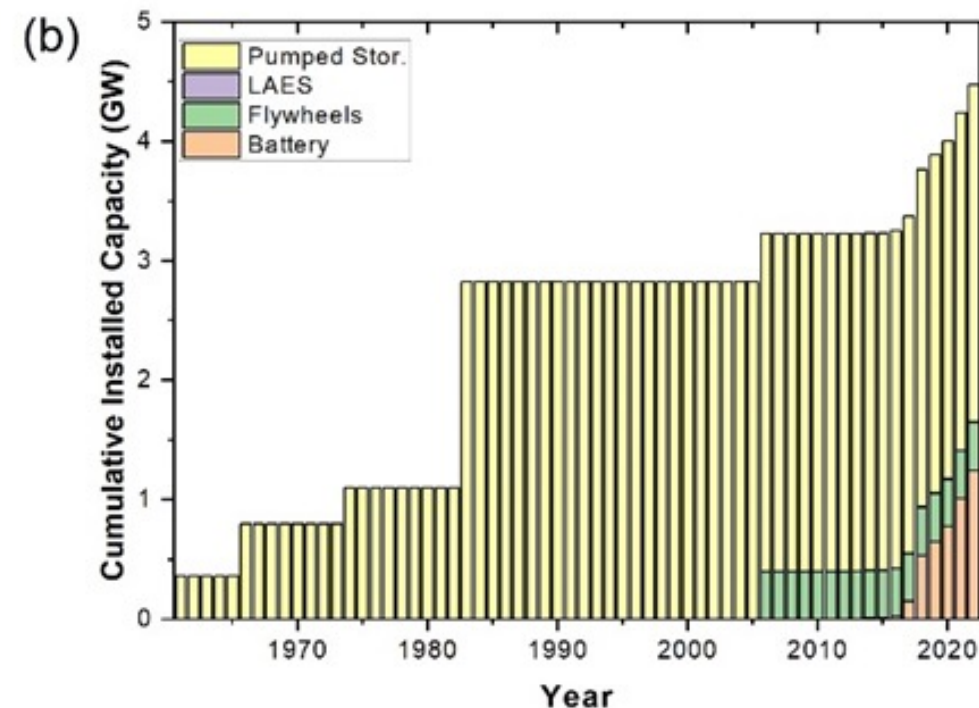
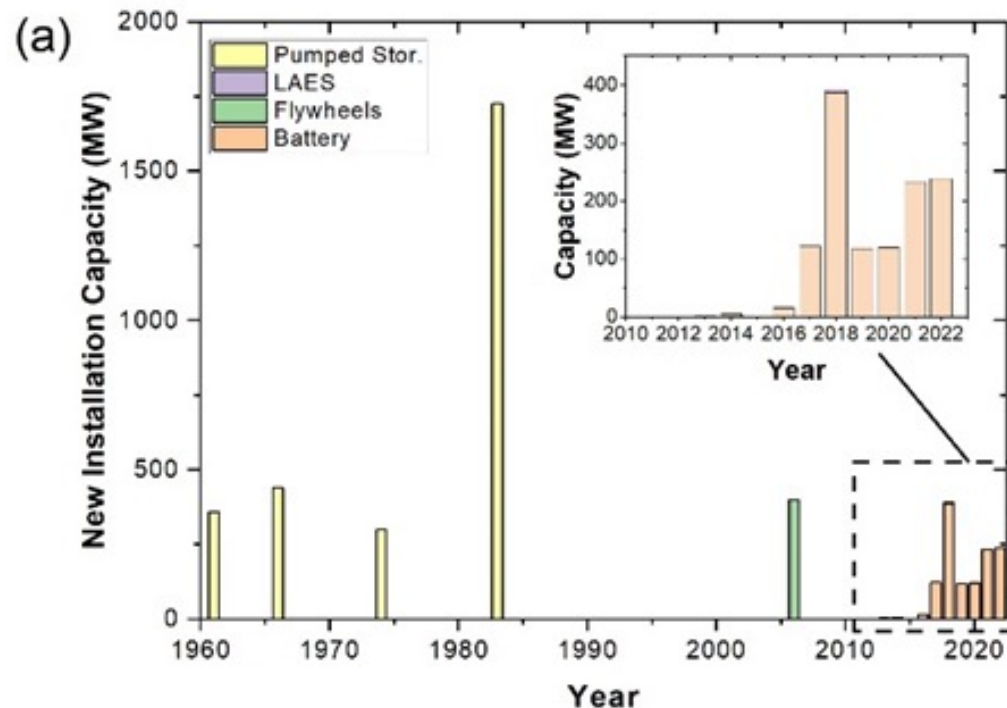
- Variability in market prices, and number of periods with negative price, also increasing.



# Energy Storage Landscape

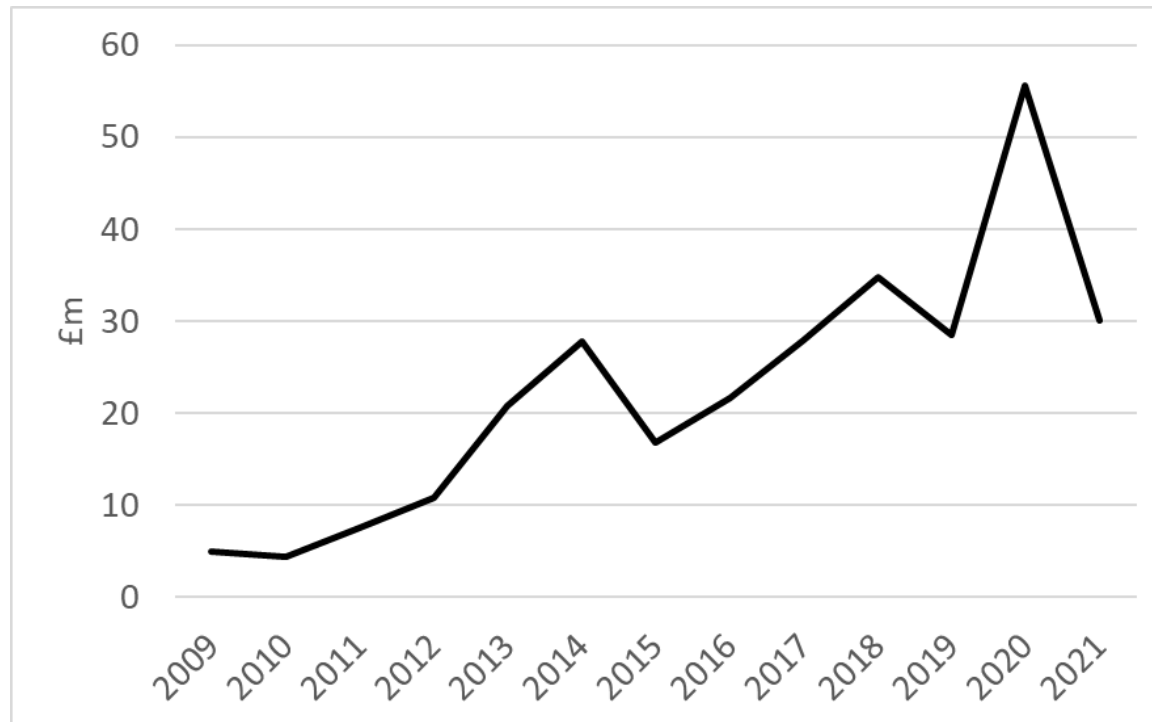
## ■ Capacity

- Today, there is around 4GW of electricity storage operational in Great Britain, made up of 3GW of pumped hydro storage and 1GW of lithium-ion battery storage that has been built since 2017.



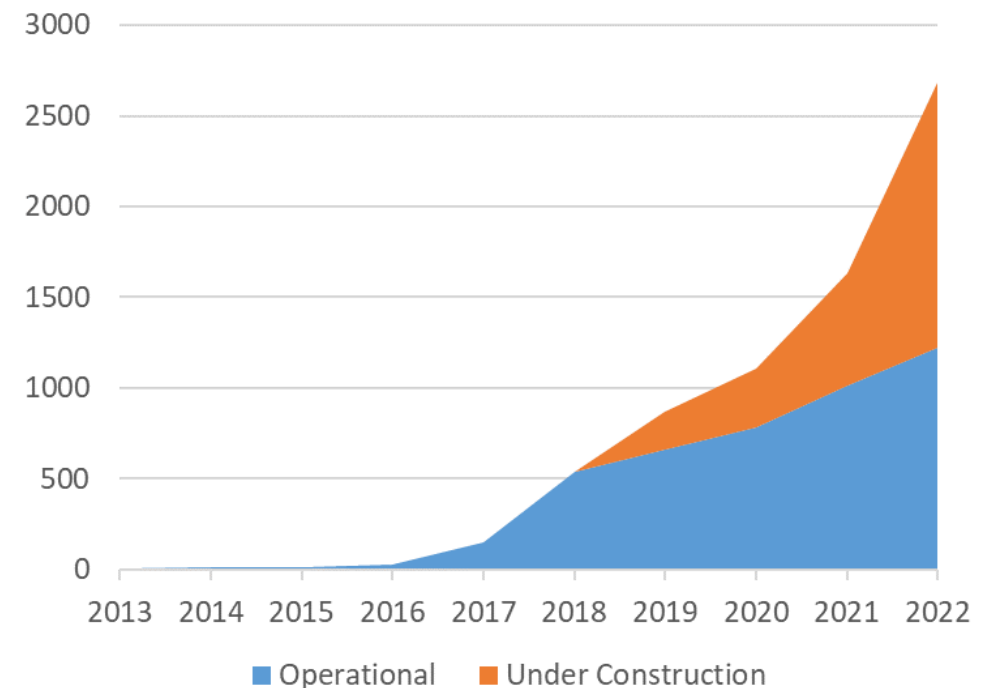
Reference: Renewable Energy Planning Database, Department for Energy Security & Net Zero (<https://www.gov.uk/government/publications/renewable-energy-planning-database-monthly-extract>)

- Energy storage RD&D funding over the last 15 years from other sources: Energy Technologies Institute, Ofgem, Govt departments, Innovate UK (separating out EV specific projects)



Source: IEA statistics

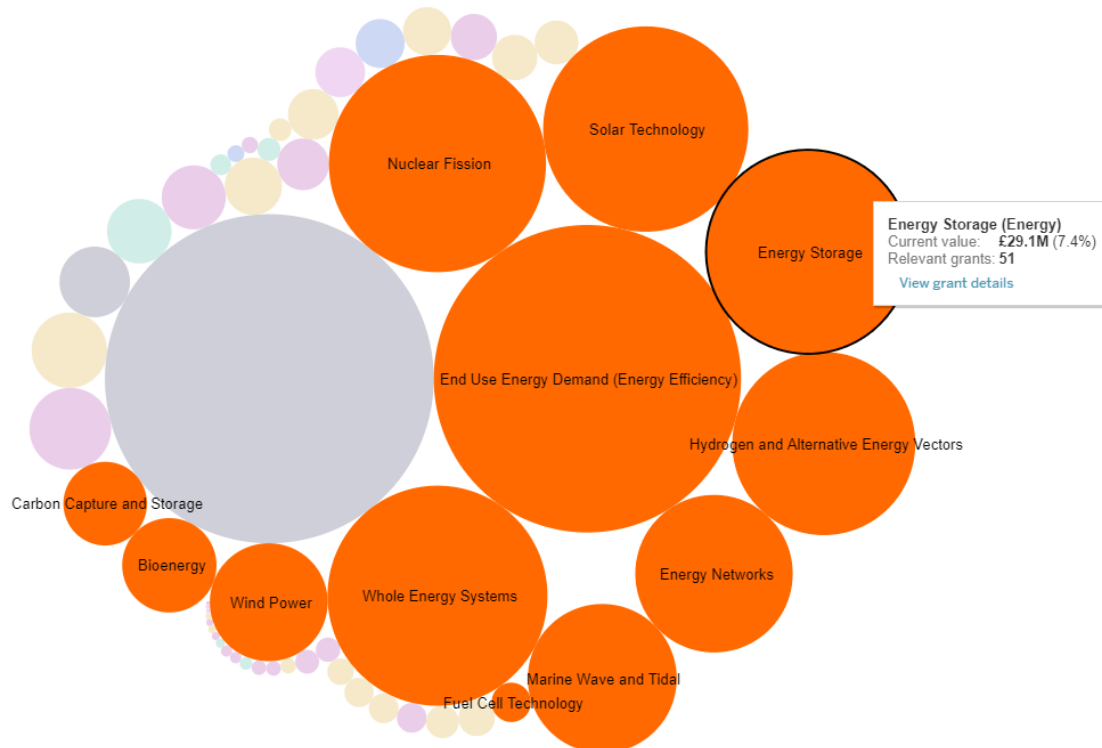
New grid connected battery storage in the UK



Reference: UK Energy Storage Observatory <https://ukesto.supergenstorage.org/>

# Energy Storage Research

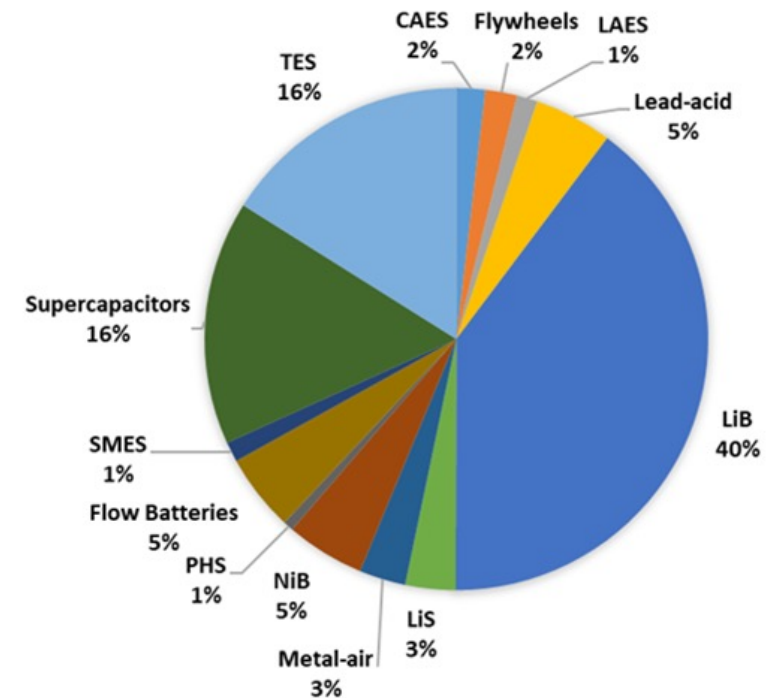
- Currently 51 research projects on energy storage, value £29m.



## UK Research Councils Energy and Decarbonisation portfolio

<https://public.tableau.com/app/profile/epsrccdatateam/viz/VisualisingourPortfolio/VoP>

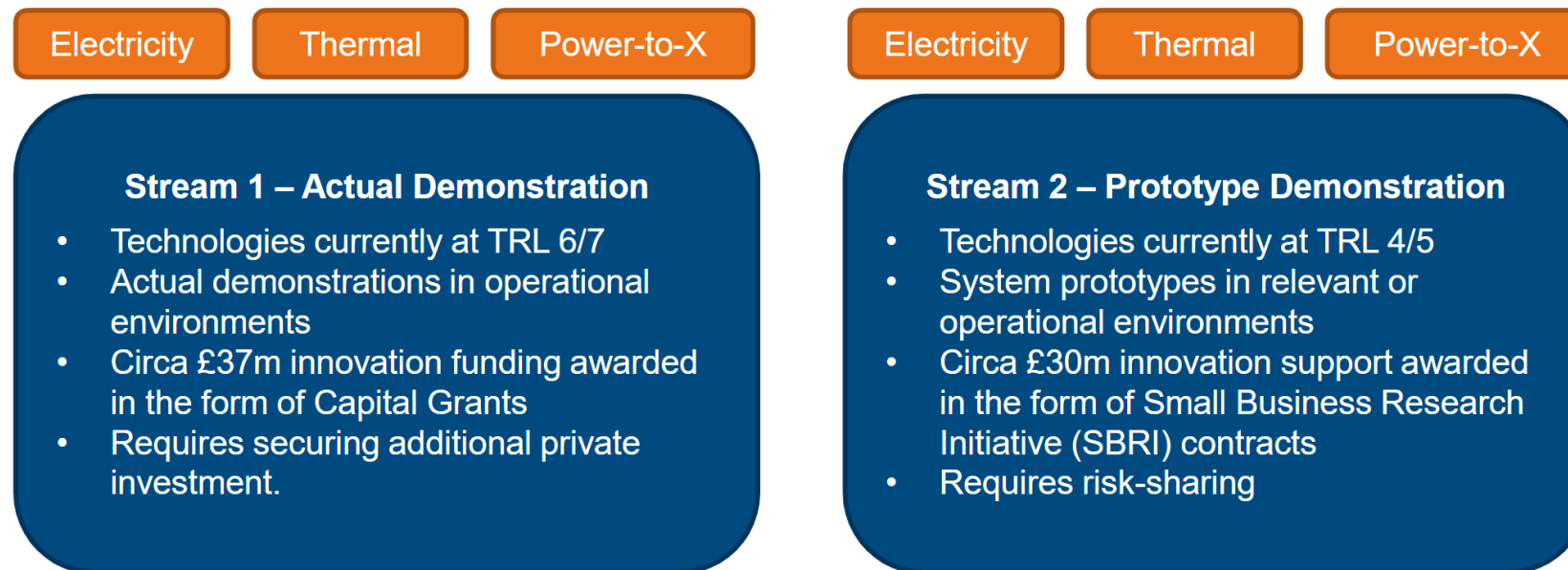
## UK energy storage publications by technology, 2000-2020



Reference: University of Birmingham analysis from Web of Science data

## ■ Longer Duration Energy Storage Demonstration (LODES)

- **£69m funding** for first-of-a-kind longer duration energy storage technologies
- **Now in Phase 2:** 8 demonstrators in progress (5x electricity; 2x thermal; 1x power-to-x)
- Completion by **end of March 2025**



- **Machinery of Government (MOG) change**

- Now Department for Energy Security & Net Zero
- Secretary of State: Grant Shapps; Minister of State: Graham Stuart

## Transition to a smarter, more flexible energy system, including:

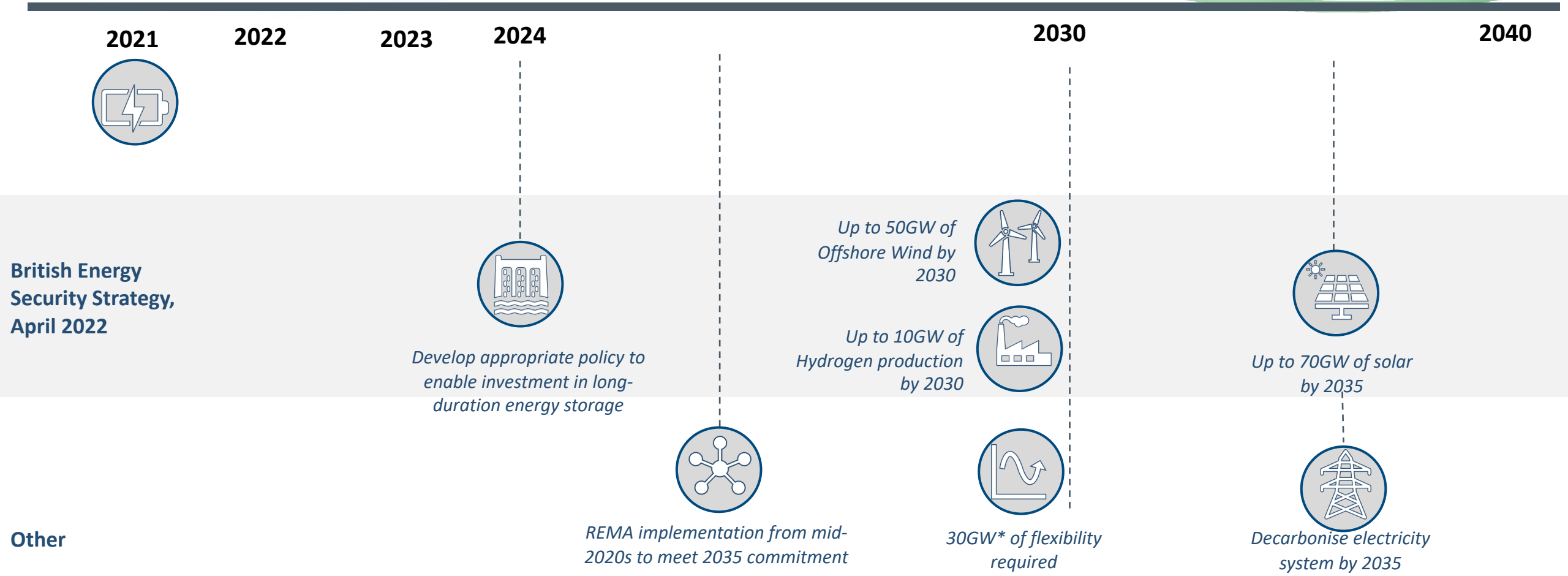
- **Continue progress towards a best-in-class regulatory framework for storage**

- **Facilitating the deployment of large-scale and long-duration storage**

- In the Powering up Britain: Energy Security Plan, we committed to putting in place an appropriate policy framework by 2024 to enable investment in large scale long duration electricity storage (LLES), with the goal of deploying sufficient storage capacity to balance the overall system.
- We are currently undertaking the next phase of policy development to assess what policy approach is best suited to enable investment in LLES projects and anticipate that we will be consulting stakeholders on a policy approach this year.

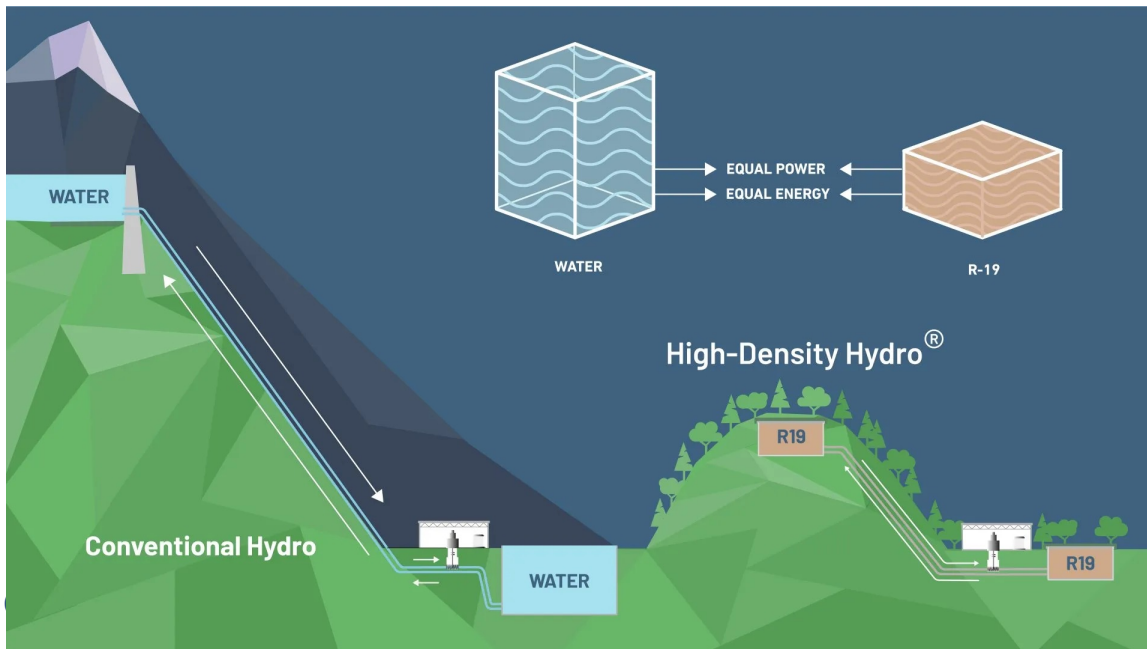
- **Removing barriers and distortions to domestic and small-scale storage**

# UK Government Ambition

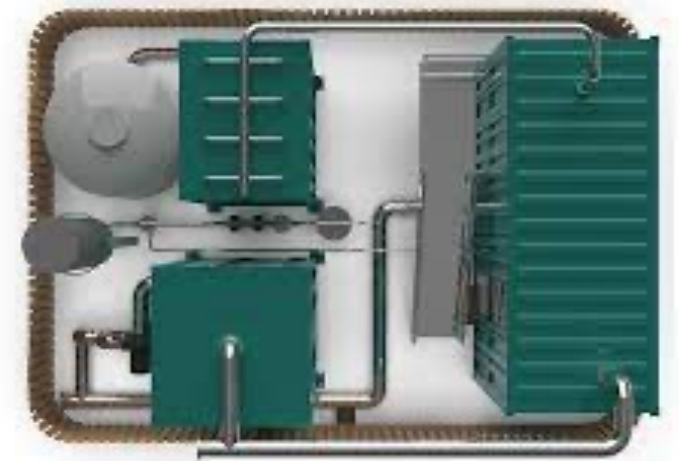


# Case Studies: LODES Stream 2 Phase 2

- [RheEnergise](#) – High-density<sup>®</sup> Hydro
- £8,242,965
- Closed loop pumped hydro system using environmentally benign fluid
  - 2.5x denser than water
- First-of-a-kind demonstrator in Devon

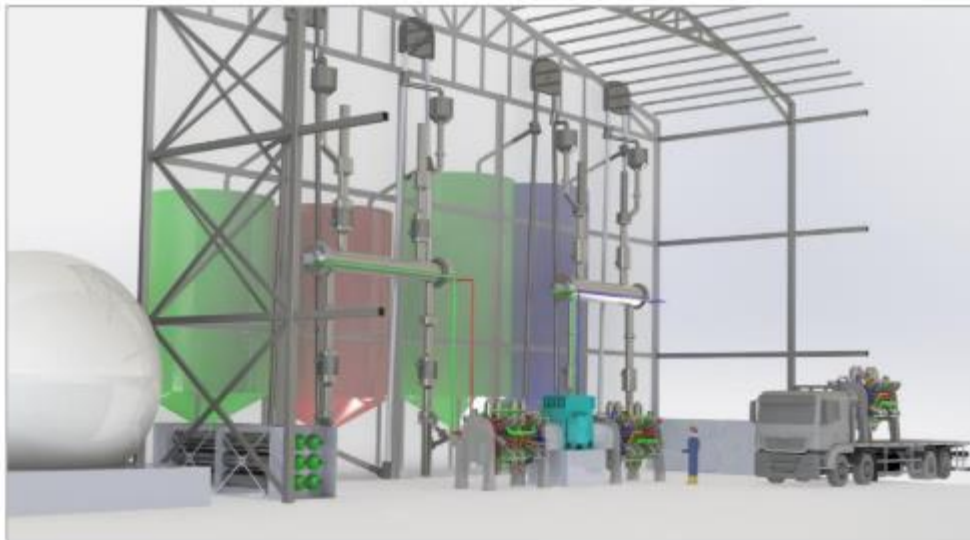


- [Cheesecake Energy](#) - Flexitanker
- £9,447,225
- Combines compressed air energy storage (CAES) and thermal energy storage
- Test unit at University of Nottingham; multiple systems in Colchester co-located with solar microgrid & district heat network



# Case Studies: LODES Stream 2 Phase 2

- **SynchroStor - Pumped Thermal Energy Storage (PTES) Demonstrator**
- **£9,439,302**
- **Patented PTES technology**
  - Electricity to heat, stored in low-cost, non-toxic sustainable materials
  - Reverses process to generate electricity when required
- **Grid-connected 1MW demonstrator with 10 hours of storage**



- **IEA ES TCP Newsletter Dec 2022 case studies:**
  - Sunamp Ltd. – Extend
  - EDF R&D UK – HyDUS
  - StorTera – SLIQ
- **Final 2 LODES projects:**
  - University of Sheffield – ADsoRB
  - Invinity - (Stream 1) – VFB LEAD

# Other Relevant Information

## ■ UK Government Publications

- [Smart System and Flexibility Plan, July 2021 \(BEIS and Ofgem\)](#)
- [Net Zero Strategy: Build Back Greener, Oct 2021](#)
- [British Energy Security Strategy, April 2022](#)
- [Powering Up Britain: Energy Security Plan, March 2023](#)
- [Longer Duration Energy Storage Demonstration: Successful Projects](#)

## ■ Events

- Thurs 29<sup>th</sup> June: UK National Team meeting followed by Task 42 meeting
- Sept 11<sup>th</sup>: Next Supergen Energy Storage Network+ annual meeting, Imperial College



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## The Energy Storage TCP

*Country reports are an informative contribution of the ExCo delegates of the ES TCP member countries.  
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