

The future role of hydrogen in the energy system as a source of flexibility







Source: Qadrdan, 2024 "Overview of flexibility services in the GB power system", EDRC



A whole systems approach





How much flexibility do we need?

- That question has some inbuild assumptions that current patterns of consumption shift from fossil to gas, without any attention to the patterning of consumption
- I.e. The 'need' to keep homes warm or to travel is a given and we just vary how that is achieved.
- Marsden, Shove, Torriti (2024). 'How much storage do we need in a fully electrified future? A critical review of the assumptions on which this guestion depends'







- 2.7GW current long duration storage (mainly pumped hydro)
- 7-15GW needed by 2050 needed (duration 6 hours plus)



Figure ES.17: Long-duration energy storage installed capacity (excluding vehicle-to-grid and hydrogen)

Source: NESO Future Energy Scenarios

HI-ACT Hydrogen Integration for Accelerated Energy Transitions

60 50 40 GW 30 20 10 0 2020 2025 2030 2035 2040 2045 2050 -Hydrogen Evolution -Electric Engagement -Holistic Transition ----Counterfactual

Figure ES.22: Low carbon dispatchable capacity

Source: NESO Future Energy Scenarios



Figure ES.37: Hydrogen storage capacity requirements



Source: NESO Future Energy Scenarios



Source: Underground hydrogen storage: a review | Geological Society, London, Special Publications (lyellcollection.org)



UK Salt Cavern Prospectivity showing wells drilled and found to have Halite bedding. UK Gas Networks also shown



Source: Data from <u>UK Hydrogen</u> Storage Database | GeoSciences





HI-ACT Hydrogen Integration for Accelerated Energy Transitions

Our mission is to deliver impactful research, through co-creation with stakeholders, which delivers an evidence base for hydrogen integration in the future net-zero energy transition. As well as technical integration questions, HI-ACT will also look at broader topics such as the development of cyber-physical architecture and the hydrogen supply chain, and how the perceptions of policy makers and the wider public will influence hydrogen rollout. (NOTE: we look at hydrogen and hydrogen based alternative liquid fuels (HALF)).





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