

# H<sub>2</sub> Storage: new £10+ billion UK infrastructure sector



- ✓ The Royal Society predict UK will need c. 60-100 TWh of new build hydrogen storage by 2050, National Grid 2023 FES STS predicts ~50 TWh by 2050, primarily to store excess renewable electricity to meet future peak demand periods
- ✓ Translates to a new UK asset class potentially of ~£10+ billion, with potential £ multibillion per year revenue market.
- ✓ GOV/DESNZ supports underground salt-cavern storage as the most cost-effective and readily deliverable large-scale energy storage solution. H<sub>2</sub> storage Revenue Support included in 2023 Energy Act. **Live: 1<sup>st</sup> Allocation round Q3 2022**
- ✓ Initial hydrogen economy will be regional: decarbonisation requires clustered storage, production and demand. Only Dorset, E. Yorkshire and Cheshire salt basins suitable for large mainland salt-caverns.



# UKEn: H<sub>2</sub> Storage Portfolio

- Green Energy Developer set up by highly experienced AIM listed project development entity/team.
- Portfolio of 3 new national scale coastal salt cavern sites, each of ~2.7 TWh (~0.9 bn m<sup>3</sup>) ~15-20 caverns/site. Each site potentially = ~20% of predicted UK 2050 storage demand\*.
- 2 sites in Dorset, 1 in E. Yorkshire. Sites secured (60 years) or under advanced negotiation. Leading engineering, planning consultants and advisors engaged since 2021, including DEEP.KBB, Penspen, Xodus Group, Hill Dickinson, Zetland.
- Biweekly to monthly engagement with Government: UKEn one of 5 storage operator members of DESNZ Hydrogen Storage Business Model Design Group. Extensive ministerial level political engagement.
- 2031-32 target operational start.
- Portfolio has offshore wind, green hydrogen, H2P and hydrogen import/export add-on opportunities



\* National grid 2023 FES STS scenario, H<sub>2</sub> storage @ max fill/withdrawal cycles = ~10.4 TWh/year



# Why is UKEn H<sub>2</sub> Storage needed?



Hydrogen storage is fundamental to the operation and success of the UK's future sustainable low carbon energy system :



\* H<sub>2</sub>P=hydrogen to power i.e. electricity generated by clean combustion in hydrogen fuelled turbines



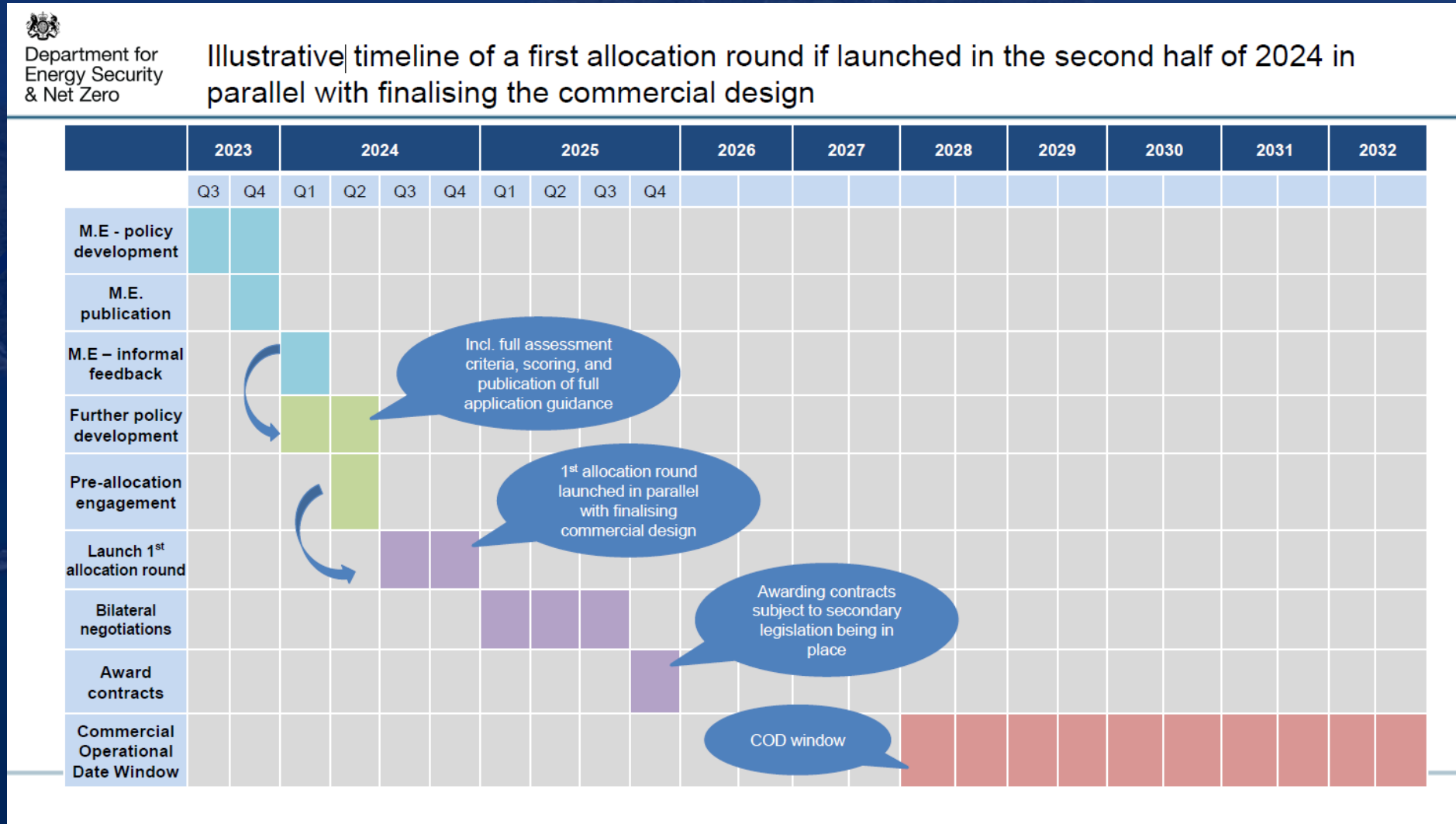
## H<sub>2</sub> Storage: Primary end-use in early network stage to 2050



- **H<sub>2</sub> Pipeline stability:** ensure Project Union & H2 Connect pipelines are full to maintain operating pressure.
- **Operational Storage:** H<sub>2</sub> producers & end users- require 2-4 weeks supply to maintain system resilience and efficiency i.e., to permit peak demand to be met.
- **H2P** (hydrogen to electrical power) e.g., Marchwood and Chickerell power plants within Solent Cluster, Didcot and other Green/low carbon H2 power in Southern UK & S. Wales, Humber, Teesside.
- **Inter-Seasonal storage:** now seen as much lower component of storage demand unless significant hydrogen based winter heating occurs.



# UKEn H<sub>2</sub> Storage: DESNZ First Allocation Round timing



\* Second Allocation Round expected ~ 12 months later in Q3 2025



# UK Sovereign Revenue Support



UKEn/industry lobbying helped Hydrogen Storage amendment into the 26/10/23 Energy Act. UKEn member of DESNZ Hydrogen Storage Business Model Design Group since Q4 2022.



DESNZ announced a “minded to” revenue support model 2<sup>nd</sup> August 2023.



Revenue Support currently aims to provide 15-year sovereign underwritten annual revenue ‘Floor’ to repay capital and fixed operating costs plus a small return on capital employed at a level similar to wind farm CfD (i.e.~1-2% over LIBOR/Gilts). If granted, support **creates significant terminal value in year 16 post support plus 30-45+ years remaining debt-free project life.**



Revenue support to include profit/gainshare upside to enable a higher target return above the revenue support floor return for efficient/active operators. Private law contracts envisaged.





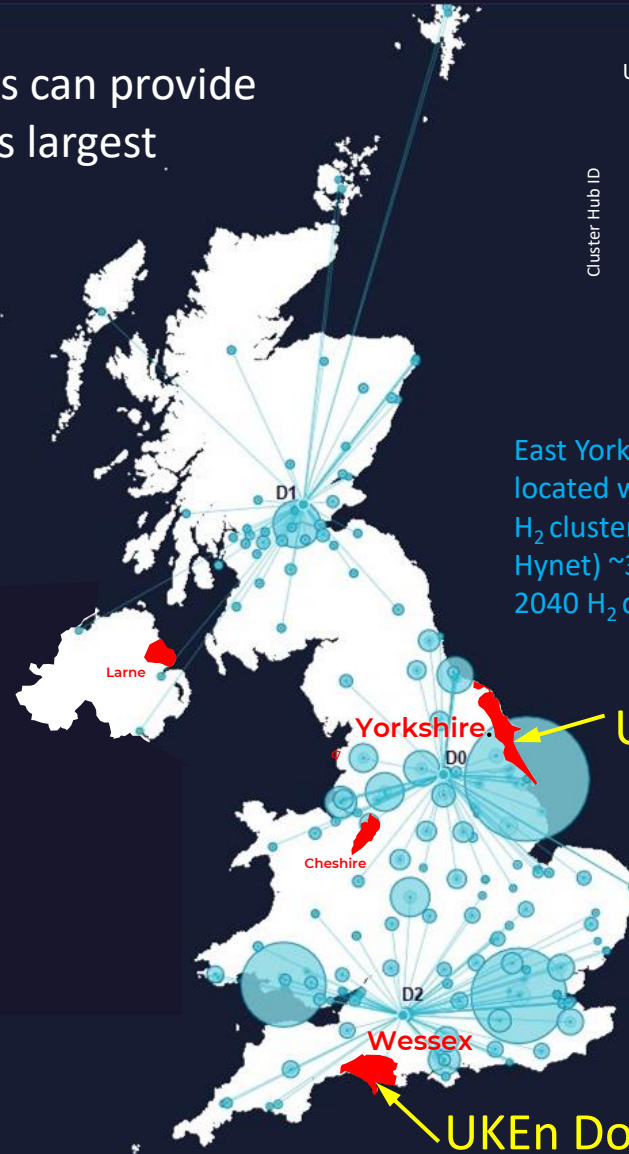
**First storage allocation round announced on 14/12/23. Round start timing ~Q3 2024, bids by end Q4 2024. Signed contracts by Q4 2025. Further rounds to follow, 2<sup>nd</sup> Round possibly Q3 2025. General Election may cause delays**



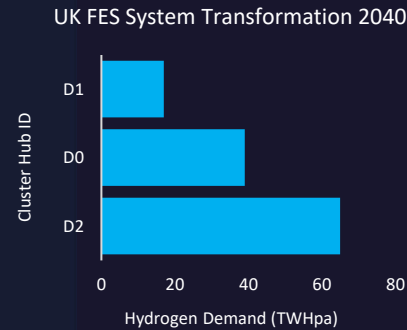
# Storage for UK's two largest H<sub>2</sub> Demand Centres

UKEn's Dorset & Yorkshire projects can provide strategic storage solutions for UK's largest hydrogen demand clusters

-  Salt (halite) deposit capable of holding large caverns
-  2040 H<sub>2</sub> demand centre
- D2** Cluster ID/centre of gravity

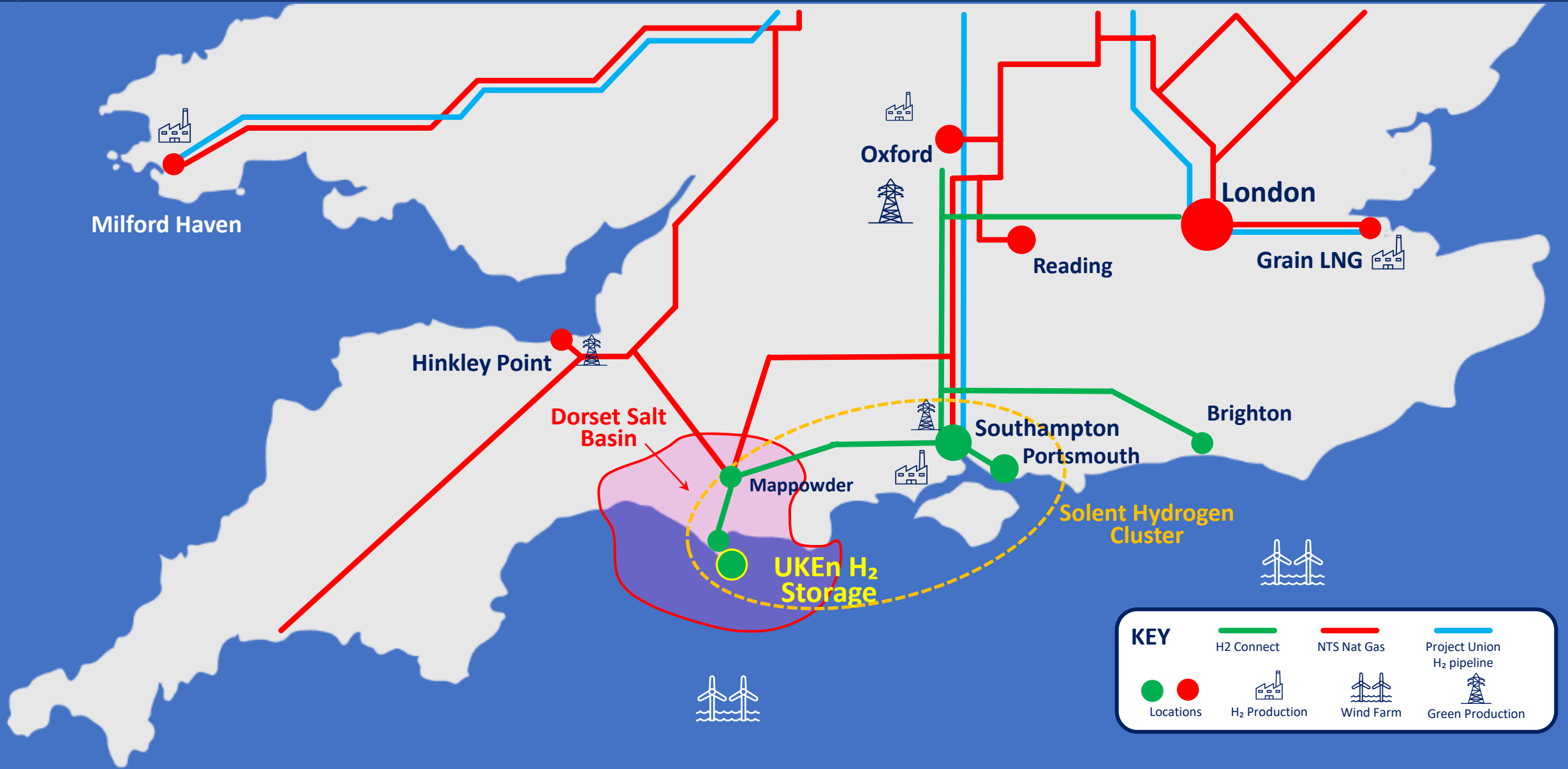


East Yorks & Cheshire Salt co-located within the (D0) Track #1 H<sub>2</sub> clusters (Humber, Tees & Hynet) ~33% of projected UK 2040 H<sub>2</sub> demand



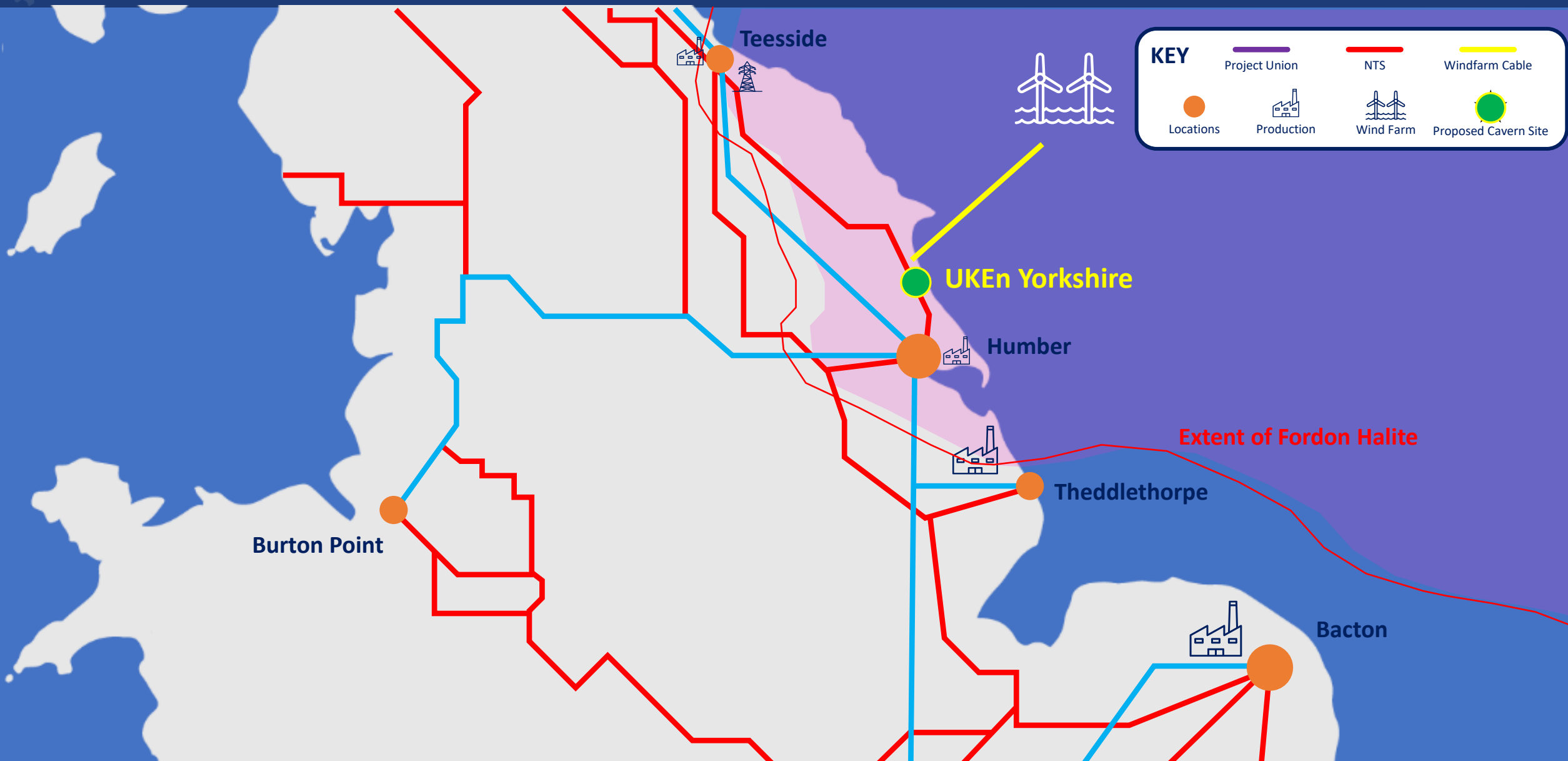
Dorset provides the only co-located salt Deposit within the Southern UK super cluster (D2) ~56% of projected 2040 UK H<sub>2</sub> demand

# UKEn Dorset: A key element of S. UK H<sub>2</sub> infrastructure





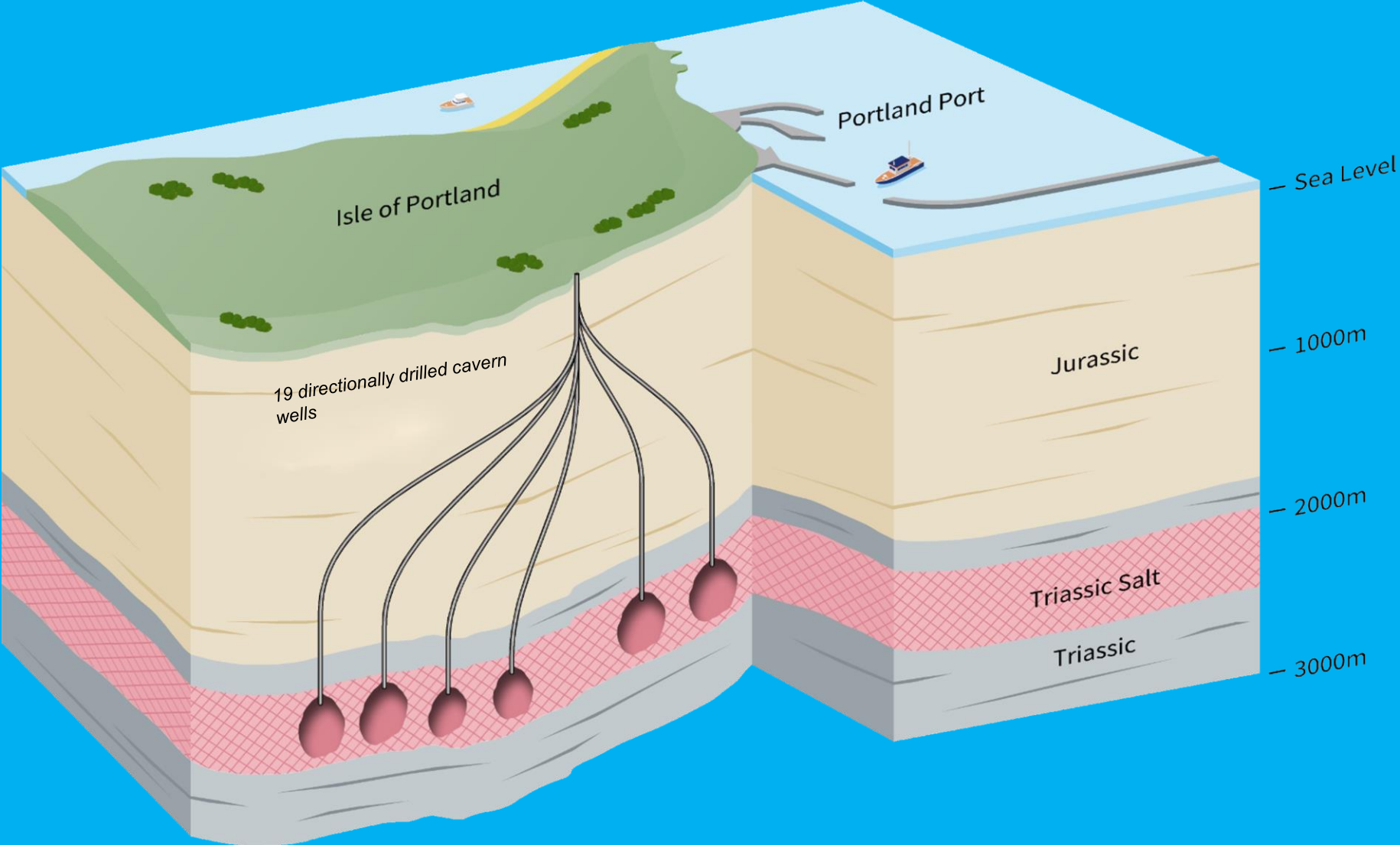
# UKEn Yorkshire: potential key element of NE H<sub>2</sub> infrastructure



**KEY**

Project Union	NTS	Windfarm Cable
Locations	Production	Wind Farm
		Proposed Cavern Site

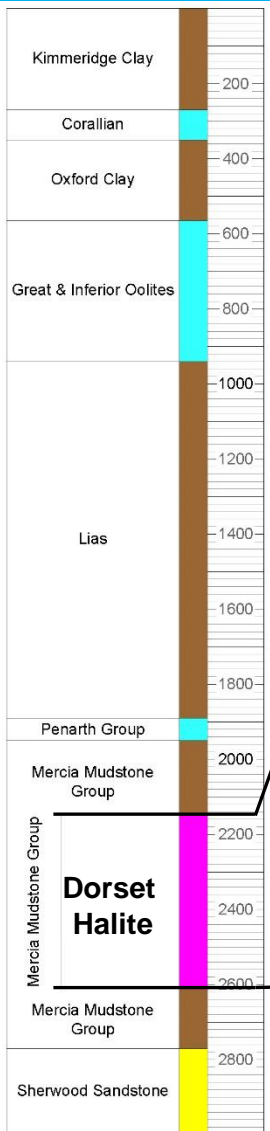
# Dorset ~0.9 bcm (~2.7 TWh static volume)



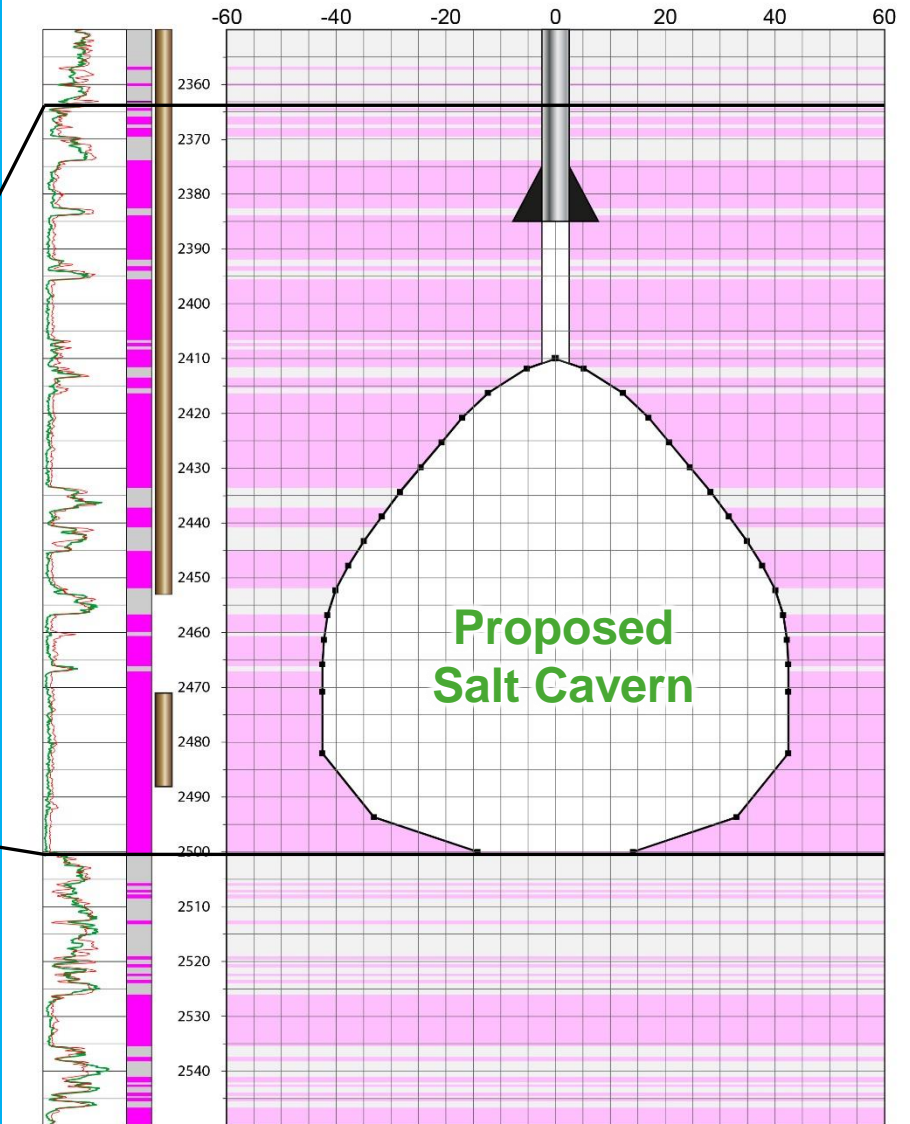
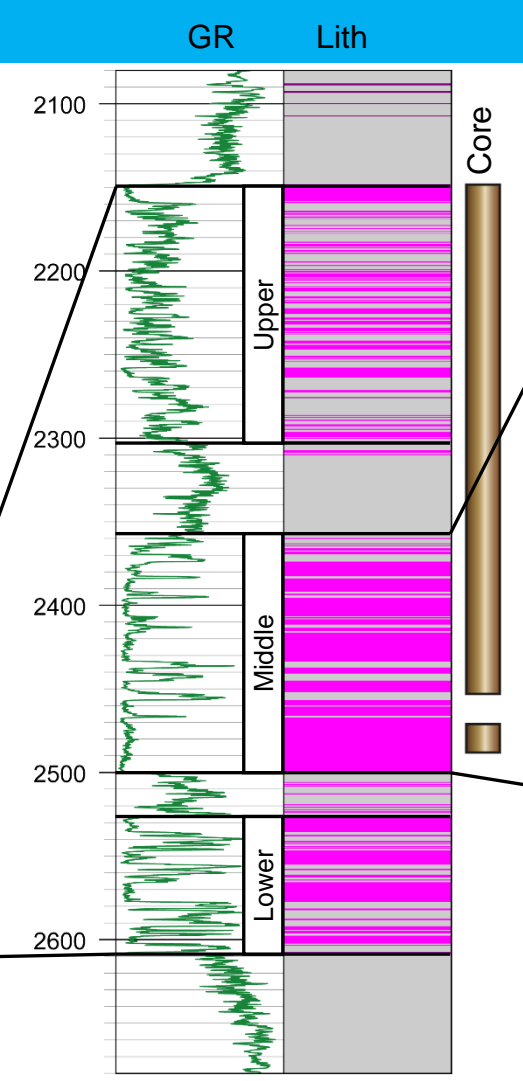


# Dorset salt cavern design

Portland-1a



Dorset Halite Interval



- Drilled in 2006, ~100m from UKEn site
- High quality electric log data plus 326m of core through Dorset Halite Upper and Middle Salt
- Core and log data used to calibrate DEEP.KBB geotechnical cavern design
- Salt properties defined by core can be extrapolated to other areas in the basin via electric log correlation

*DEEP.KBB cavern design  
Logs plotted in MD (m)*