

# UKEn Hydrogen Storage



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*Major UK  
Energy  
Hub*




UK  
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- UK Energy Storage (UKEn) is a wholly owned subsidiary of UK Oil & Gas Plc
- Experienced management team transitioning company out of oil and gas and into energy storage
- Salt cavern hydrogen storage projects in:
  - Dorset
  - East Yorkshire


# 2040 Hydrogen Demand

Dorset provides the only co-located salt deposit within the UK's largest cluster (D1) with ~48% of projected 2040 UK H<sub>2</sub> demand

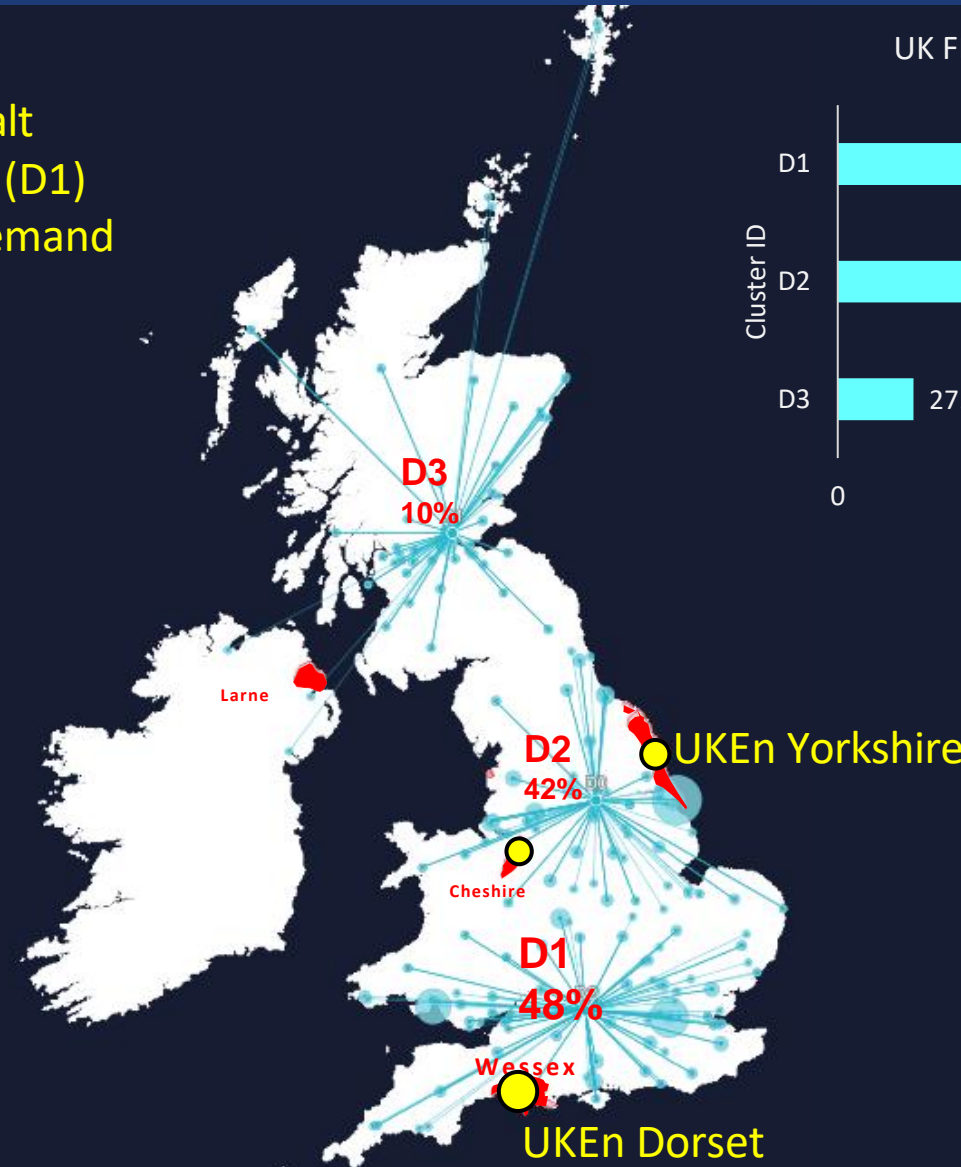
 Salt (halite) deposit with 100+m effective thickness

 2040 H<sub>2</sub> demand centre

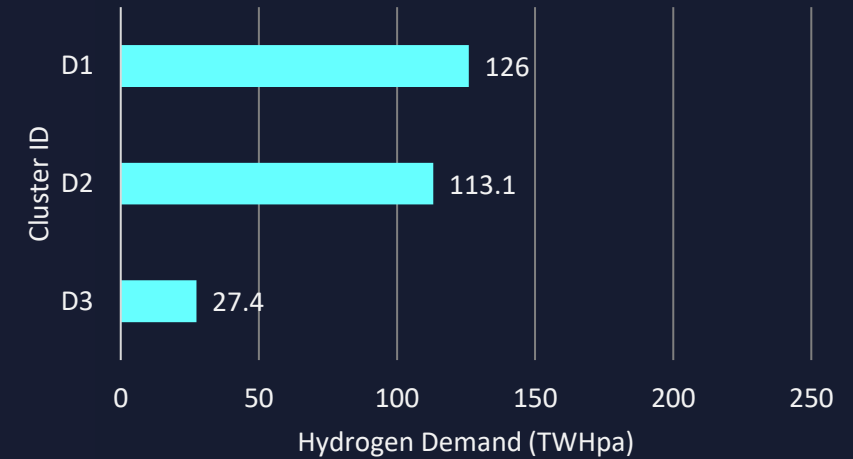
**D2** Cluster ID/centre of gravity

 Planned National Scale Hydrogen Storage

NB: Blue bubble size is relative to overall chart TWh magnitude,



UK FES System Transformation 2040

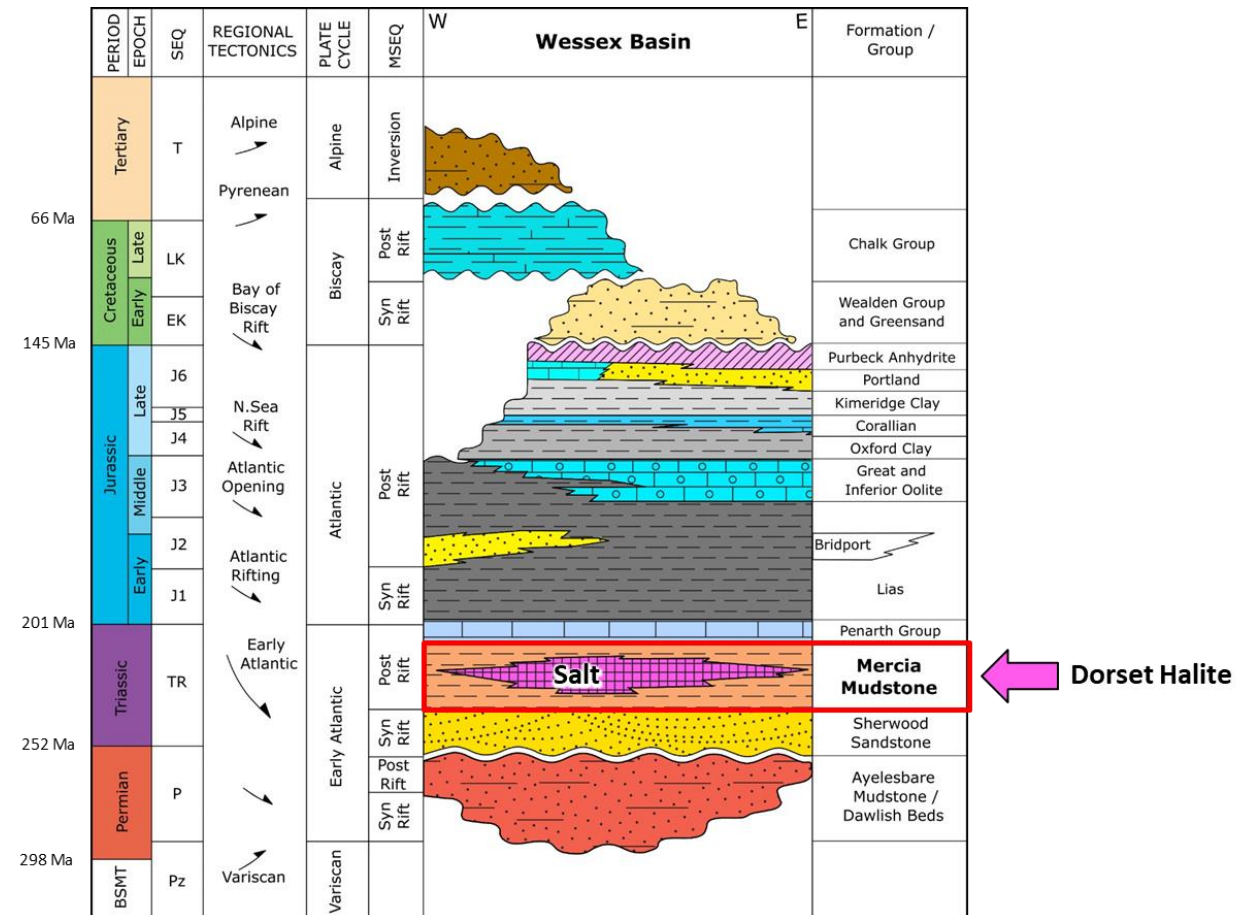
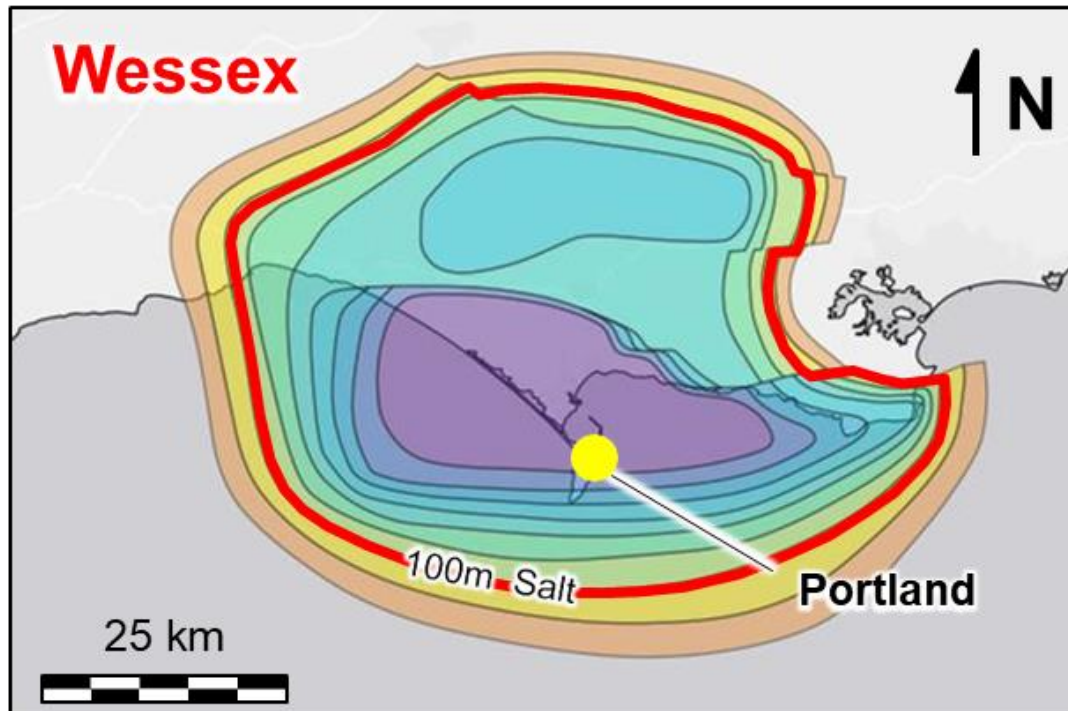


# South Dorset Geology

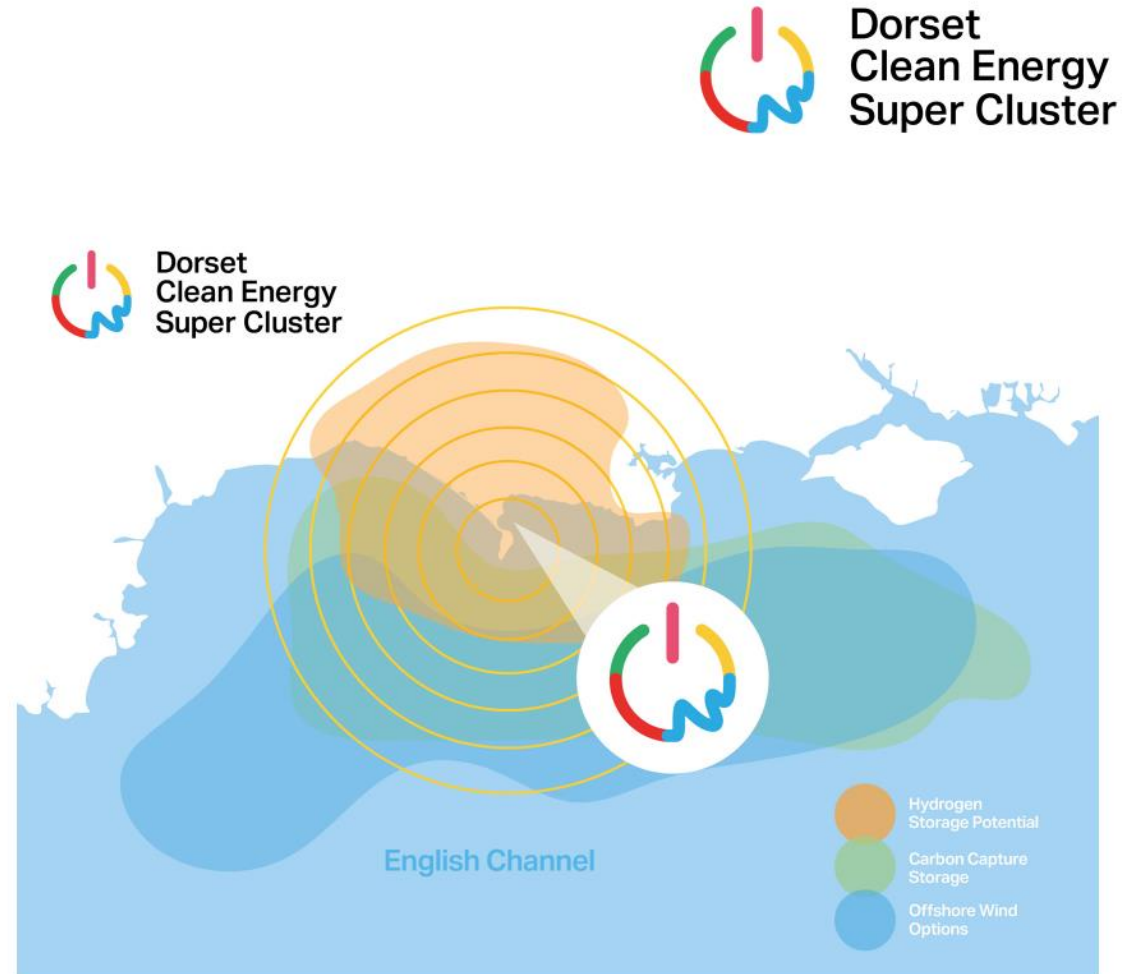
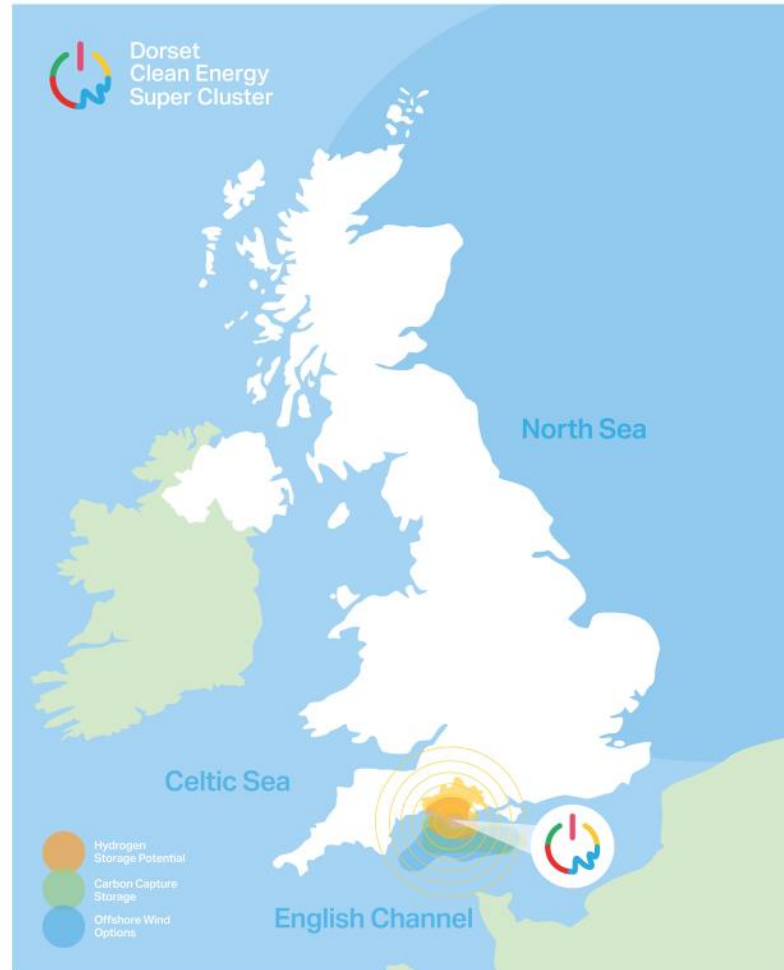
## South Dorset Summary:

- **Triassic age halite up to ~450m thick**
- Contains a massive, clean Middle Salt unit, which reaches thicknesses of **~200m (suitable for salt caverns)**
- Depth range **~500 to 2500 m**

## Dorset Halite Thickness Map.



# Dorset Clean Energy Super Cluster







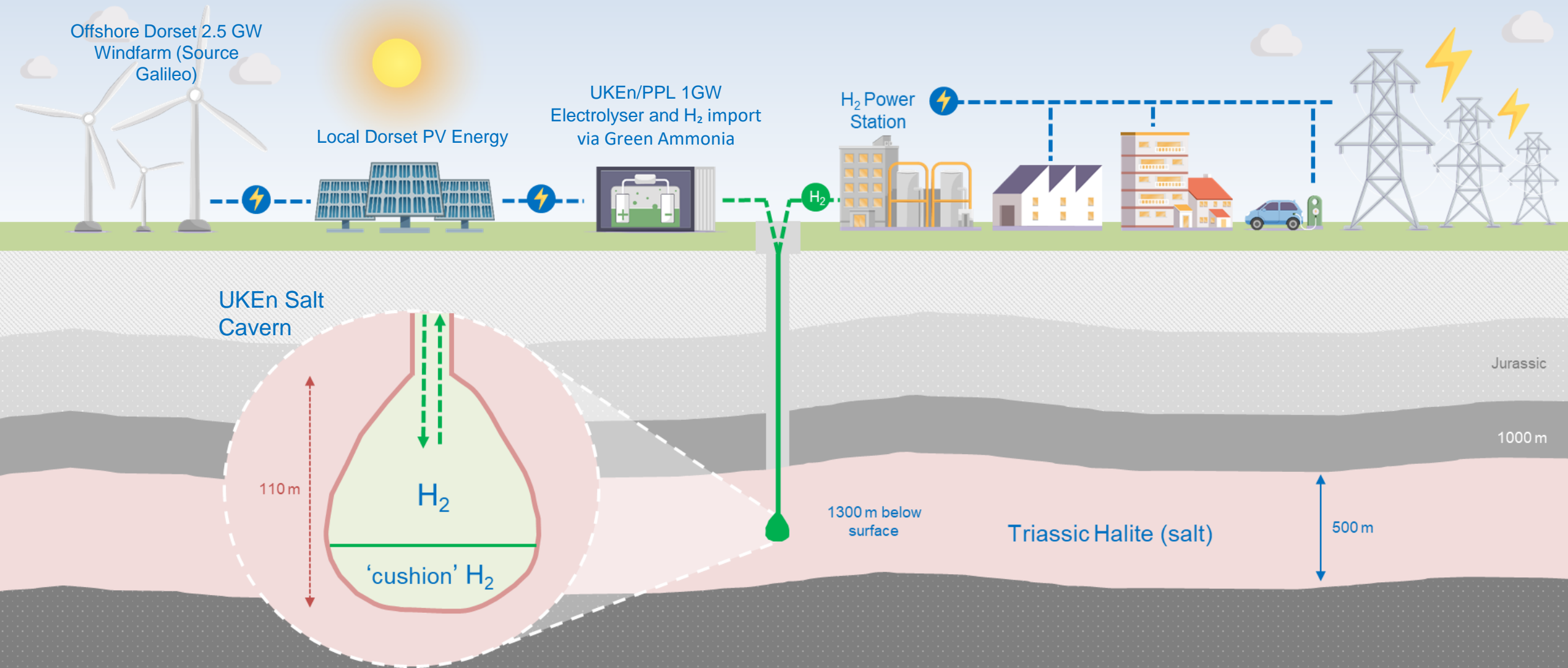
## Introducing...

- **Portwind: Source Galileo** are proposing 2GW's of offshore wind (deep fixed) in the English Channel
- **Hydrogen Import and Storage by UKEn:** One billion m3 of hydrogen storage as alternative clean fuel
- **Portland Port:** A perfect location, a unique opportunity. Construction Headquarters, accommodation, transport services
- **Channel Gateway: Proposed by Morwind,** as a deepwater, offshore wind hub up to 60 ha to enable manufacturing, assembly and servicing of offshore wind sector in the English Channel
- **Carbon Capture and Storage:** Dorset can play its part in locking away a gigatonne of CO2 to reduce pace of global warming
- **New nuclear:** SMR deployment at Dorset Innovation Park
- Related grid, battery storage improvements, electric infrastructure

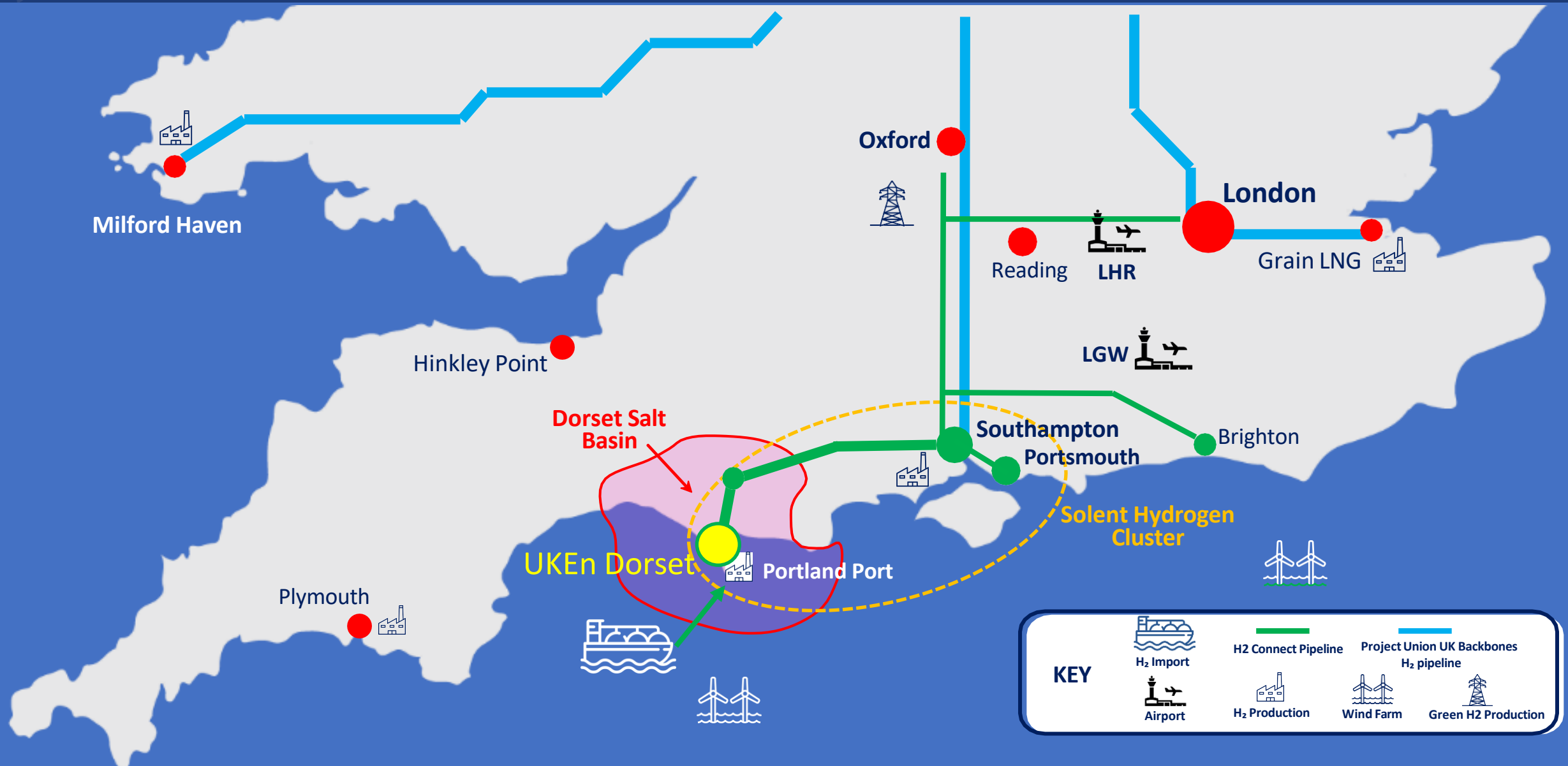


~30TWh national H<sub>2</sub> storage, 1 GW green H<sub>2</sub> gen + NH<sub>3</sub> import

**1. Hydrogen Battery: solve renewable intermittency 2. Balance supply & demand 3. Maintain pipeline pressure/fill**



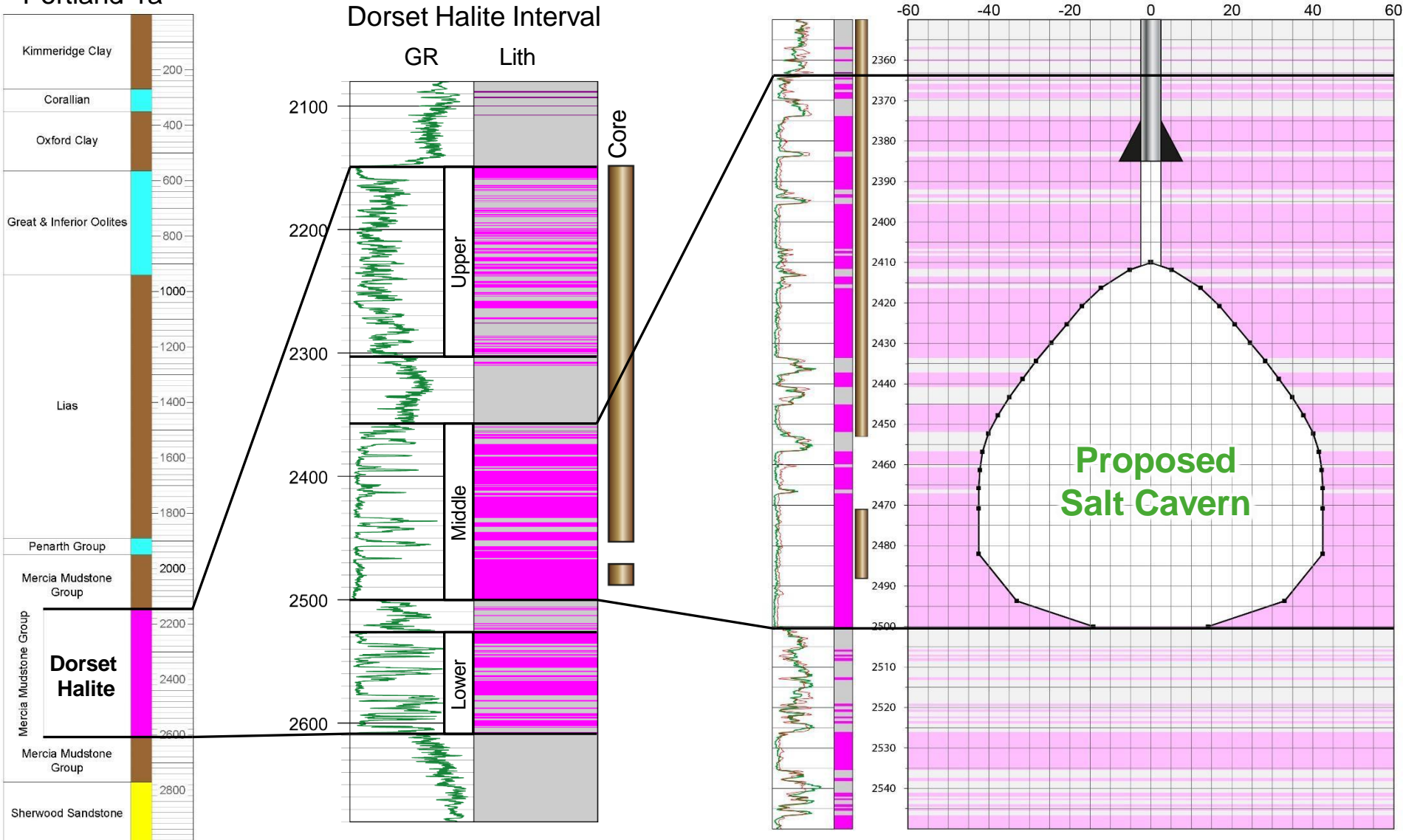
# UKEn Dorset: A key element of S. UK H<sub>2</sub> infrastructure





# Portland-1a borehole & cavern design

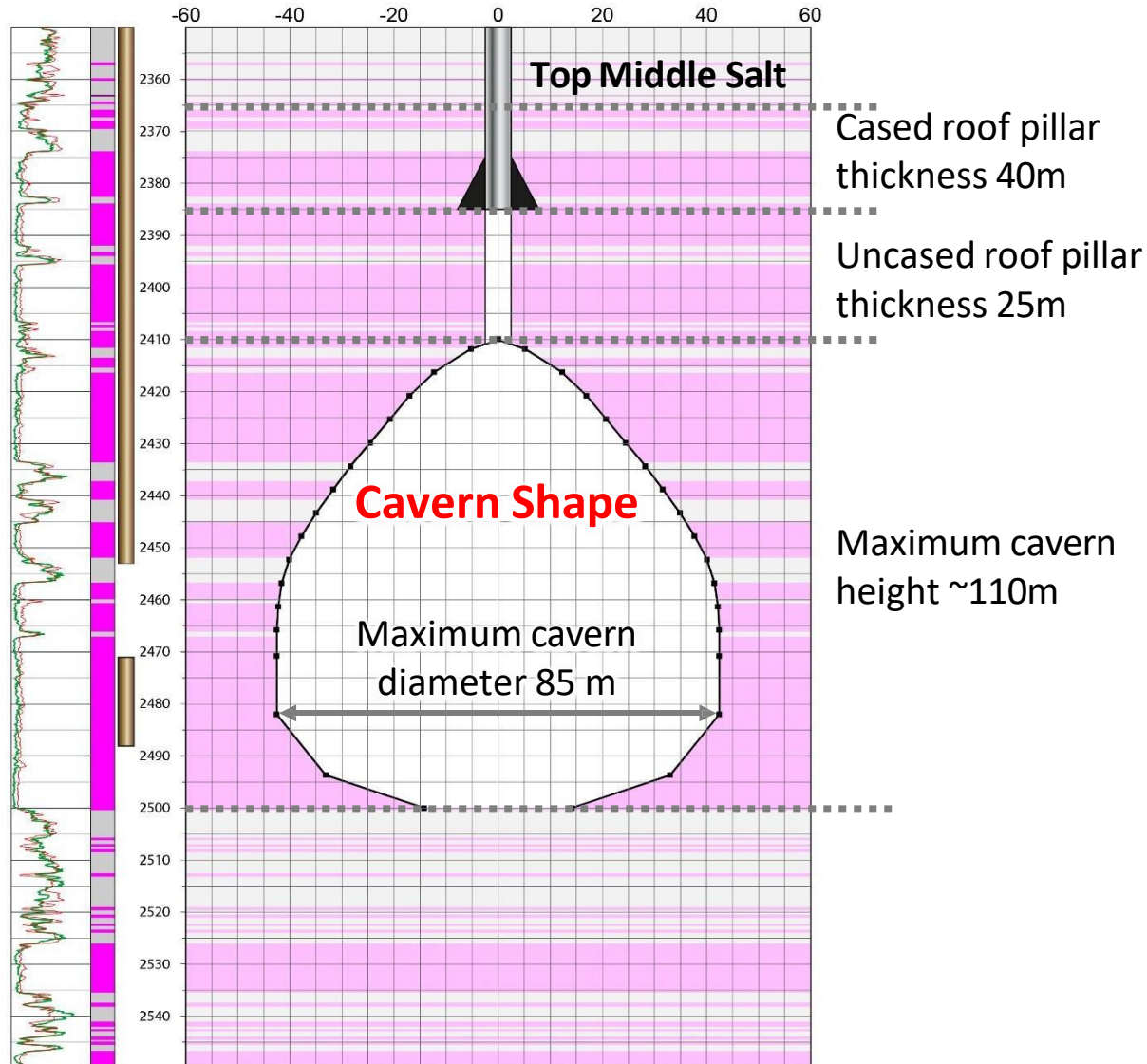
Portland-1a



- Drilled in 2006
- 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

*Logs plotted in MD (m)*

# South Dorset Cavern Design



## DEEP.KBB Design Summary:

- Top Middle Salt depth **~1300m below surface**
- **40m cased roof pillar**, to ensure sufficient cement beneath mudstone
- **Minimum uncased roof pillar** (open borehole cavern neck) **length of 25m** to protect casing from extensive viscous deformation during operation

## Single Cavern:

- Useable cavern volume **332,000 m<sup>3</sup>**
- Maximum operating pressure **240 bar**
- Min operating pressure **69 bar**
- Working Hydrogen Volume **42 million Sm<sup>3</sup>**
- Working Natural Gas Volume: **56 million Sm<sup>3</sup>**

# UKEn South Dorset Hydrogen Storage Project

## Project Overview:

- 24 caverns providing up to 1.01 billion standard m<sup>3</sup> ("bcm") working hydrogen volume (90.8 ktonnes).
- A technical maximum annual storage capacity of 30.2 TWh.
- Operated via cushion gas (~31%) which is a proven technology.

	South Dorset Site
Approximate Cavern Depth (m)	1,330
Number of Caverns / Wells	24
Operational Mode	Cushion gas
<b>Static Working Hydrogen Volume (bcm)</b>	<b>1.01</b>
<b>Static Working Hydrogen Volume (kg)*</b>	<b>~ 90,800,000</b>
<b>Static Working Hydrogen Volume (tonnes)</b>	<b>~ 90,800</b>
Max Annual Cycling Capacity (TWh)	30.2
Max Cycles per year (~37 days)	~10
Estimated Project CAPEX (million)	~£800

\*Hydrogen Density @STP (kg/m<sup>3</sup>) = 0.0899

# South Dorset H<sub>2</sub> Storage Economic Benefits



## Material Economic Benefits to UK and Dorset Economies

- **£2.28 bn/year GVA during its 30-60 year operational life** (Quod Economic Impact report)
- **Job creation: up to 2,100 direct + 5,100 supply chain jobs, 135 permanent jobs in development operations**

## Significant National Scale Contribution to UK Energy Security

- **Store equivalent of 14-27 days of UK electricity supply (i.e., ~4-8% of 2023 annual electricity demand)**

## Key Enabler for UK Hydrogen System and Decarbonisation in UK & Southern England

- **Critical for establishment of UK Backbone Hydrogen Pipeline into Southern UK**
- **Direct synergy/pipeline link with proposed 1GW green H<sub>2</sub> production at Portland Port**
- **Supports Key Industrial sector H<sub>2</sub> demand/decarbonisation:**
  - Solent Cluster **SAF production** at Fawley to decarbonise LHR and LGW
  - Dispatchable electricity decarbonisation via **“H2P”** (e.g., Chickerell, Marchwood, Didcot et al)
  - Southampton and Portsmouth (IMO) 2030-50 **maritime sector low carbon fuel targets**.

Note: <sup>1</sup> National Grid 2024 FES STS 49TWh/yr & Royal Soc. 2023 60-100TWh/yr, \* Assumes 5 cycles/year (15TWh) from 3TWh (1 bnm<sup>3</sup>) static storage



# Hydrogen Supply

Port Wind/Source Galileo ~ 2 GW offshore wind farm off the Dorset Coast.  
**Commercial discussions ongoing for green hydrogen project.**



Close geographic proximity of UKEn's South Dorset storage site and PPL's deep-water port. Hydrogen or green ammonia import.  
**Commercial discussions ongoing/MOU announced.**



Dynamics' Fawley Green Hydrogen project. 120 MW electrolyser. Shortlisted for HAR2 by government. Fawley blue hydrogen production plan: 4.3 TWh of hydrogen annually.

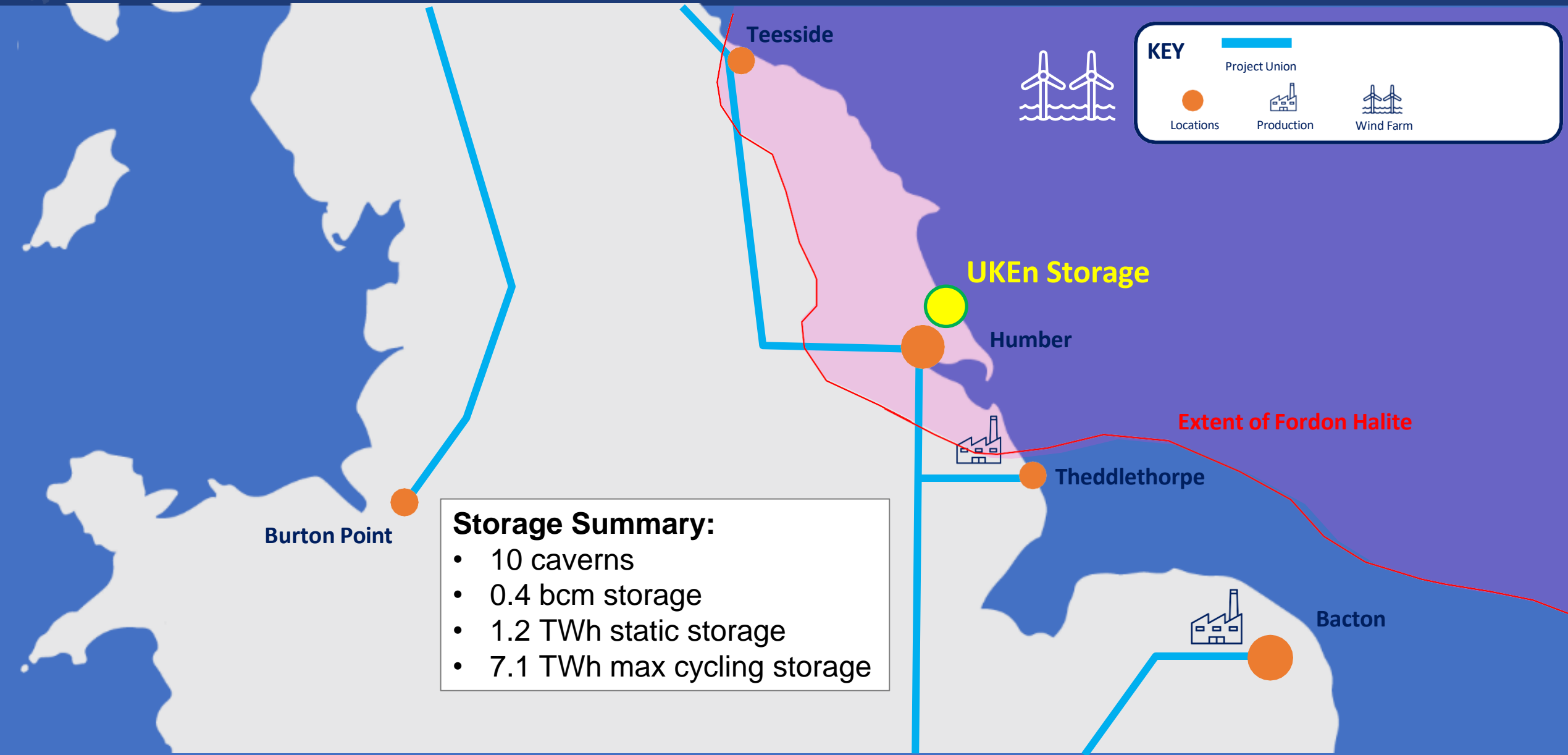


Project Union will develop a transmission network of 100% hydrogen pipelines in the UK. H2 Connect will develop similar pipelines in the south of England and integrate with Project Union.  
**Commercial discussions ongoing.**





# UKEn Yorkshire Salt Cavern Site



# Why UKEn favours new build salt caverns for hydrogen storage



- New build salt caverns are proven technology (TRK7-9) for hydrogen storage
- Cost effective construction specific for duty and purpose – but transferable usage
- Modular build and easy to scale up with demand and hydrogen economy
- No risk to current security of supply by removing key UK gas storage assets
- Dorset is the only region that can support significant storage for future demand in UK south