

**Q17 What are your views on the strategic storage options outlined above in relation to addressing the priorities set out in Chapter 2 (ensuring sufficient infrastructure capacity; ensuring resilient infrastructure capacity; and commercially viable infrastructure capacity)?**

**a. Do you recommend a specific strategic gas storage option?**

The British Geological Survey have engaged with Ofgem, NESO and Energy Systems Catapult on a variety of gas storage projects with applications and learning transferable from hydrogen, CO<sub>2</sub> and natural gas storage<sup>1,2</sup>. These experiences have highlighted the need for a geographic spread of options and a diversity of gas storage technologies to ensure an available capacity regionally when required and in line with industrial clusters or large demand centres.

In general, salt caverns have a smaller capacity and requirement for cushion gas but may inject and produce stored gas more quickly (fast cycling). The presence of salt in the UK is also restricted to areas of onshore UK, such as Cheshire, west Lancashire, Teesside/Humberside and Dorset-Devon, which limits the development of caverns to these areas<sup>3</sup>. Salt caverns are thus more suited to medium-scale storage duration where they may utilise their ability to quickly cycle gas storage.

Meanwhile, porous rock storage has a larger capacity but a relatively slower recharge/discharge rate. Porous media are widely spread across onshore and offshore UK, and may be selected nearby centres of demand. Porous rocks are more suited for long duration inter-season storage and fills the niche role of emergency gas stock held for long periods of time and for extreme scenarios.

To be able to deliver security of supply for natural gas and balance gas supply and demand in extreme scenarios, a combination of both salt caverns and porous media would be required. In conjunction, they would be able to complement one another for deliverability (salt caverns) and capacity (porous media), while also mitigating their disadvantages such as geographical area (salt caverns) and high cushion gas requirements (porous media).

For the purpose of supplying storage for extreme scenarios beyond a 1-20 year weather event, it is recommended that a diversity of storage options in the market are available so both medium- and long duration gas storage roles are completed and complemented.

1 <https://cadentgas.com/news/march-2024/geological-hydrogen-storage-funding-bid-success>

2 <https://www.bgs.ac.uk/news/funding-awarded-for-study-on-hydrogen-storage-potential-in-the-east-midlands/>

3 Williams, J.D., Williamson, J.P., Parkes, D., Evans, D.J., Kirk, K.L., Sunny, N., Hough, E., Vosper, H. and Akhurst, M.C., 2022. Does the United Kingdom have sufficient geological storage capacity to support a hydrogen economy? Estimating the salt cavern storage potential of bedded halite formations. *Journal of Energy Storage*, 53, p.105109.

## Q17 b

### **B. Are there any alternative strategic gas storage options we have not listed?**

Yes, other strategic options not considered include surface silo arrays, lined rock caverns and lined shafts. These options are at a low technology readiness level and would require a significant amount of research and development investment to reach commerciality, however such investment has the potential to open up options for storage in onshore regions of the UK that would not be possible for caverns or porous rocks.

The British Geological Survey have undertaken high-level regional studies investigating where these technologies may be applied in the East Midlands and North Yorkshire areas<sup>1,2</sup>. While undertaken for hydrogen storage in these projects, learnings may be applied for similar natural gas storage studies.

1 <https://cadentgas.com/news/march-2024/geological-hydrogen-storage-funding-bid-success>

2 <https://www.bgs.ac.uk/news/funding-awarded-for-study-on-hydrogen-storage-potential-in-north-yorkshire/>

## Q22

### **Please provide any evidence on the cost of developing a new storage facility.**

The up-front costs associated with developing a new storage facility are significant in part due to the requirement for initial geological data gathering and geological modelling. The cost of undertaking geological investigations could be lowered by developing data and models that may be shared between projects to reduce replicating

data gathering and geological studies for high level feasibility investigations. For new onshore cavern storage facilities, these could only be located in Cheshire, west Lancashire, Teesside/Humberside and Dorset-Devon. Models may be generated that inform the operating limits of such new cavern sites, helping screen sites and contributing to initial site appraisal. Gaining a regional understanding of the most promising locations and technical abilities of salt cavern developments would lower the cost of entering the market and reduce work that would otherwise be repeated by multiple developers during initial site selection work.

More appraisal work would be required for porous rock sites (either depleted hydrocarbon fields or saline aquifers), but these may be more favourably located in terms of geography (e.g., closer to the south-east of England and centre of demand).

### **Q34**

**What are the risks and opportunities of interaction between a possible gas storage commercial support model and other business models in energy, notably hydrogen storage and carbon dioxide storage**

#### **Opportunities**

- Linking gas storage technologies would allow a strategic approach to be developed related to where, when and how storage sites are commissioned and for what purpose. Identifying and planning for specific purposes allows for planned CO<sub>2</sub> storage that supports the carbon capture required for green hydrogen production via steam methane reformation.
- Repurposing, sharing and co-locating infrastructure between CO<sub>2</sub>, hydrogen, and natural gas storage will develop industrial clusters where, for example, excess renewable power can create green hydrogen (stored in salt caverns), while blue hydrogen production sends its CO<sub>2</sub> directly into nearby geological storage.
- Development of gas or hydrogen storage can be de-risked by using invaluable seismic and pressure data collected from different types of storage (e.g. CO<sub>2</sub>) located in the same geological area, potentially reducing both the amount of additional data required and the associated geotechnical appraisal.

## Risks

- If the commercial support mechanisms for different storage technologies (such as subsidies, floor prices, or guaranteed revenue models) are not aligned, one technology could become artificially more attractive to developers. This creates a risk of “crowding out” other storage types that may be strategically important but appear less financially competitive.

For example, if CO<sub>2</sub> storage receives a high subsidy or more favourable support terms, developers may prioritise CO<sub>2</sub> projects because they offer a higher or more predictable return. In this scenario, investment could shift away from methane storage, even if the system has an urgent need for additional gas storage capacity to ensure energy security in extreme or unexpected demand events.

This misalignment matters because different subsurface storage technologies perform very different roles in the energy system. Methane storage, hydrogen storage and CO<sub>2</sub> storage each provide distinct services, operate at different pressures and cycling rates, and are suited to different geological formations. A strategic system requires a balanced portfolio, not a market skewed toward whichever technology has the most favourable support scheme at a given time.

Ensuring that support models are complementary, not competitive, helps avoid unintended distortions. It also supports long-term planning across the subsurface, allowing the UK to maintain adequate emergency gas reserves while continuing to scale hydrogen and CO<sub>2</sub> storage for the net zero transition.

- Many of the UK’s most favourable geological units lie close to existing or emerging industrial clusters. These areas are attractive because they offer suitable subsurface conditions for multiple storage technologies, including natural gas, hydrogen and CO<sub>2</sub> storage. However, these same regions are also in high demand from other transition-related infrastructure such as offshore wind export cables, major transmission lines, and even potential facilities for geological disposal of radioactive waste.

All these technologies rely on overlapping elements of the subsurface and share parts of the same supply chain — including skilled labour, specialist drilling rigs, seismic acquisition capacity, engineering contractors and access to suitable land or seabed. As a result, they may compete directly for both physical space and technical resources.

This concentration of competing demands introduces a risk that some technologies, particularly those at an earlier stage of deployment, could be crowded out. For example, if a region becomes dominated by CO<sub>2</sub> storage development or large-scale hydrogen cavern construction, it may become more difficult or costly for developers to

secure the subsurface access, permitting capacity or engineering resources needed to progress other strategically important but less mature storage options.

To avoid these unintended conflicts, a comparative strategic plan for subsurface use is recommended. Such a plan would help government and regulators prioritise the most efficient and nationally beneficial allocation of underground space, ensuring that emerging technologies are not excluded and that long-term energy system needs — including security of gas supply, hydrogen development and CO<sub>2</sub> storage for net zero — can coexist sustainably.

## **Action**

- Given the wide range of competing demands on the UK subsurface, there is a need for comprehensive national mapping and capacity assessments covering all major forms of geological storage, including natural gas, hydrogen, CO<sub>2</sub> and radioactive waste, as well as mapping of marine and energy-transition infrastructure such as offshore wind connections, cable corridors, and gas transport networks. A consistent national evidence base of this kind would allow government and regulators to understand where geological opportunities overlap, where spatial constraints may emerge, and where different technologies may come into competition for the same subsurface or offshore space.

Such mapping is essential for strategic decision making. Without a coordinated national view, infrastructure planning risks being reactive and uncoordinated, potentially leading to bottlenecks, constrained supply chains, higher development costs, and the unintended crowding out of strategically important storage types. In contrast, a well-developed national subsurface mapping framework would support early identification of priority areas, help sequence development across regions, reduce permitting delays, and ensure that the UK's geological resources are allocated in a way that maximises security of supply while also accelerating the energy transition. It would also ensure that emerging technologies are not disadvantaged by the earlier or more aggressive rollout of others, protecting the long-term functionality and resilience of the energy system.