

## Assessing the Rental Valuation of Underground Gas Storage for Hydrogen and Natural Gas



As the UK transitions towards a more sustainable energy system, underground gas storage (UGS) is playing an increasingly crucial role. Traditionally used for natural gas, these facilities are essential for balancing supply and demand, ensuring energy security, and managing price volatility. With the growing focus on hydrogen as a low-carbon energy source, underground storage is expected to become a key component of the UK's future energy infrastructure, supporting industrial decarbonisation and the integration of renewable energy sources.

Determining the rental valuation of underground gas storage sites presents a unique challenge. Unlike conventional commercial properties, these facilities are rarely let on the open market, meaning direct rental comparisons are often unavailable. Instead, valuation relies on alternative methodologies that assess a site's profitability, operational costs, and geological suitability. In some cases, a Receipts and Expenditure (R&E) approach is used to reflect the facility's income potential, while in others, a Contractor's Basis may be applied, assessing the cost of developing a similar facility from scratch.

This article explores the key factors influencing rental valuation for underground gas storage, the methodologies used in practice, and how these considerations may evolve with the emergence of hydrogen storage. Understanding these principles will be essential for landowners, energy firms, and policymakers as the UK prepares for the next phase of its energy transition.

### UNDERSTANDING UNDERGROUND GAS STORAGE

Underground gas storage is a key component of the UK's energy infrastructure, providing security of supply and flexibility to balance fluctuations in demand. With the transition to a low-carbon economy, storage is becoming increasingly important not just for natural gas but also for hydrogen, which is expected to play a significant role in decarbonising industries and supporting renewable energy integration. The valuation of underground gas storage facilities is heavily influenced by the type of geological formation used, operational capabilities, and the regulatory environment in which they operate.

#### Types of Underground Gas Storage

The suitability of a storage facility is largely determined by the geological conditions of the site. One of the most established methods is storage in depleted oil and gas fields, which have already proven their ability to contain hydrocarbons over geological timescales. These sites often have the advantage of existing infrastructure, such as wells and pipeline connections to the National Transmission System, reducing development costs. However, depleted fields have relatively slow injection and withdrawal rates compared to other storage options. Their potential for hydrogen storage is still under review, with concerns around gas purity and possible reactions between hydrogen and reservoir rocks that could impact containment efficiency.

Salt caverns provide an alternative, created through a process known as solution mining, in which water is used to dissolve

underground salt deposits to form a sealed cavity. These caverns are well suited for gas storage due to their excellent containment properties, ensuring minimal leakage and allowing for rapid injection and withdrawal of gas. They are already widely used for natural gas storage and are considered one of the most promising options for hydrogen due to their impermeability and ability to maintain gas purity. However, the geographical distribution of salt formations in the UK is limited, meaning that new projects will be constrained to certain regions.

Aquifers offer a further potential option, making use of natural water-bearing rock formations where injected gas displaces water. While they can provide large storage volumes, they are less predictable in their behaviour compared to depleted fields or salt caverns. Gas movement within an aquifer is more difficult to control, increasing the risk of migration and leakage. This makes them a less attractive option for hydrogen storage, particularly given the need to ensure long-term containment and retrieval efficiency.



The suitability of these storage options varies depending on the type of gas being stored. The table below summarises key characteristics of each type:

Factor	Depleted Fields	Salt Caverns	Aquifers
Capacity	High	Moderate	High
Injection/ Withdrawal Speed	Slow	Fast	Moderate
Containment Security	Moderate	High	Low
Infrastructure Availability	Existing wells and pipelines	Requires new infrastructure	Limited infrastructure
Hydrogen Suitability	Moderate - risk of gas-rock reactions	High - excellent containment	Low - risk of gas migration

### Regulatory and Planning Considerations

The development of underground gas storage facilities is subject to extensive regulatory oversight to ensure safety, environmental protection, and compliance with planning requirements. Large-scale storage projects exceeding 43 million cubic metres of working capacity are classified as Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008, requiring Development Consent Orders (DCOs) from the Planning Inspectorate. Smaller facilities remain under the jurisdiction of local authorities, where planning decisions may take into account environmental sensitivities, land use policies, and public consultation.

Environmental and safety regulations also play a crucial role, particularly for high-pressure storage sites. The Control of Major Accident Hazards (COMAH) Regulations 2015 apply to such facilities, requiring operators to conduct detailed risk assessments and implement safety measures to prevent incidents. Compliance with COMAH is overseen by the Health and Safety Executive (HSE) and the Environment Agency (EA), both of which have enforcement powers to ensure safe operations.

While natural gas storage is well understood within the UK's regulatory framework, hydrogen storage presents new challenges that are not yet fully addressed in existing legislation. The Hydrogen Strategy (2021) highlights the need for large-scale storage solutions but acknowledges that further regulatory clarity is required. The Petroleum Act 1998, which governs hydrocarbon storage, does not currently provide a dedicated licensing regime for hydrogen. Research led by the British Geological Survey (BGS) and other industry bodies is exploring how depleted gas fields and salt caverns can be adapted for hydrogen storage, with future legislative updates expected to address these emerging requirements.

As hydrogen storage gains momentum, the regulatory landscape will need to evolve to provide a clear framework for project development, safety standards, and integration into the wider energy system. This will be a key factor influencing the valuation of underground gas storage sites, particularly as demand for hydrogen-ready infrastructure grows in the coming years.

### KEY FACTORS AFFECTING RENTAL VALUATION

#### Location & Geology

The location of an underground gas storage facility is a primary driver of rental valuation, with proximity to major transmission infrastructure and high-demand energy markets increasing commercial appeal. Sites situated near the National Transmission System (NTS) or key industrial clusters command higher values due to reduced transport costs and greater accessibility for potential operators.

Geology is equally influential, as the physical characteristics of the storage formation determine operational efficiency and long-term viability. Salt caverns, for example, allow for rapid injection and withdrawal, making them attractive for short-term balancing and premium storage contracts. By contrast, depleted fields may offer larger capacities but often require longer cycle times and greater investment in well integrity. These geological differences not only shape operating costs and revenue potential but also impact the hypothetical tenant's willingness to pay, a critical component in assessing rental value.

#### Market Demand & Energy Policy

The economic value of storage capacity is directly linked to supply-demand fluctuations in the gas market. When gas prices are volatile or supply security is uncertain, storage becomes more valuable, pushing up rental valuations. Seasonal demand is also a major factor; facilities with the ability to store gas in summer and release it in winter, when demand peaks, attract higher rental premiums.

Government policy is another critical consideration. The UK's Net Zero Strategy and increasing investment in hydrogen infrastructure mean that storage facilities capable of future hydrogen conversion may see enhanced valuations. However, market uncertainty remains: regulatory frameworks for hydrogen storage are still developing, and without clear government incentives, investors may be hesitant to assign significant value to hydrogen-ready storage assets. This balancing act between current market conditions and future policy shifts adds complexity to rental assessments.

## Regulatory & Environmental Considerations

Storage facilities operate within a complex regulatory landscape, and compliance costs can significantly influence rental valuation. Large-scale sites classified as Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008 require Development Consent Orders (DCOs), adding time and legal costs to project development. In contrast, smaller facilities that fall under local planning regulations may be subject to different environmental constraints, particularly in areas with sensitive land designations.

Beyond planning permissions, compliance with environmental and safety regulations imposes ongoing financial obligations on operators. The Control of Major Accident Hazards (COMAH) Regulations 2015 require risk assessments, emergency response planning, and ongoing regulatory reporting, all of which factor into operational costs. For hydrogen storage, where long-term containment risks remain a key concern, future regulations may introduce additional compliance costs that must be reflected in rental valuations.

## Operational Costs & Risks

The financial viability of a storage facility is not just about its revenue potential; it also depends on infrastructure investment, maintenance liabilities, and risk exposure. Rental valuations must account for the costs associated with gas injection, withdrawal, and compression, which vary depending on the geological characteristics of the site. Facilities requiring high capital expenditure to maintain well integrity or upgrade aging infrastructure may see downward pressure on their rental value.

Risk exposure is another significant factor, particularly in hydrogen storage. Unlike natural gas, hydrogen presents unique containment and material integrity challenges, potentially leading to higher insurance costs and regulatory scrutiny. Sites with greater risk mitigation requirements, such as additional safety measures or enhanced monitoring systems, may experience lower net rental values due to the increased financial burden on the operator.

## The Evolving Landscape of Underground Storage Valuation

While traditional gas storage valuation has been driven by physical capacity, geological characteristics, and market demand, the emergence of hydrogen storage is adding a new dimension to the equation. Investors and operators must now assess whether sites have the long-term adaptability to support hydrogen storage, or whether the regulatory uncertainty surrounding hydrogen will suppress rental values in the short term. As government policy, market conditions, and technological advancements continue to develop, rental valuations for underground gas storage must evolve accordingly.

## RENTAL VALUATION METHODOLOGIES

The valuation of underground gas storage sites presents unique challenges due to the absence of a direct rental market. Unlike conventional commercial or industrial properties, gas storage facilities are rarely let to third parties, meaning that valuation must rely on alternative methodologies that consider profitability, development costs, and site-specific characteristics. There are three principal approaches to rental valuation in this context, each with varying levels of applicability depending on the availability of market data and the operational nature of the facility.

### Comparable Market Analysis

One of the most straightforward valuation methods in property assessment is a comparison with similar assets. However, in the case of underground gas storage, there is limited rental market evidence due to the bespoke nature of such facilities. While some agreements exist between gas storage operators and energy companies, they often reflect long-term strategic contracts rather than purely rental-based transactions, making direct comparisons difficult. Where possible, rental evidence from similar energy infrastructure may provide useful benchmarks, but in practice, alternative valuation approaches are usually required.

### Receipts and Expenditure (R&E) Method

Where a storage facility is actively generating revenue, the Receipts and Expenditure (R&E) approach is often considered the most appropriate method of valuation. This approach seeks to determine the rental value by assessing the income-generating potential of the site, factoring in the operational costs and the expected return for a hypothetical tenant. The valuation process involves:

- Estimating gross receipts – This includes income from storage fees, capacity charges, and any financial arrangements that allow third parties to utilise the facility.
- Deducting operating costs – Key expenditures include maintenance, energy costs for compression and injection, regulatory compliance costs, and staffing expenses.
- Assessing a fair return to the operator – Once operating costs have been deducted, the residual income is divided into a tenant's share (for business operations) and a landlord's share (reflecting a fair rental payment for use of the site).

## Contractor's Basis

Where there is insufficient income data to support an R&E valuation, the Contractor's Basis is often applied as a method of last resort. This approach estimates value based on the cost of constructing a modern equivalent facility, adjusted for depreciation and obsolescence. The process typically involves:

- Assessing the cost of building a comparable storage site – This includes excavation, engineering works, compression and processing infrastructure, and pipeline connections.
- Adjusting for depreciation – As underground gas storage facilities have long operational lifespans, adjustments are made to reflect age, condition, and functional efficiency.
- Land valuation – The value of the site itself is factored in, considering its geological suitability and market conditions.
- Applying a return on investment calculation – The estimated capital cost is converted into an annual equivalent rent, using an appropriate decapitalisation rate.

While this method provides a structured valuation framework, it does not reflect market demand or income generation potential, meaning that it may not always provide the most accurate representation of real-world rental values. However, in cases where a facility is not actively operating under a revenue-generating contract or where financial data is unavailable, it remains an essential tool for valuation assessments.

## Balancing Methodologies for a Fair Rental Valuation

Given the complexities involved, rental valuation for underground gas storage often requires a balanced approach, drawing on elements of multiple methodologies to reflect both real-world market conditions and the intrinsic value of the asset. Where financial data supports an income-based valuation, the Receipts and Expenditure method is typically preferred. However, for newer facilities or sites where financial information is unavailable, the Contractor's Basis may provide the only viable means of assessment. As the market for hydrogen storage develops, new financial models and policy incentives may further shape the valuation landscape, necessitating ongoing adaptation of these methodologies.

## THE FUTURE OF HYDROGEN STORAGE VALUATION

As the UK accelerates its transition to a low-carbon economy, the role of underground gas storage is set to evolve significantly, particularly in relation to hydrogen storage. While natural gas storage has long been established as a commercial and strategic necessity, the valuation of underground sites for hydrogen remains largely untested, with key factors such as market demand, regulatory frameworks, and infrastructure investment still in flux. The way in which rental valuations are determined will need to adapt to the shifting energy landscape, with emerging economic, technical, and policy considerations influencing future assessments.

### The Impact of Hydrogen Growth on Valuation

The increasing focus on hydrogen as a major energy carrier will inevitably reshape the value of underground storage facilities. Unlike natural gas, hydrogen presents distinct technical and economic challenges, including higher containment risks, material compatibility concerns, and differing injection and withdrawal requirements. These factors mean that not all existing gas storage sites will be equally viable for hydrogen storage, and the rental value of sites will be affected by their ability to accommodate hydrogen without excessive retrofitting costs.

Geological suitability will continue to play a decisive role in valuation. Salt caverns, which provide near-impermeable containment and rapid injection/withdrawal cycles, are expected to see increased demand and potential rental premiums. By contrast, depleted gas fields, while offering larger storage volumes, face greater technical challenges due to the risk of hydrogen interactions with reservoir rock, leading to possible containment losses or contamination. Sites that require extensive upgrades or pose operational uncertainties may see downward pressure on rental values, particularly if alternative storage options become more competitive.



Beyond geological considerations, future valuations will be shaped by the commercialisation of hydrogen markets. At present, the hydrogen economy is in its early stages, with limited large-scale production, distribution, and demand. However, as hydrogen use expands across industry, transport, and power generation, demand for storage will grow, strengthening the economic case for investment and potentially increasing rental values for well-positioned sites. The extent to which rental valuations rise will depend on how quickly the hydrogen market matures and whether storage sites can generate stable, long-term revenue streams.

### Government Policy and Financial Incentives

Public sector intervention will play a crucial role in determining the financial viability of hydrogen storage, and consequently, its rental valuation. The UK government's Hydrogen Strategy has set out an ambitious framework for scaling up production and infrastructure, but specific regulatory and financial mechanisms for underground storage remain underdeveloped. The extent to which the government provides subsidies, tax incentives, or revenue support mechanisms for hydrogen storage will have a direct impact on valuation, as sites benefiting from government-backed funding or preferential contracts may see stronger rental demand.

Potential policy mechanisms that could influence valuation include:

- Capacity Market Incentives – If hydrogen storage is integrated into energy system flexibility schemes, similar to how natural gas storage supports balancing mechanisms, this could increase rental demand for well-located facilities.
- Long-term Storage Contracts – Government-backed contracts for strategic hydrogen reserves, akin to current natural gas storage agreements, could stabilise income streams and lead to higher valuations for storage assets with secure revenue structures.
- Infrastructure Grants and Loans – Financial support for retrofitting existing storage sites for hydrogen compatibility could alter the cost dynamics and affect rental pricing models.

The absence of clear regulatory guidance currently creates uncertainty for investors and valuers, limiting confidence in long-term rental forecasts. As regulatory frameworks solidify, particularly in areas such as hydrogen purity standards, safety requirements, and licensing regimes, valuation methodologies will need to be updated to reflect new compliance costs and financial incentives.



### Private Sector Investment and Market Maturity

While government intervention will provide the initial push for hydrogen storage development, private sector investment will ultimately shape how rental valuations evolve. Energy companies, infrastructure funds, and institutional investors will assess storage assets based on commercial viability, risk exposure, and long-term revenue potential. The attractiveness of underground hydrogen storage as an investment will depend on how quickly demand grows and whether stable market structures emerge.

In the early stages of hydrogen deployment, rental valuations may be constrained by uncertainty around utilisation rates and price volatility. However, as private-sector demand for hydrogen storage increases, particularly from industries such as steel, ammonia production, and fuel cell transport, valuations are likely to rise. Sites that secure long-term commercial offtake agreements with industrial users or hydrogen suppliers will benefit from stronger rental prospects, while those reliant on speculative demand may struggle to command premium valuations.

Infrastructure investors will also consider the scalability and adaptability of storage sites. Facilities that can accommodate both natural gas and hydrogen during the transition phase may attract higher rental values, as they provide flexibility to operators managing hybrid energy portfolios. This hybrid capability will be particularly valuable as the UK navigates the gradual shift from natural gas to hydrogen over the coming decades.

### The Changing Valuation Landscape

The rental valuation of underground gas storage is entering a period of transformation, with hydrogen presenting both new opportunities and new risks. While sites with strong geological suitability, regulatory clarity, and commercial backing are likely to see increased valuations, others may face greater uncertainty and slower rental growth until the hydrogen market fully matures. The evolution of policy support, market confidence, and infrastructure investment will ultimately determine how hydrogen storage is valued in the coming years, requiring a more dynamic and adaptive approach to rental assessment.



## CONCLUSION

The rental valuation of underground gas storage is a highly specialised process, shaped by a combination of geological, market, regulatory, and financial factors. Unlike conventional commercial properties, these facilities lack a direct rental market, requiring valuers to rely on alternative methodologies such as the Receipts and Expenditure (R&E) method or, where necessary, the Contractor's Basis. The choice of valuation approach depends on the availability of financial data, site-specific characteristics, and market comparability, ensuring that assessments reflect the true economic value of storage assets.

One of the most critical considerations in valuation is site suitability, with different geological formations offering varying levels of efficiency, containment security, and operational flexibility. Salt caverns continue to be seen as a premium option for gas storage, particularly as the energy transition drives interest in hydrogen storage, while depleted fields provide larger capacities but require careful assessment of gas integrity and conversion costs. The role of planning and regulatory constraints is equally significant, influencing development feasibility and imposing compliance costs that affect net rental value.

Market dynamics and government policy interventions will shape the future of underground storage valuation. As the UK seeks to enhance energy security and expand its hydrogen economy, storage assets capable of supporting both natural gas and hydrogen may command higher rental values, particularly in regions prioritised for hydrogen infrastructure investment. However, regulatory uncertainty, infrastructure readiness, and commercial market maturity remain key variables that will determine how valuations evolve.

For landowners, developers, and energy firms, the evolving storage landscape presents both risks and opportunities. Existing facilities must navigate shifting demand, regulatory updates, and technological developments, while new projects will require careful financial modelling to account for future market uncertainties. As policy frameworks solidify and hydrogen storage scales up, rental valuations will need to be continuously reassessed, ensuring they reflect the changing realities of energy storage economics and infrastructure investment.

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