House of Commons Public Bill Committee
Energy Bill
Written submission from UK Energy Storage (UKEn)

22nd May 2023

1. ***The omission of any plans or legislation for hydrogen storage in the first drafts of the Energy Bill is deeply concerning.*** Although we were encouraged by the Secretary of State's brief statement to the House of 9th May 2023 that the Bill would be amended to encompass hydrogen storage, we are concerned by the lack of any detail.

2. It is UKEn's view that ***new large-scale hydrogen energy storage is an essential and critical part of the UK's hydrogen economy and future energy system. The Bill should, therefore, explicitly help enable this new sector to get underway and flourish***. Hydrogen production alone will not provide the UK with a suitably balanced, resilient, and flexible hydrogen system unless it massively over gears and overspends on production capable of meeting peak demands. Storage, primarily in the form of underground geological salt cavern storage, capable of holding 0.5 to 1+ billion cubic metres (bcm) per facility, is the most realistic and proven technology to provide the necessary ability to balance production against demand.

3. As seen recently in the UK natural gas sector and, more emphatically, in the EU's gas sector, ***strategic levels of underground energy storage help provide key resilience to shocks to the energy system,*** such as the illegal war in Ukraine or a cold winter. Adequate hydrogen storage will, therefore, likely provide a similar role to today's natural gas storage and will be essential for our future Energy Security.

4. ***Uniquely, hydrogen storage can be used to create large scale hydrogen batteries,*** capable of storing green hydrogen produced via electrolysis from otherwise curtailed renewable energy***.*** The hydrogen can be readily reconverted to electrical power to meet future peak intra-day or intra-seasonal demand. Unlike electrical batteries, hydrogen is also particularly suitable for medium to longer term energy storage. ***The Bill must, therefore, recognise this opportunity and help create a framework for its timely delivery.***

5. ***Hydrogen Batteries are new technology in which the UK could lead the world, and something that UKEn plans to implement in Portland, Dorset***. Curtailing renewable power is simply a waste of a precious energy resource and something that cost the taxpayer £571 million in curtailment payments to windfarms in 2021. Using otherwise curtailed wind could also bring down the unit cost of green hydrogen. We see a hand-in-glove fit between underground geological salt-cavern storage and offshore wind, both of which the UK is richly and uniquely endowed. Nuclear power, large or small scale, allied with salt cavern storage could also prove a powerful opportunity to capture otherwise curtailed power.

6. ***It is undeniable that the UK will require many multiples of its existing ~2.2 bcm underground gas storage capacity to meet its ambitions in the Hydrogen Transition.*** In UKEn's view, to meet its 2035 10 GW hydrogen generation target the UK will likely require 6-7 bcm of new active hydrogen storage. By 2035, using National Grid's FES scenarios, new hydrogen storage

needs rise to 10–30 bcm, five to fourteen times existing UK capacity. ***In simple terms, to meet the lower end of predicted storage requirements will require the UK to add a minimum of 1 billion cubic metres of new storage each year from 2024.*** Currently, UKEn plan the UK's largest onshore storage facility with up to 2 bcm by 2030, however, even with other identified planned storage projects, the UK could likely struggle to meet the lower end of the projections by 2030-3 unless a positive environment for investment and support in the storage sector is delivered by government. Currently there are only two hydrogen storage projects on HMG's key infrastructure list, both of which will fall well short of the UK's overall hydrogen system storage requirements. More projects must be identified and put on the key/critical UK infrastructure list.

7. ***The UK's current ill preparedness to channel investment into underground storage capacity is a specific and serious UK challenge. It could hamper the development of a competitive hydrogen economy compared to EU countries that already have large existing storage capacity. For instance, Germany has 23 bcm and France 12 bcm that can both be partially repurposed to hydrogen. The UK has less than a tenth of this combined capacity.*** Since UKEn sees the UK also having a need for substantive new gas storage during the energy transition, there will also be little spare underground storage capacity capable of repurposing into hydrogen pre-2035.

8. ***Underground geological storage is a capital-intensive undertaking and has long lead times, taking around 5-10 years to deliver in the current planning environment.*** Large-scale caverns cost c. £1 billion per bcm and each cavern can take 2-3 years to dissolve. It is clear, therefore, that to meet the hydrogen system's minimum storage requirements, facility construction will need to be implemented from 2024 onwards. In para 6., above, we suggest that ***the UK will need to add a minimum of c. 1 bcm/year until 2035*** simply to meet the lower end of requirements. ***The requirement to meet the upper forecast would, obviously require a massive increase up to 3 bcm/year i.e., building an equivalent to more than the UK's current gas storage capacity each year over 10 years.***

9. ***To ensure the UK grasps this hydrogen storage opportunity, the Bill must, therefore, include enabling legislation for a suitable business model and licencing that encourages and underpins rapid private investment into the sector.*** The UK cannot wait until a hydrogen market has been established to build long lead time storage, it needs to break the current "chicken and egg" situation.

10. ***The aim of such a hydrogen business model should be to remove the high degree of market volume uncertainty that exists at present to ensure that the required storage infrastructure is built in time to integrate seamlessly with production and transmission, as part of a holistic system.***

11. ***To accomplish this, we believe the government must underpin storage projects by enacting within the Bill a semi-regulated environment that provides investors with reasonable certainty of a reasonable return on capital employed and that gives both investors, operators, and the government an appropriate share of any upside.***

12. ***We advocate that hydrogen storage should operate under a fundamentally different business model to existing gas storage.*** The current gas storage 'merchant model' requires storage operators to take advantage of price volatility in the market, to inject gas into storage when prices are low and to export into the network when prices are high. This model hasn't worked over the past 12 years as volatility until the recent Ukraine 'Black Swan' event has been low. The collapse of the market model is directly responsible for why there has been no

new UK storage added in the last decade. It also exemplifies why Rough Storage was mothballed in 2017. This model is also fundamentally at odds with trying to reduce price volatility to end users.

13. ***There are existing semi-regulated business models used in the renewables sector and interconnector space that could be readily modified/adapted to a fit for purpose model in a relatively short time frame.*** The example of the underpinning of the offshore wind sector provides an illustration as to how nascent technologies can be grown successfully with government support. The UK is now one of the world's leaders in wind power, it could also become so in hydrogen storage and hydrogen batteries (allied to offshore wind).

14. ***We encourage the government to ensure the Bill facilitates the adoption of a semi-regulated hydrogen storage Cap and Floor model whereby initially the operator's marginal cost of capital and facility operating costs are effectively underpinned by the government***. The Floor price should aim to ensure that investors see the cost of capital is repaid with a realistic return over a fixed period, probably of around 15 years, as per the lifespan of current offshore wind farm CfD's and infrastructure projects in general. The Cap would provide an incentive for Operators to become increasingly efficient and to strive to make returns that are above that underlain by the Floor. We do not advocate a CfD model as we believe that offering the incentive of a Cap type profit share will provide crucial economic incentives for good operators to perform. As per the interconnector space it might also encourage operators to trade. UKEn's economic modelling suggests that over a 10-12 year period, a Cap and Floor regime would see a potential net gain to HMG. We also envisage that if the hydrogen sector flourishes it is feasible that storage could revert to a simple commercially based model between providers and users after the initial Cap Floor model term.

15. ***We do not advocate that HMG should contribute directly to the capital costs of hydrogen storage*** as a properly designed business model will create the necessary environment whereby investment into the sector becomes attractive and capital can be obtained via private sector infrastructure investment.

16. ***The current state of planning under the DCO/NSIP and TCPA regimes may cause delays to the successful implementation of necessary storage projects*** even if there is large scale popular and political support. It is usual that detailed engineering studies are carried out only once planning has been granted, which under NSIP takes c. 3.5 years at best. Such engineering studies can take up to 2 years. Consideration should thus be given, either within or separate from the Bill, to HMG providing small scale funding of up to £10-15 million to enable storage operators to conduct the necessary detailed design studies prior to planning consent. This would help accelerate project delivery by up to 2 years at modest cost, which could be regained during the operational life of the facility.

17. ***From an energy security perspective, ensuring that the hydrogen system has sufficient volumes in storage to mitigate against demand shocks to the system, such as unseasonable weather or Black Swan political events will also be critical.***

18. ***We, therefore, suggest that thought should be given within the Bill to mandating that producers/network operators should ensure that a given percentage of hydrogen demand is kept in storage. This could then constitute part of a UK strategic energy reserve.***

19. ***Given, in our view, that in the initial days of the hydrogen system there are likely to be only a handful of meaningful storage sites, the Bill should also give some consideration to the possibility that storage operators could hold initial clusters to ransom i.e., strong market***

force. We note that only two hydrogen storage projects are on HMG's key infrastructure lists.

20. ***We encourage the government to ensure that the Bill enables a holistic hydrogen system, whereby its regulation balances the contribution and roles of storage, production and transmission/transport. At present the Bill is solely focused upon hydrogen production, which is only one key system element. An overall holistic system regulator could help facilitate this and provide an eye to ensuring that strategic energy security needs are met.***

21. ***In order to encourage investment into the key hydrogen storage sector, we also believe that HMG must publish a forecast for the UK's required future hydrogen storage volumes. Without a roadmap that shows the UK's needs over time it remains difficult for both HMG to underpin and the private sector to invest in this key infrastructure.*** Currently HMG has no published plan for the volumes of either natural gas storage or hydrogen storage the UK will require in the future. UKEn has provide DESNZ with its forecasts and methodology for gas storage and HMG could do worse by adopting National Grid's FES hydrogen storage forecasts, which are well thought out and systematic. We therefore urge the government to determine and publish its forecasts for both hydrogen and natural gas storage through 2035 and beyond, so that the implementation of new storage can be shaped to meet these projections. These predictions should be updated as the system evolves.

22. ***We also suggest that a combined natural gas and hydrogen storage road map is required*** as energy storage in geologic receptors is effectively the same issue regardless of the molecule that fills the receptor. A holistic view of overall storage is necessary to provide sufficient gas storage during the energy transition and to help implement a plan to switch caverns from methane to hydrogen over time. UKEn calculates that for the UK to maintain its current winter gas coverage whilst N. Sea gas production declines, will require between 7-12 bcm of new underground storage, which if designed in a dual methane and hydrogen role could also help fill part of the UK's future hydrogen storage needs.

23. ***To continue to provide Energy Security during the energy transition we also urge the government to include provision within the Bill to support existing and future natural gas storage using a similar Cap and Floor model to hydrogen.*** As stated above our gas storage demand forecast illustrates the UK's continuing and expanding need for gas storage. Currently the prevailing merchant model provides no economically viable rationale to invest in new gas storage facilities. We also argue in 6. above, that to some extent existing storage is at odds with the overall system ambition of low-price volatility as it can currently only make a profit where high price volatility prevails. Supporting a key sector and encouraging investment during the energy transition would help guarantee sites stay in operation to be repurposed for future hydrogen use. Centrica, the Rough Field operator made a similar argument in 2017.

24. We also question how much existing gas storage could be readily and profitably repurposed to handle hydrogen. Safe hydrogen cavern construction design has moved forwards rapidly over the past 10 -years leading to increased cavern separation and well engineering. The cost of replacing non-hydrogen compatible steel may also be prohibitive. What is clear, however, is that new facilities can readily be constructed to handle both methane and hydrogen from inception at only a marginal 5-7% increase in facility capex. If a holistic UK storage view were to be adopted, it would facilitate building new storage that could handle methane in its early life which is the able to transition into 1005 hydrogen fill when gas demand drops/hydrogen demand increases.

25. In our view the required strategic level of hydrogen storage is best filled by geological storage, primarily in large salt caverns which provide the most suitable storage medium to supply the system balancing and resilience needs of large-scale clusters. Salt caverns are a proven technology, currently accounting for most of UK and EU gas storage. Caverns are ideal for hydrogen as it is impermeable to hydrogen and caverns enable large volumes to be rapidly injected to and from storage to meet system needs. The modularity of caverns also means facility expansion and flexibility is much easier than in other storage media. The British Geological Survey reported that the presence of favourable geology for caverns exists in three main UK areas: Dorset (Solent Cluster), Cheshire (Hynet Cluster) and West Lancashire and NE Yorkshire (East Coast Cluster), consequently the UK could likely accommodate most of its hydrogen and gas storage requirements in salt caverns alone. ***Successful hydrogen clusters should be aligned with the sites of such geological storage until an extensive national pipeline network is established. The siting of caverns allied to renewables is also a key strategic consideration to enable the implementation and use of Hydrogen Batteries.***

UK Energy Storage's mission is to build the largest underground hydrogen storage facility in the UK, that could provide up to 20% of the total national storage demand in 2035, at the former Royal Naval base at Portland Port in Dorset. The storage will form the core of a strategic scale hydrogen battery allied to green hydrogen production, powered by otherwise curtailed wind from the English Channel and SW Approaches.

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