Written Evidence Submitted by InfraStrata plc (HNZ0074)

About InfraStrata

InfraStrata plc develops, commercialises and operates high value strategic infrastructure and is **pioneering an underground natural gas storage facility, to address the long-term energy needs of the United Kingdom.** Strategically located off the east coast of Northern Ireland by its main gas-powered power station at Ballylumford, which provides half of the province's power, and is also the terminating point of the existing Scotland-Northern Ireland Gas Pipeline (SNIP), making it a strategic location for a gas storage project.

Construction of the natural gas storage project is scheduled for commencement in 2021. Once complete, the Islandmagee gas storage facility will consist of seven underground caverns, capable of storing up to a total of 500 million cubic metres of gas in Permian salt beds, a well-proven technique that represents the most environmentally friendly, safe and efficient method of storing large volumes of gas.

Overview

- Large-scale hydrogen storage is essential to building a hydrogen economy. Salt caverns are the most promising technology for this kind of storage.
- This technology is not new, for it has been used widely in natural gas storage for several decades. However, it would require design, planning and regulatory changes to facilitate a timely decision; in conjunction with the investment of time and finance to make the necessary adaptations.
- Whilst salt caverns are not new technology, there are component materials of the infrastructure which would differ for hydrogen requirements.
- Underground salt cavern projects which have not yet begun construction such as the Islandmagee gas storage project offer a unique opportunity to "future proof" our next generation of large-scale hydrogen storage assets to ensure we hit our hydrogen transition targets.
- Government investment support funds are required to achieve the hydrogen transition and associated large-scale storage concepts, design, engineering and development works.

1. The suitability of the Government's announced plans for "Driving the Growth of Low Carbon Hydrogen"

1.1 Blending of hydrogen into the gas grid

InfraStrata plc, wholly supports the transition to a green economy, and recognises the essential role large-scale hydrogen storage must play. Whilst transitionary plans to a hydrogen economy are not sufficiently detailed, there are several permutations which require business, financial and technological consideration.

1.1.1 A transitional strategy relates to the gradual phased introduction of hydrogen into the transmission and distribution network including repurposing of existing infrastructure. By extension, it will require additional technological considerations for existing large scale underground gas storage infrastructure.

1.1.2 It should also be considered prudent and cost efficient, that any new strategic gas infrastructure, such as the Islandmagee gas storage facility, should be financially supported to ensure the design, engineering and construction is 'future-proofed' and hence able to be trialled and operated in a phased hydrogen transition regime. To accompany the technological evolution, there should also be the development of a transparent and defined planning regime to wholly support a hydrogen economy.

1.1.3 Government support would therefore be required for the necessary planning and regulatory requirements, design and technology considerations for the UK's initial large-scale purpose-built hydrogen storage facility, and the repurpose of newly constructed assets.

1.2 Commercial Hydrogen Market Mechanism

Inter-seasonal storage is traditionally commercially viable due to the arbitrage presented by seasonal demand fluctuation and short-term volatility in the market. As a United Kingdom, European and global transition to hydrogen occurs, analysis would be required to confirm that mechanisms exist to support the capital requirements for large scale storage construction and the conversion of existing gas storage assets. Any business analysis would also need to be cognisant of the perceived price differentials between current natural gas mechanisms and a hydrogen economy.

2. The progress of recent and ongoing trials of hydrogen in the UK and abroad, and the next steps to most effectively build on this progress

2.1 According to the paper "Technical Potential of Salt Caverns for Hydrogen Storage in Europe" published by Jülich Institute for Energy and Climate Research, 'salt caverns are considered the most promising large-scale storage sites owing to their operational safety, low cost, sealing capacity and low cushion gas requirements'[1].

2.2 Storage of hydrogen in salt caverns is similar to that of natural gas. They have similar needs for cavity design, construction and operation. They differ predominantly in the materials of construction in the access wells, cavern heads, and import/export infrastructure.

2.3 The German gas provider EWE will be the first to pilot hydrogen storage technology by building a cavern bespoke for 100% hydrogen storage in Rüdersdorf near Berlin. Initial tests are expected to take place in the spring of 2022.

3. The engineering and commercial challenges associated with using hydrogen as a fuel, including production, storage, distribution and metrology, and how the Government could best address these

3.1 Salt caverns require a stringent set of geological conditions in order to be optimally formed and subsequently utilised. To be viable it is therefore

[1] A natural gas storage requires cushion gas, or base gas to maintain sufficient pressure in the cavern.

restricted to certain geographical locations, such as those identified off the coast of Islandmagee in Northern Ireland. It is therefore important that these known sites are both utilised and optimised for hydrogen.

3.2 Existing salt caverns and their related operational infrastructure are designed, constructed, and operated against rigorous and robust United Kingdom safety and quality standards. Whilst they are not a new and innovative technology, the existing natural gas legislation, standards and working practices, however, would require review to be specific to the storage of hydrogen, or any blended derivative.

3.3 Adapting existing designs, construction plans to include hydrogen or blends of hydrogen will require an investment of time and money. The German government has backed the EWE pilot in Berlin by providing the majority of the money required to design, construct and test the pilot cavern.

4. The infrastructure that hydrogen as a Net Zero fuel will require in the short- and longer-term, and any associated risks and opportunities

4.1 It is widely recognised via several studies, which review holistic (production, storage, transmission & distribution) hydrogen-based systems, that there is a mandatory requirement for large-scale inter-seasonal storage of hydrogen.

4.2 Studies would be required to ascertain the operational viability of any co-mingled, hydrogen and natural gas, storage asset to understand the properties and viability of a transitional hydrogen policy in comparison to a 100% hydrogen purity operational concept.

4.3 Underground salt cavern projects which have not yet begun construction such as the Islandmagee gas storage project offer a unique opportunity to "future proof" our next generation of large-scale hydrogen storage to ensure we deliver our hydrogen transition targets.

5. Summary

5.1 Large-scale inter-seasonal hydrogen storage is a mandatory requirement for network support in association with intra-day storage. The large-scale storage requirements must be able to meet a peak year, peak month and peak day demand, and hence salt cavern storage could be perceived as the predominant storage technology to support this.

5.2 Previous studies specific to the 'North of England' identified that to support inter-seasonal demand requirements there was a need for 90 large-scale caverns to be constructed for that demographic area . This alone equates to the current largest gas storage site in Europe which covers 6km2. Extrapolating this for the remaining areas of the UK and Northern Ireland, immediately demonstrates the magnitude of the requirements to support a net zero strategy; and illustrates that strategic support is required for significant capital intensive developments, such as an Islandmagee facility, to accommodate hydrogen, as a minimum requirement.

5.3 UK Government support is therefore imperative and an essential enabling mechanism to support large scale, underground hydrogen storage. This will support both the repurpose of those assets about to commence

construction, whilst allowing trials against proven storage concepts in the transition to hydrogen. This support would also provide timely alignment with Government's goals and societal ambition to ensure a transition to net zero, which mandates new large-scale facilities bespoke in their design for the storage of hydrogen.

6. Recommendations

6.1 It is essential that Government recognises, within the "Green Industrial Revolution", the strategic importance of large-scale storage assets and their compulsory role in the transition to and delivery of a net zero economy.

6.2 Similar to those countries, whose geology allows for large-scale gas storage, the Government should invest in the adaptations needed for design, construction and testing for underground salt caverns for hydrogen storage imminently.

6.3 Regulatory safety and quality standards and legislation should be defined in a timely manner to allow for design, construction, trialing and operations to commence to allow the UK to meet its transition targets in a time-bound manner.

6.4 Gaining the regulatory permissions and licenses for underground gas storage can take many years. In instances where this has been obtained for underground natural gas storage, government should expedite processes to adapt to hydrogen storage to enable readiness for the transition, whilst maintaining due diligence.

6.5 The commercial business model for hydrogen must be defined, and support measures identified. Until this occurs, hydrogen will not be perceived as a commercially viable option.

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