Hydrogen Economics Deep Dive

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For a hydrogen economy to develop, massive amounts of the gas will need to be produced at low cost and with minimal emissions. The rapidly declining costs of renewable energy and electrolyzers now make this possible. We anticipate the cost of producing renewable hydrogen at largescale will plummet from $2.5-6.8/kg in 2019 to $1.4-2.9/kg by 2030 and just $0.8-1.0/kg by 2050, undercutting the current cost of producing it from fossil fuels without carbon capture ($1-1.8/kg in 2019) and ensuring a bright future for the green gas.

***Figure 1: Forecast levelized cost of renewable hydrogen production from large projects***



*Source: BloombergNEF. Note: The range for fossil fuel derive hydrogen reflects current costs.*

A hydrogen economy will require plentiful and reliable storage. Eight major technologies exist to meet the full *spectrum* of needs – from small to massive, daily to seasonal. Storing hydrogen can be cheap for those regions blessed with underground salt deposits, such as parts of Europe and the U.S. However, less geologically lucky countries, like Japan, will pay more. Regardless of technology, storing hydrogen is harder and pricier than storing natural gas.

Visions of a hydrogen economy often imagine networks of pipes, trucks and ships transporting clean energy in the same way that natural gas moves around the world today. But moving H2 is costly. Its low density makes trucks and ships expensive, even when advanced technologies become fully mature. Pipelines offer the cheapest route, but require large volumes, big investments and often new infrastructure. Unless a pipeline can be used, it is better to avoid transporting altogether in favor of producing on site or as close as possible.

***Figure 2: Levelized cost of hydrogen storage and typical storage duration, 2019***



*Source: BloombergNEF. Note: Ammonia, LOHCs and liquid hydrogen are mainly media for long-distance transport*

***Figure 3: H2 transport costs based on distance and volume, $/kg, 2019***



*Source: BloombergNEF Note: Ammonia assumed unsuitable at small scale due to its toxicity. While LOHC is cheaper than LH2 for long-distance trucking, it is less likely to be used than the more commercially developed LH2. Assumes salt cavern storage for pipelines.*