Hydrogen: the Molecule to Power a Clean Economy?

BloombergNEF – Martin Tengler

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Introduction

What	BNEF is conducting a special project to evaluate whether hydrogen can be the molecule that powers a clean economy.
Why	Significant interest is building around the potential for hydrogen to become one of the principal fuels in a low carbon economy. Leading companies are forming business units, major countries are devising strategies and pilot projects are being constructed. However the costs of using hydrogen as an energy carrier are still very high, and the viability of a hydrogen economy remains unclear. No comprehensive, global, independent studies on the economics have been published.
How	BNEF has formed a cross-sectoral team of experts to research, model and analyze the economics and strategic benefits of using hydrogen.
When	Analysis will be published throughout 2019 with a major report released in mid 2019

Analytical approach in a nutshell

Do the economics work?

Cost of production
What is the lowest plausible cost of producing hydrogen?

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Cost of transport and storage
At what price can it be transported and stored?

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Economics of demand
What price does hydrogen need to be to unlock demand?

Can the strategic benefits align?

The pathway to scale

Is there a plausible path to scale and industry development?

Who are the backers and are there enough benefits? How much subsidy will be required?

What are the key signposts of industry development?

Summary of scope

Production costs

Key questions

- What is the lowest plausible cost hydrogen could be produced for? What is the envelope of likely costs?
- What is the most promising production technology?
- What will be the dominant electrolysis technology?
- Is production likely to be centralized or distributed?

Major outputs

- Forecast cost of hydrogen to 2050 (range/scenarios)
- Levelized Cost of Hydrogen (LCOH) model
- Assessment of different technologies
- Learning curves for key technologies
- Identification of the key technologies ‘to watch’

Cost of transport and storage

Key questions

- What is the cost of storing hydrogen at medium- and large-scale (e.g. in salt caverns)?
- Is large-scale storage practical and available (in the right places in major markets)?
- How “hydrogen ready” are gas networks in major heat markets, and what is the cost of making them compatible?
- What is the cost of long-distance shipping?

Major outputs

- Forecast cost of storage by technology/method
- Stocktake of salt caverns/other suitable facilities in major markets
- Evaluation of gas network suitability for hydrogen transport in major markets and estimate of upgrade costs
- Forecast cost of shipping by chemistry/method
- Case study comparing cost and benefits of hydrogen shipping vs. electricity transmission via HVDC

Summary of scope (2)

Economics of demand

Key questions

- What is the cost reduction potential and commercial readiness of usage technologies (e.g. fuel cells)?
- What is the *required* delivered fuel price for hydrogen to have an economic use case in different applications (e.g. power, transport, heating, industrial energy, chemicals)?
- Can these delivered fuel prices be achieved (taking into account production + storage + transport + usage)?
- What is the implied subsidy/carbon price that would be required for the different use-cases to be economic?

Major outputs

- Fact sheets on the economics and potential for using hydrogen in different applications
- Simple Economics of Hydrogen Usage models for each application
- Potential demand curve for hydrogen (mapping costs, volume of demand, commercial readiness etc.)

The pathway to scale

Key questions

- What applications/sector(s) can provide the initial pathway to scale and cost reduction?
- How much subsidy will be required to support industry development?
- Do the strategic benefits suggest this support will be forthcoming?
- What are the key signposts of industry development?
- Is it feasible to produce hydrogen at the scale required?

Major outputs

- Forecast envelope of possible demand to 2050
- Assessment of viability of supply at full scale
- Map of the potential pathway to scale
- Discussion of key backers and their motivations
- List of key signposts to industry development
- Stocktake of funding committed to date

Recent BNEF research on Hydrogen

The big picture

- The Key Challenges for a Hydrogen Economy
- Beyond Three Thirds: The Road to Deep Decarbonization
- National Grid Eyes Decarbonizing Gas, Using Hydrogen: Q&A

Applications

- Commercial Freight and Future Fuels
- Hydrogen as a Source of Grid Flexibility
- BNEF Watchlist: Hydrogen Forklifts, Remote Control Ferries

Technology primers

- Power-to-gas: a technology overview
- Webinar: hydrogen and fuel cells

Case studies

- Honing Remote Solar with Hydrogen Gas Infrastructure
- Will Japan's hydrogen dreams come true?
- Japan’s Hydrogen Society: Companies and Projects

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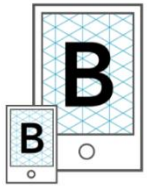

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