



Tipping Point: Enabling the Scale-Up of Hydrogen (and Associated Fuels)



Workshop

Friday 19 May 2023 (13:00 - 15:30)

Time	Item
13:00 - 13:05	Welcome and Introductions
13:05 - 13:15	Network-H2 Overview
13:15 - 13:20	Setting the Scene: Workshop Objectives
13:20 - 13:55	Theme 1: Enabling Scale-Up: Are infrastructure requirements and fuel availability aligned?
13:20 - 13:25	Introduction to the topic
13:25 - 13:40	Ideas generation using Miro
13:40 - 13:55	Discussion
13:55 - 14:05	BREAK
14:05 - 14:40	Theme 2: Regional Considerations: Where will reach the tipping point first?
14:05 - 14:10	Introduction to the topic
14:10 - 14:25	Ideas generation using Miro
14:25 - 14:40	Discussion
14:40 - 15:15	Theme 3: A Modal Perspective: Across the sector, which mode will be first to reach the tipping point?
14:40 - 14:45	Introduction to the topic
14:45 - 15:00	Ideas generation using Miro
15:00 - 15:15	Discussion
15:15 - 15:30	Final Thoughts and Thanks (including results of live scribing from Nifty Fox Creative)

Enabling Scale-Up: Are infrastructure requirements and fuel availability aligned?

Current Position

Lack of business case for H2 use in transport

Competition with other uses for Green H2 where there is not another zero carbon option

Fear that commitment to H2 is not commitment to decarbonisation as Grey H2 option remains

Development of standards still underway

Hydrogen infrastructure providers keen to proceed in deployment but the demand is limited

Production cost is high. For instance, platinum used by PEM (as catalyst) is expensive.

Demonstrators to be used as the safety use cases

No enough green H2

Failure to see the value of hydrogen is at the system level

Not yet defined requirements for infrastructure needs

Nothing is at scale and is all 1st generation hardware originally designed for the kW scale

Moving Forward

What can we learn from EV chicken and egg situation

This isn't BETAMAX vs VHS...you need both electrification & hydrogen to work to reach net-zero.

Lack of business case and is most critical barrier - TCO case for H2 needs to be demonstrated

Better catalysts for ammonia and methanol storage to enable storage at lower temperatures and more affordable costs

Cheaper and more efficient refuelling equipment

More extensive refuelling infrastructure

Awareness of the cross-sectors needs and potential alignment

Not enough attention on demonstrating the potential of hydrogen across the supply chain and how fuel can be used for multiple modes of transport. IN order to scale up we need to demonstrate that technology is ready. In some sectors, there is no clear drive from the Government in implementing a alternative fuel in the business as usual (i.e. rail)

Prove the viability of the business case to the freight operators so the demand will be aligned with the provision

Funding / ownership model for large scale infrastructure necessary. Moving in tankers does not seem feasible due to volume so requires model for pipeline distribution and / or local generation from electricity

EVs & FCEVs are 95% the same components

Need more investment

Research Gaps

Evaluation of the co-benefits of H2 transport infrastructure, for other parts of energy system

Socio-technical system modelling considering actor and decision maker requirements and decision criteria

Reduced energy demand for dehydrogenation

Mapping the organisational change needed for H2 transportation to be scaled up in for example HGV sector

Techno-economic modelling that demonstrates feasible end-state system based on green hydrogen and transition path to achieve this.

Novel reactor designs, heat transfer materials and catalysts for hydrogen production from biomass with carbon capture and storage

Implementing safety standards to refuel and transfer hydrogen from area of production/ import to points of use.

A need to push forward on options based on evidence rather than revisiting addressing historical hydrogen myths

Hydrogen - opportunities to offer resilience and security of supply

Effective and enough H2 production

Regional Considerations: Where will reach the tipping point first?

Current Position

Hydrogen is relatively expensive to transport. So it will be used close to its production in Teesside, Humber and Merseyside

Power conversion technologies and transportation have been advanced and demonstrated

lack of awareness/definition where refuelling stations could be, for example, data for rail depots, where coaches stop, number of times per day for example, RCVs, detailed market segmentation and identification of priority routes

Moving Forward

Need for multi-country co-ordination to enable refuelling in long distance transport applications

Hydrogen hubs will grow out of the sources of production and connect up. This is most likely across the teesside, humber and then across the M62

Finance schemes to encourage broader uptake

More compact and cheaper storage tanks

Refuelling stations supplying a range of low-carbon fuels

Use of hydrogen produced in Scotland, especially for off shore operations and aviation

where there are local multiple off-takers

Free ports will potentially offer the aggregated demand between road, rail and maritime

Research Gaps

Standards, codes and regulations

Improvement in design, control, fuel efficiency and lifetime of hydrogen fuel cells and engines

Carbon prices

Novel materials and efficient energy management for hydrogen storage

Regional demand might not be co-located with regional resource for H2 production (water particularly) and H2 infrastructure

A Modal Perspective: Across the sector, which mode will be first to reach the tipping point?

Current Position

Marine applications progressing

For aviation, synthetic kerosene-like fuel is a drop-in pathway as the fuel is suitable for direct use on existing aircrafts and engines

For sea-going ships, advancement in power system design, energy management, and naval architecture is required.

10s of 1000s of buses are being built in china each year

Hydrogen hybrids technology converting existing cars is now possible

Moving Forward

Motorway fuelling - HDV & coaches

Specialist off road applications such as diggers, cherrypickers, dumpers etc for mining/construction sector

More local case studies to show its possible.

Aviation has a clear pathway for hydrogen - but still way to go in terms of standards

Also in relation to using hydrogen as aviation fuel, power technologies and systems must be modified together with new aircraft design and onboard fuel storage and supply systems.

Ship bunkering services at ports, considering space reallocation and new facility for handling, storing, and releasing liquid hydrogen and supplying compressed gas hydrogen in large quantities.

Forklifts using metal hydride storage

Use of hydrogen powered equipment such as cranes, forklifts and harbour tugs at ports

Retrofit existing vessels

approach to model alternative fuels for surface transport with an integrated understanding of EV and hydrogen for different modes and uptakes for all transition phases

Marine use cases - probably leisure boats or off shore maintenance will probably be the first adopters

niche delivery drones, off road vehicle hubs such as airports

Long-range trucks when optimal strategy for storage will be defined

Cargo ships that transit across short distances on a daily routine are possible to switch to clean fuels

Research Gaps

How will tipping points cascade as sectors interact

Larger storage volumes over longer periods safely with minimal technical issues e.g., sloshing effects, heat or hydrogen losses, and impurities

Focus on the exhaust material of hydrogen is clean rather than pollution and evidence that hydrogen is safe as 100 years on its still linked to hindenburg

Support structure knowledge share important. Set up a WhatsApp group or discord to attract wider audience into discussion

Understand the international aspect - will the UK be left behind? Is it a really a decision maker or will it simply follow US/Chinese markets?