Durham University

Network-H_2

A network for hydrogen fuelled transportation

UKRI Engineering and Physical Sciences Research Council

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 with 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.
- Demonstartors 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 isnt 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
- 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)
- Awareness of the cross-sectors needs and potential alignment
- More extensive refuelling infrastructure
- 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
- 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
- Mapping the organisational change needed for H2 transportation to be scaled up in for example HGV sector
- 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
- Implementing safety standards to refuel and transfer hydrogen from area of production/ import to points of use.
- 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?