Written Evidence Submitted by the Manchester Fuel Cell Innovation Centre (MFCIC), Manchester Metropolitan University (HNZ0023)

Introduction

This submission from the Manchester Fuel Cell Innovation Centre (MFCIC) at Manchester Metropolitan University draws upon and updates two reports: a hydrogen road map prepared for the Northern Powerhouse, a hydrogen strategy prepared for Greater Manchester and our submissions to the APPGs on Climate Change and Hydrogen in 2020.

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

In considering the scale and timescales of the Government's proposals it is necessary to consider the counter-factual of what is likely in the absence of a commitment to a hydrogen economy.

The Government's current hydrogen strategy is focussed on the supply of bulk hydrogen for industry and heat use. This focus on Blue hydrogen supply risks focusing development on methane reformation and carbon capture and storage which, while lower in carbon output, does not in the long-term meet the objective of zero carbon. Left to the market this technology is likely to dominate given the significant cost advantages of methane reformation compared to hydrogen produced by electrolysis.

In contrast, hydrogen also has a key role in transport but requires higher purity levels that is delivered by hydrogen produced by electrolysis. When coupled to renewable power technologies (e.g. solar and wind) or nuclear power, hydrogen can be produced carbon free. The main factor driving the higher cost of this hydrogen production method is the cost of the electrical power. Recent analysis by Proost[i] indicates that with electrical power prices below €30/MWh hydrogen production cost on a par with methane reformation are achievable. Currently such prices only arise when renewable generation is high and demand low in the absence of "green taxes" on the power supplied. With the predicted growth in renewable generation the periods when such price levels are available could provide a basis for cost competitive hydrogen production.

Hydrogen by electrolysis is an area where the UK already holds a significant advantage with the worlds' largest electrolyser factory in Sheffield, where manufacture commenced in Jan 2021. This facility alone has the capacity to meet the International Energy Agency's[ii] forecasts for global capacity growth in electrolysers to 2023. However, the Government's focus on Battery Electric Vehicle (BEV) as the main route to transport decarbonisation risks losing this advantage as other countries invest in Fuel Cell Electric Vehicles (FCEV) such as California's "hydrogen highway" and Japan's plan for a "hydrogen" Olympic Games. The lack of a refuelling infrastructure or deployment strategy is a significant disincentive to investment in this type of vehicle. In our strategy advice for the Greater Manchester Combined Authority we have highlighted the role of FCEV particularly for HGV, buses and other return to base public vehicle fleets as a key measure in both driving adoption of the technology and improvement in local air quality.

Our discussions with refuelling infrastructure providers indicate that provided a sufficient "anchor user" demand is identified financial models exist that would support private investment in

infrastructure development. Extending this approach to a national level would enable a wider switch to FCEV in the haulage industry and build public confidence in Hydrogen technology.

FCEV also offer advantages over BEV both in terms of range and refuelling / recharging time. Increasing the range of BEV requires increases in battery size and consequently weight of the vehicle and hence the associated materials needed to carry the weight. In contrast increasing range of a FCEV only requires a larger hydrogen tank which has little impact on vehicle weight.

At the consumer level a number of manufacturers are developing FCEV models. While current FCEV models are priced at the premium vehicle end of the market the development of BEV has already shown that wider scale availability can drive down costs to levels close to those of similar fossil fuel vehicles. In such a scenario equity in refuelling / recharging costs also arises with only those BEV consumers with access to at-home recharging able to benefit from low cost recharging while those reliant on the public charging infrastructure face significantly higher recharging cost.

In summary therefore we recommend that BEIS and DfT collaborate in the development and delivery of a hydrogen transport strategy given that this technology is readily deployable now without the need for long term safety evaluation and demonstration studies to grow the UK's presence in this technology area and build public confidence.

Authors: Dr Laurie King, Dr Ian Madley, Amer Gaffer

(January 2021)

---

[i] Proost J (2020) Critical assessment of the production scale required for fossil parity of green electrolytic hydrogen, Intl J Hydrogen Energy **45**, 17067-17075 https://doi.org/10.1016/j.ijhydene.2020.04.259

[ii] https://www.iea.org/reports/hydrogen