Call for Evidence Response

Friday 19th June 2020

Technological Innovation and Climate Change: Hydrogen

The Energy and Utilities Alliance (EUA) provides a leading industry voice helping shape the future policy direction within the sector. Using its wealth of expertise and over 100 years of experience, it acts to further the best interests of its members and the wider community in working towards a sustainable, energy secure and efficient future. EUA has seven organisational divisions - Utility Networks, the Heating and Hotwater Industry Council (HHIC), the Industrial & Commercial Energy Association (ICOM), the Manufacturers of Equipment for Heat Networks Association, the Hot Water Association (HWA), the Manufacturers' Association of Radiators and Convectors (MARC) and the Gas Vehicles Network (GVN).

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1. How effective has the Government's investment in hydrogen projects such as the Low Carbon Hydrogen Supply competition, the UK Hydrogen Mobility Programme and Hy4Heat been in moving the sector towards becoming an integral part of a low-cost, low-carbon economy and boosting the productivity and competitiveness of the UK energy sector?

Government investment in projects such as these has been a positive influence in kick-starting research into the feasibility, safety and processes of hydrogen as a low carbon fuel source. For example, the HyDeploy project at Keele University has proven that, in the medium term, generation and use of hydrogen via electrolysis is a viable option for decarbonising the gas grid by blending hydrogen with natural gas for heating and cooking. The project is now moving on to look at process plants.

HHIC is involved in the Hy4Heat programme which is making excellent progress with regards to appliances that could operate using 100% hydrogen. Particular successes of the programme so far include:

- Two manufacturers have developed fully functional hydrogen boilers which will be available for the H100 project.
- A consortium has developed a hydrogen cooker.
- Two consortiums have developed hydrogen domestic fires.
- A specification for hydrogen quality, derived from existing standard BS ISO 14687:2019, has been agreed.
- A new standard has been developed by industry alongside the British Standards Institution (BSI) (PAS4444) to enable hydrogen appliances to gain a CE mark so they can be used for the H100 trial and, in the future, placed on the market.

Perhaps the most important function of this investment is giving certainty to industry that the Government considers hydrogen to be a potential low carbon fuel for the gas grid and that it

wants to explore its feasibility. This is very welcome after years of uncertainty around the Government's position on the future heat and the continuing role of the gas grid.

For a transition to a hydrogen economy to occur, we will need full suite of policy support from the Government including:

- Subsidies for low carbon hydrogen production.
- Strategic oversight of increasing hydrogen blends in the gas grid and phased switching of individual areas to 100% hydrogen.
- Investment in, and support for, carbon capture and storage.
- Mandating hydrogen-ready appliances when natural gas appliances are replaced.

2. What level of output can the sector deliver in the UK, and what Government support would be needed to achieve this? How does the potential for hydrogen differ by end-use?

In the first instance, funding is required for the H100 project which will construct a hydrogen network and supply 300 homes in order to prove the use of hydrogen at scale. Further work would be required for industrial processes, but conversion to a full hydrogen network is possible with the necessary funding. The sector can deliver a full hydrogen economy but would need the green light from government to unlock the full investment which would allow it to happen in practice. Government intervention and support will be crucial to ensuring the sector's ability to meet the vast majority of current gas demand with hydrogen.

Government would need to invest in carbon capture and storage (CCS), a critical technology, to ensure it reaches commercial viability, not only for hydrogen but for many other industrial processes. The Government will also need to support the development of hydrogen production, both renewable and from steam methane reformation (SMR), until it reaches the point of being commercially viable.

Hydrogen clearly has great potential to create a zero carbon gas grid and carbon-free gas appliances which would transform domestic energy use. The end user would require new appliances but regulating so that hydrogen-ready appliances are sold would prime the system ready for conversion. In operating and performance terms the end user would see little to no difference. It could also play a significant role as a zero carbon transport fuel, particularly in hydrogen fuel cells; there are additional challenges with this and a hydrogen fuel for combustion engines may be needed for heavier vehicles if biomethane cannot fully replace diesel by 2050.

3. How realistic is industry's claim of widespread applicability of hydrogen technology in transport, heating and other sectors? Is hydrogen a cost-effective, feasible solution towards a low-carbon economy?

HHIC believes that this is a realistic claim from industry. Hydrogen could certainly be applicable as a low carbon, cost-effective solution for decarbonising the gas grid and the appliances which use it. Furthermore, our existing gas grid, the most developed in the world, covers a large

proportion of the country including both domestic, commercial and industrial processes. The grid can transport fuel at minimum cost and environmental impact compared to other methods. We should be leveraging this major asset as we move to a net zero economy.

In the short term, steam reformation of natural gas to produce hydrogen, in conjunction with carbon capture and storage, is an effective solution for reducing carbon emissions and is a method that is already in use today. However, this will increase the cost of gas in the short term. The cost of producing hydrogen will decrease as the technology develops especially with larger scale developments. Once demand has surpassed the early stages of the new technology, appliance costs could be available at a similar (relative, taking inflation into account) price to existing natural gas appliances. Storing energy produced by low carbon electricity by using water to generate hydrogen is also an effective way of meeting the UK's energy demand; the demonstration project at Keele University is proving this.

Adapting the current gas network to carry hydrogen and introducing hydrogen-ready appliances is possible and can be proven via the H100 project. The combination of low carbon electricity and hydrogen will be needed to meet the future green energy demand. Hydrogen is already being used for transport in cars, buses and lorries using fuel cells. There are 16 refuelling stations in the UK that generate hydrogen from water.

4. What are the different implications of hydrogen produced from fossil fuels versus from renewables in terms of cost, scale, and emissions, and in terms of meeting the UK's net zero targets?

CCS will be critical to producing so-called 'blue hydrogen' from SMR whilst meeting the 2050 target. It is likely that we would be able to produce blue hydrogen on a larger scale due to the availability of natural gas versus excess renewable electricity. 'Green hydrogen' production could utilise renewable electricity when grid demand is low. As we are seeing currently due to the pandemic, excess supply can present a challenge for grid operators. Utilising excess supply through electrolysis would solve this issue and produce carbon neutral hydrogen; this type of production could therefore be incentivised in the long term.

5. How feasibly can hydrogen technology be applied in various sectors, from transportation, to energy generation and industrial processes, whilst maintaining the highest safety standards?

The UK is at the forefront of gas safety and has numerous committees on the subject via BSI and IGEM. The European Commission provides the legal framework for placing gas appliances on the market through the Gas Appliance Regulation and European standards which are the responsibility of CEN. Gas is also is regulated in the UK by the Health and Safety Executive. The UK and European Union are already developing hydrogen safety standards. International standards for the transport sector are also already in existence.

The Hy4Heat project is demonstrating the safety of raising hydrogen blends in the grid and has shown promising results. We can also learn some lessons from the usage of town gas which had a 50% hydrogen content. Polyethylene gas mains, as are now commonplace due to the ongoing Iron Mains Replacement Program (IMRP), and suitable for hydrogen distribution, could transport the gas and the exemplary safety record and expertise within the UK gas industry would ensure a safe transition.

6. How might the UK take advantage of further advances in hydrogen technology, such as hydrogen boilers and innovative storage and distribution solutions?

Hydrogen boilers are already in development and close to completion but legislation will be required at the appropriate time to ensure all gas products sold are hydrogen-ready. As previously stated, selling hydrogen-ready gas appliances would prime the system and help with future deployment of hydrogen. There is also ample potential for additional research and product development in the commercial and industrial sector as advancements in this area could deliver significant emissions reductions.

Developing a zero carbon hydrogen gas grid and appliances which can run on 100% hydrogen could, if made a national infrastructure priority, make the UK a world leader in this technology which would benefit the economy and domestic expertise. Hydrogen boilers could offer a cost-effective and minimally disruptive solution for the more than 85% of households which currently use natural gas to heat their home. Unlike other alternatives, hydrogen boilers would be very familiar and would slot into a central heating system that consumers understand, like and know how to control. They would require minimal, if any, changes to existing heating systems and would be maintained in much the same way as natural gas boilers.

7. What support does the sector require to keep pace with the most cutting-edge innovations, such as in hydrogen fuel cells, using Small Modular Reactors for hydrogen production and in end use applications?

The sector needs to see continued Government support through innovation funding, funding for feasibility studies and positive policy statements such as the Hy4Heat and HyDeploy projects.

8. What is the UK industry doing to scale up green and blue hydrogen production by using its offshore wind capability and developing feasible, cost-effective Carbon Capture and Storage technologies?

The HyNet project which has been initiated by Cadent is an example of the gas industry proactively investing in and building CCS infrastructure as part of a hydrogen-based network. This project is envisaged as one which will incorporate a range of technological applications for hydrogen including production, blending into the grid, transport fuels, industrial usage, power generation and storage.

9. Given hydrogen's potential cross-sector application, how co-ordinated is the Government's approach to policy and regulatory development of hydrogen?

The Government's approach has been co-ordinated so far when it comes to energy, but soon further policies will be needed to take the development of hydrogen beyond the feasibility stage on to trials, etc. There has been very little policy development around hydrogen's potential applications in transport given that technological development of this technology is not yet.

10. How well has the Government raised awareness amongst industry, public officials and the general public of the potential for hydrogen to support a low-carbon economy?

Public awareness of the need for certain areas of the economy, such as heat, to become low carbon and how this could be achieved is very low. Amongst consumers, awareness of technologies such as heat pumps also remains very low despite significant Government investment via subsidies and funding for projects to investigate persistent low levels of uptake. Consumers are very aware of natural gas as a heating fuel so it would not be a significant challenge to make them aware of hydrogen as an alternative and the few differences in usage between the two gases. With all the current levels investment in hydrogen projects, now is an ideal time to raise awareness of hydrogen amongst the public; this would most likely be something the general public would be supportive of due to their general support for the net zero agenda. The Government will need to ensure results of studies into the safety of hydrogen are communicated alongside environmental and practical information to assure consumers of its safe use.

Amongst industry, awareness of hydrogen, its potential applications, benefits and challenges is high in the gas industry but not as high in other sectors, such as transport. With positive Government signals on the future role of hydrogen, this awareness gap can be addressed and the full potential of a hydrogen economy better explored.

11. To what extent has the UK established, or can establish, any early adopter advantage in the use of hydrogen in research, applied science or industrial processes? Which countries are at a similar or more advanced stage than the UK in exploring applications for hydrogen in helping deliver net-zero targets?

The UK is currently at the forefront of establishing hydrogen as a fuel for the heating sector. We could benefit greatly from being an early widespread adopter of hydrogen, but only if the Government is supportive and moves quickly unlike the prevarication over CCS which squandered the opportunity to be a leader in that technology.

Several other countries are more advanced in the development and sales of hydrogen fuel cell vehicles but as for use in buildings, there is less evidence from abroad to point to. The current focus in Europe appears to be on replacing natural gas with either biomethane or electrification.

In Germany, Deutsche Bahn are beginning to roll out hydrogen fuel cell trains on their networks and have had early success with this.

12. What can the UK hydrogen sector learn from other countries' hydrogen strategies?

There is little evidence of hydrogen strategies being developed at a more advanced level than in the UK at the present time. However, this could change at a rapid pace. Germany have published hydrogen strategy and so has the EU. Currently, these strategies are not as ambitious as the UK's but they soon will be. As previously mentioned, the UK currently has an opportunity to be a world leader in hydrogen technology and to export it to the rest of the world. We have one of the most advanced and extensive gas infrastructures globally, one that could be transformed into a hydrogen network, but this will require Government investment and commitment. The Government needs to be clear and publish a comprehensive hydrogen strategy to detail how it will develop and nurture a hydrogen economy. This will unlock a significant amount of private investment and will transform the UK's energy infrastructure. However, without clear Government signals that investment may well go to other countries and we will lose our competitive advantage.