13th April 2021

APPG on Hydrogen, Inquiry Launch - The role of hydrogen in powering industry

About the IET

We are the Institution of Engineering and Technology (IET), and one of the world's largest engineering institutions with over 168,000 members in 150 countries. Our aim is to inspire, inform and influence the global engineering community to engineer a better world. We are a diverse home across engineering and technology and share knowledge to engineer solutions to global challenges like climate change. With our roots in electrical engineering, we have been championing engineering solutions and the people who deliver them for 150 years.

The Institution of Engineering and Technology (IET) provides independent, impartial, and expert advice, spanning multiple sectors including Energy, the Built Environment, Transport, Manufacturing and Digital.

In 2019 the IET published **a report**, which focused on the engineering questions that need to be addressed if the UK is to transition to hydrogen. The IET welcomes the opportunity to comment on the ***APPG on Hydrogen, Inquiry Launch - The role of hydrogen in powering industry***.

The role and potential of hydrogen across different UK industry sectors

The potential of hydrogen across a wide range UK industry sectors, is significant and includes; use in back-up electricity generation, heating, carbon capture and storage, energy/resource efficiency, storage, fuel cells, transport (heavier vehicles e.g. HGVs, trains), shipping, aviation, infrastructure, and electricity network expansion.

Further opportunities include education, skills[i], employment, transitioning traditional fossil fuel industries (generation and consumption), growing the green economy (research, development, manufacturing, infrastructure etc.).

However, in order to leverage the full potential of this energy vector, it must be considered as part of a wider energy system i.e. Whole Systems Thinking.

There are five key messages from the IET Transitioning to Hydrogen report[ii], that require urgent attention:

1. ***Progress CCuS infrastructure*** - Without the simultaneous deployment of a carbon capture, utilisation, and storage (CCuS) infrastructure hydrogen does not have a future for large-scale retrofit deployment to industry, homes, and businesses.
2. ***Deploy critical new technology*** - The large-scale deployment of hydrogen to homes and businesses will involve the introduction of new technologies for which there is limited experience.
3. ***Prepare a transition programme*** - This needs to include sufficient enough detail to ensure the identification of critical path items and their associated uncertainties.
4. ***Develop skills and plan resources*** - Transitioning to hydrogen will require resources ranging from craft skills, technicians, planning and designer engineers, academic and industrial researchers though to project management and customer-facing skills.
5. ***Fund the programme*** - The transition programme will require substantial investment over many years.

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How hydrogen can help the UK meet its net-zero target

Of the two main hydrogen production methods, i.e. natural gas reforming and electrolysis; there has been much debate across the industry and media regarding the 'pros and cons' of each. It has been stated by some that even with carbon capture and storage (CCS), reforming using natural gas as a feedstock, is not very green, that it is only promoted by the oil and gas industry, and that the technology for large scale production has yet to be developed. Whereas production of hydrogen from electrolysis requires huge investment in renewable generation, coupled with electrolysis plant, and is very inefficient.

But there are other choices for hydrogen production. For example, from biomass gasification. This is important because, to achieve net zero, the UK must have a strategy for greenhouse gas removals. In the future, we might be able to decarbonise without the need for removals but that is not the case at present. The key technology here is biomass with CCS (or BECCS). The Climate Change Committee's (CCC's) sixth carbon budget[iii] report has 250TWh of energy bioenergy and waste by 2050 in its Balanced Net Zero Pathway, most of which is indigenous. In addition, there is scope for imported hydrogen, produced using solar PV, which also has substantial potential.

These options warrant further investigation before any decision can be made. Ruling them out at this stage would be unwise. For example, it is possible that gas reforming using a combination of autothermal reformers and gas thermal reformers could achieve high levels of conversion efficiency with extremely high levels of carbon capture. We should certainly do more to find out if that is the case. There are also other options such as importing hydrogen. These also have challenges, particularly in terms of transportation losses, but again we should investigate before ruling out.

The UK and the global community as whole; will need a wide range of technologies and hybrid systems, in the transition to Net Zero; this means investing, evaluating, and implementing at pace and scale now, in order to make informed choices and decisions at every stage of this challenging but essential journey.

If you would like to discuss further anything in this response, please contact Caroline Holman, email carolineholman@theiet.org

[i] IET skills for net zero and a green recovery 2020 survey (theiet.org)
[ii] transitioning-to-hydrogen.pdf (theiet.org)
[iii] Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)