

The role of hydrogen in achieving Net Zero – HMG Call for Evidence

Details of submitter of evidence:

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Introduction to person/organisation and reason for submitting evidence

As the Flow Measurement SIG within the Institute of Measurement and Control we have taken a keen interest in the niche, but critical, role of accurate flow measurement in the deployment of a hydrogen economy within the UK. In summary, every financial and fiscal transaction with hydrogen will be based upon the reading from a flow meter, whether this be hydrogen gas supplied to the home, refuelling of a vehicle or large-scale industrial supply and usage. In essence, flow meters will be the cash registers, much as they are for the fossil fuel-based energy system today. Hence, we commissioned a targeted piece of research to understand the flow measurement needs for hydrogen use in domestic, transport and industrial settings, including the role of documentary standards and regulation. This report, by PA Consulting, is now publicly available and includes five recommended actions for Government, with one of the key findings being that there is a lack of suitable flow measurement standards for hydrogen.

Evidence

By way of evidence, I submit the executive summary from this report (the full report is available upon request):

In the UK and internationally, hydrogen is being increasingly seen as a key component of the global energy transition. Currently, most hydrogen is produced from fossil fuels and has a consequently high carbon footprint (*grey* hydrogen). However, technological advances are opening up the opportunities for low- or no-carbon hydrogen. Whether it is *blue* hydrogen, produced from fossil fuels with associated carbon capture and storage, or *green* hydrogen produced via an electrolysis process using renewable electricity.

Hydrogen is a highly versatile energy fuel, vector and storage medium. *Grey* hydrogen is currently considerably cheaper than *blue* or *green*. But further investment and support around hydrogen production, storage and distribution, and hydrogen consumption technologies (e.g. fuel cell vehicles, hydrogen domestic boilers, etc.) will continue to drive down supply chain costs and lead to economies of scale. Therefore, hydrogen is set to become more cost effective with an increasing range of uses.

Hydrogen has physical and chemical characteristics quite different to natural gas or other hydrocarbon fuels. It is exceptionally light, with less energy by volume, but far more by mass, than conventional fossil fuels. These characteristics can be challenging for the flow meters most commonly used today and many are not fully tested or calibrated to accurately measure hydrogen.

All major economies see a role for hydrogen in their economies. And all agree that there will be a strong international market in production and consumption technologies. To ensure that this market (or any other) can operate effectively, there will need to be an international harmonisation of a range of standards including those for flow measurement. As the cash registers of the future hydrogen economy there has to be total user acceptance and confidence in the accuracy of hydrogen metering. This report looks in detail into the suitability of the metering technologies and flow measurement standards for three use cases for hydrogen in a low carbon economy. They are:

- Domestic - As a replacement fuel for domestic heating and cooking. We are assuming that this relates to consumers using a hydrogen-methane blend, or pure hydrogen, and connected to existing gas grid.
- Industrial - As a replacement fuel for industrial applications. We are assuming that this relates to grid-connected consumers.
- Transport - As a replacement fuel for the transport system (primarily HGVs, forecourts applications, etc.)

Domestic & Industrial

The UK has an opportunity to use its extensive natural gas transmission and distribution network to distribute hydrogen (pure or blended) direct to domestic and industrial customers. This report identifies a number of schemes and pilots that are exploring the feasibility of hydrogen (having been transported by the natural gas network) being used in domestic and industrial settings.

But there needs to be a real drive to understand the accuracy of, and establish standards for, the metering of the hydrogen blends and pure hydrogen. This would need to be an international endeavour because many of the meter manufacturers are based overseas, and the network is physically connected to other networks overseas.

Transport

This is an international sector, with significant cross-border traffic flows. The UK's closest trading partners will be facing the same challenges with regards to accuracy and reliability of flow measurements in hydrogen refuelling stations (HRS). So there needs to be continuing collaboration to explore the best ways to test and calibrate flow meters within HRSs, and to provide traceable measurement in deployed HRS.

Actions

The physical characteristics of hydrogen, the variability of temperature and pressure in measuring systems, and the absolute need for consumer confidence and enthusiasm, make the harmonisation of flow measurement standards essential. There is an urgent need to identify and harmonise flow measurement standards, and test and calibration techniques. The report identifies a number of actions that are needed on hydrogen flow measurement:

1. The UK Government, working with industry, should publish a National Hydrogen Strategy as soon as possible (at least by the end of 2021) and ensure that the vital importance of harmonised standards, including for flow measurement is given clear priority.
 - And as an interim measure, there needs to be a growing clarity about the role of hydrogen in the long-awaited Energy White Paper.
2. The UK Government needs to provide Physical Primary Standards for hydrogen for the UK to ensure that a traceable and suitably accurate measurement chain exists.
 - This is essential to enabling domestic and international trade and markets – you can't sell what you can't measure.
3. The UK Government needs to help the relevant bodies develop the correct regulatory regime and documentary standards.

- Tight enough to ensure control, but relaxed enough to enable affordable and technologically feasible compliance.
4. Supported by BEIS, the UK's Designated Institute for Flow and Density Measurement (NEL) needs to help industry to implement flow measurement in compliance with regulations and documentary standards.
- For example, today such support is in place to help industry meet the OGA's fiscal regulations in the North Sea for oil and gas production; we will need to do likewise for hydrogen and CCS.
5. The UK Government and relevant agencies need to develop a full engagement programme allowing them to participate fully in all relevant international hydrogen metrology and standards fora.
- Leadership in this area will provide considerable confidence and clarity to the sector as a whole.
 - Being at the table is essential and being there early and leading the conversation is even better. This will help the UK's progress to net zero, enhance clean growth and facilitate global standards that are well suited to UK's commercial success in the global marketplace.