REA's position on hydrogen blending

The REA believe hydrogen blending into the gas network has a key role to play to support the scale up of the UK clean hydrogen sector.

Government should clearly back the strategic role of clean hydrogen blending into the gas network and support it financially and this paper sets out the reasons why.

Paper contents

The case for hydrogen blending

Government and industry have been working together on how to ensure the UK's 2030 low carbon hydrogen production capacity target is met. This has been now doubled to 10 GW, as announced in today's Government's Energy Security Strategy.

So far Government has been mostly focused on hydrogen mobility (supported under the Renewable Transport Fuel Obligation) and hydrogen production and supply to industrial clusters (which will be supported under the Hydrogen Business Models). We believe that Government should also focus on supporting hydrogen blending into the gas grid and we have set out our reasons for this below.

Reaching multiple users and de-risking investments

Firstly, a key advantage of hydrogen blending is that hydrogen blends can reach many end users, not just a few large industrial users within the industrial clusters and provide some decarbonisation effect for all of them.

Secondly, hydrogen producers and project developers will look at these policy mechanisms to see how to create an investable project, in a similar way to how project developers used policy mechanisms such as the Feed-in Tariff Scheme, the Renewable Obligation, the Renewable Transport Fuel Obligation (RTFO), the Renewable Heat Incentive and the Green Gas Support Scheme. History has shown that grids are essential to facilitate the production and use of renewable energy (such as wind, biogas, solar) and that capital grant schemes for the production technology have not always worked. Examples of this include the Bioenergy Capital Grant Scheme, which has resulted in limited deployment. Energy production developers look to de-risk the investment through having a regular payment for the energy produced.

According to some investors members of the REA, one of the critical risks to successful deployment and scaling up of low carbon hydrogen production in the UK is that currently the two sectors which will have ongoing policy support mechanisms in place are the

transport sector (under the RTFO) and the Commercial and Industrial (C&I) sector (under the Hydrogen Business Model (HBM), which appears to be particularly geared towards this end user type). Both sectors require that project developers align the production and demand of hydrogen to make a project viable. Furthermore, the creditworthiness of the demand has considerable importance as failure of demand or fluctuations in demand have a material impact on the financial performance of the investment.

Comparing the early stage of the industry that is looking at hydrogen production against other sectors such as solar, wind and biogas generation, the key difference between hydrogen and the other sectors is that they did not rely on end-use customers but were able to connect their production facilities to the grid and dissipate the energy relatively easily through either a gas or an electricity supplier. The way in which Government is currently looking to create a low-carbon hydrogen production market is to rely solely on the end-user demand rather than the ability to inject hydrogen into the grid. We believe, however, that Government should support hydrogen use by distinct end users where feasible, but on the other hand take advantage of the gas grid to access multiple users.

We can see in the past how impactful this has been when we look at the biogas sector, whereby developers have historically had an option to produce biogas for mobility (through the RTFO), and also for gas injection. One of the key barriers to developers having relied solely on mobility was that it created greater investment risk due to the uncertainty of demand, combined with the volatility of the value of the RTFCs. Similarly, 'private-wired' wind and solar assets are more common today, but at the start of the sector nearly all projects were grid connected. The RTFC mechanism now works well but this is normally achieved via mass balancing so the waste derived biomethane is injected into the gas grid at the AD plant and taken out at the truck depot. Less than 1% of RTFCs are directly generated biomethane going into trucks and no compressed or liquid biomethane is moved by road.

Given the experience of biomethane, the safety and low density of hydrogen, blending of hydrogen is crucial in the first years of the electrolyser market as the ability to inject directly into the existing gas grid allows a materially lower risk option for hydrogen production developers to be able to develop projects, fund and build them. This materially de-risks the project and, crucially, allows for a much larger uptake of hydrogen production. This approach allows the hydrogen production market to develop and enables blending to play a crucial role as a steppingstone towards a decarbonised gas system.

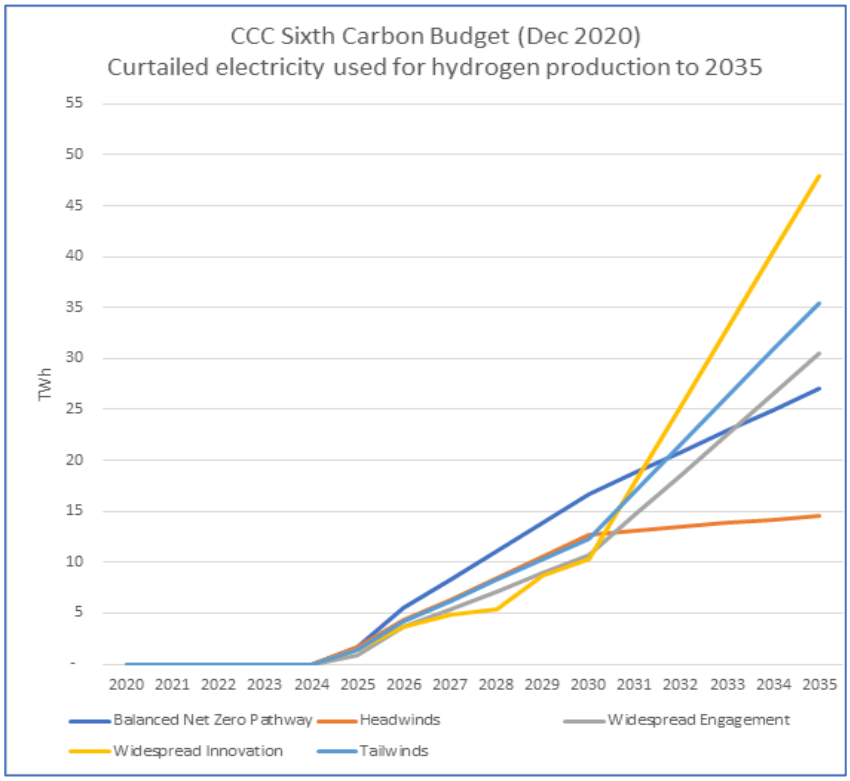
Supporting Government hydrogen production targets

Even a relatively small blending acceptance will generate a significant demand for hydrogen on the network. With the current gas demand of 800TWh, 20% volume blend gives around 50TWh of hydrogen. To put this in context, the Government previously set an ambition to deliver 5 GW hydrogen production capacity by 2030 (which has now been doubled to 10 GW in the Government's Energy Security Strategy), expected to provide up to 42 TWh of low carbon hydrogen. A 10% blend by 2030 is just over 3% by energy and 24 TWh/annum.

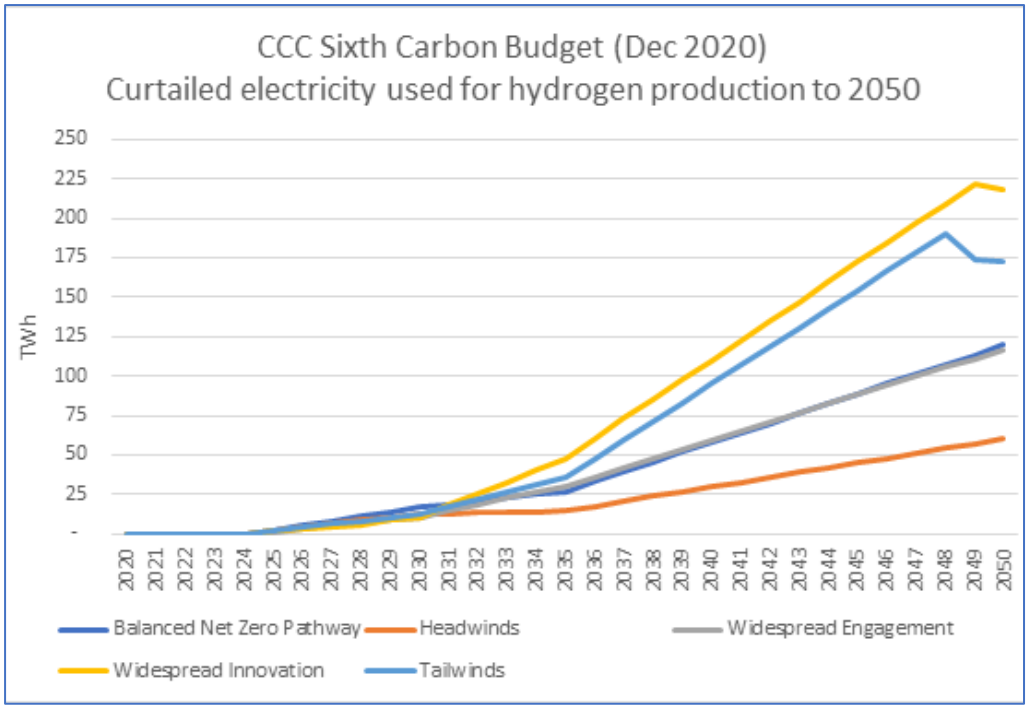
In conclusion, the gas grid could accommodate nearly 6GW of hydrogen without exceeding the 20% limit, supporting the Government towards its 2030 hydrogen capacity target.

Supporting large scale balancing of the network and curtailment reduction, along with energy storage

The UK Government is committed to decarbonising electricity by 2035. This will require significantly more renewable electricity generation to be installed in the UK. In 2020, curtailment costs were c. £ 250million according to Bloomberg. A paper released by Edinburgh University "Utility-scale subsurface hydrogen storage: UK perspectives and technology" estimates that wind production alone could result in 7.72TWh of curtailed generation by 2030. Reports from the Climate Change Committee also show significant curtailment of power as shown below:



Source: CCC, Sixth Carbon Budget Report, December 2020



Source: CCC, Sixth Carbon Budget Report, December 2020

There is an increasing need for long-duration, large-scale seasonal renewable energy storage in order to help balance the increasing shares of renewables which will be required to meet the UK Government's commitment to decarbonising the power grid. Future wind and solar projects which will be faced with curtailment prospects, will cause investment risk and in turn either make the projects non bankable, or more expensive to fund (as the cost of capital will be higher as the risk premium is higher). Seasonal storage (different to battery, short term) such as hydrogen production and injecting into the gas network to be stored as gas-hydrogen blend and then later dedicated hydrogen pipelines will be the foundation blocks of enabling large scale balancing of the network between the peaks of generation and demand. It means that the green electrons that may have been curtailed can be instead converted into green molecules and used to decarbonise the gas network. Taking this further as hydrogen concentrations increase within the network it can be linked to large storage facilities such as salt caverns and depleted gas storage facilities such as Rough to balance the profile between production and demand and cope with the '*Dunmkelflaute*' (periods of low wind in winter in NW Europe).

Blending hydrogen into the grid will be strong facilitator to avoid curtailment as the gas network can absorb variable production rates of hydrogen from electricity. Support to blending of hydrogen in the network will help deliver one of the huge potential benefits of hydrogen – i.e. that you can store and dispatch renewable energy at necessary times, whilst reducing the cost of curtailment.

In addition, we believe hydrogen injection into distribution networks can play a key part to support numerous smaller scale projects (1 – 50 MW). If this is not possible, smaller scale projects will mostly not be feasible and it will be mostly projects above 100 MW injected into the transmission system within the industrial clusters.

As highlighted to BEIS previously, we think a wide range of scales and types of projects is required in the UK to build a functioning hydrogen economy. This includes smaller scale, decentralised projects which are key to kick start the hydrogen market and can be deployed relatively rapidly with the right support from Government.

Financial support for hydrogen blending

In the context of the Hydrogen Business Model that BEIS is developing, the department has recently sought stakeholders' views on whether the role of blending in the hydrogen economy should be primarily as a 'demand backstop' for hydrogen producers facing volatile, or temporarily unavailable demand, rather than financially supported by the government as a long-term, majority offtaker. They also sought views on potential commercial options to deliver the backstop strategic role of blending and how they could ensure that, if supported commercially, blending would not displace supply of hydrogen to higher-value end-users such as industry or power.

For the reasons highlighted above, we believe that Government should not simply see blending as a 'backstop' but blending needs to be seen as an important sink for hydrogen, alongside government initiatives for hydrogen in large industry and transport.

We also consider that blending should be commercially supported by BEIS. The REA is developing a position on a 'CfD' lite approach that could be introduced to support smaller scale projects (e.g. 1-50MW) and other financial mechanisms (e.g. an amended Green Gas Support Scheme (GGSS) and a GGSS successor that includes hydrogen) that may be needed to support hydrogen injection into the grid. We will be sharing this with BEIS as soon as we have agreed a position with our members.

Quick actions for Government to unlock barriers to blending

There are some quick wins that could greatly assist the sector and unlock barriers to deployment of clean hydrogen - for example members believe that a low-level blending of hydrogen into the National Transmission System (~5% by 2030) could and should be greatly speeded up given the current energy security crisis. 5% is about 12 TWh of hydrogen or about a quarter of the government's previous 5GW target, and around 14% of the new 10 GW target, which sounds reasonable.

By injecting another 5% into the gas distribution network we can also boost that volume to 10%, which would amount to about half of the Government's 5 GW target (and around a quarter of the new 10 GW target).

Future Billing regime

Cadent and Xoserve have recently consulted industry on the Future Billing methodology and sought industry's feedback on what solutions should be progressed to maximise the amount of renewable or "Green Gases" which can be carried in the gas network without negatively impacting consumers and ensuring fair billing. Our full response to this consultation can be read here.

For the reasons set out in this paper, we support a Future Billing regime that accommodates blending of green gases into the network. We need to ensure that the billing regime addresses both hydrogen and biomethane: a solution that accommodates only one of them and undermines the other will not be suitable - both green gases are set to play an important role to advance the decarbonisation of the gas grid and reach net zero.

Notwithstanding this, industry is ready to deliver ambitious targets, but we believe that there needs to be a clear political indication from Government on their support for blending. Once Government has set a clear direction of travel, then industry experts can work out the best solutions to deliver those priorities. We believe that reasonable targets for the Government to set would be:

- 5% of the gas in the National Transmission System should be hydrogen by 2030
- 10% of the gas in the grid should be hydrogen by 2030
- Delivery of trials of 100% hydrogen mini grids by 2030, and
- Delivery of 100% Hydrogen backbone by 2040.

Other important barriers to be addressed

Reducing the cost of grid electricity

As previously highlighted to BEIS, one of the key barriers to the deployment of electrolytic hydrogen projects connected to the grid remains operational costs. In addition to the cost of electricity itself, further costs are added by regulatory support levies and system fees applying to electricity bills. There is a danger that the number of projects being developed will be limited, because high electricity prices for electrolysers will result in high hydrogen prices and that will slow down deployment significantly, so it is crucial that Government address the levels of fees and levies to be paid by electrolyser operators in the electricity market when buying electricity. This could be considered as part of the upcoming Government's Fairness and Affordability Call for Evidence.

The REA believe it is paramount that, in addition to developing business models, providing capital grants, and supporting blending, measures are taken to reduce the running cost of grid connected electrolysers by enabling them to access cheaper renewable electricity. This can be done by:

- Exempting electrolysers from 'green levies' on electricity bills – i.e. electrolysis could be on the list as energy intensive users (see EII Scheme), thereby qualifying such sites for exemption from the indirect costs of funding Contracts for Difference (CFDs), the Renewables Obligation (RO) and the small scale Feed in Tariff (FIT).
- Exempting electrolysers that provide grid services from use of system fees (on a time limited basis), or adopting an approach similar to the new rules for grid balancing charges borne by energy storage assets – i.e. on a net usage basis (exemption from final consumption levy double charging like storage devices[1][1]).
- Facilitating the use of PPAs designed to sleeve renewable energy to electrolysers that achieve a high degree of temporal and geographic correlation and so directly help reduce curtailment and grid balancing, by ensuring the £/MWh electricity price paid by the electrolyser operator is kept relatively low.

[1][1] When charging and discharging from the grid, storage devices in the past were paying fees for both these activities on a gross basis. However, there have been grid modifications made that allow them to be charged only on a net usage basis. This recognises the fact these devices are aiding the electricity system flexibility. A similar approach needs to be applied to hydrogen electrolysers that are grid connected.