Our Manifesto

Climate science tells us we need to decarbonise the global economy by mid-century at the latest to avoid the worst climate impacts.

This warning from scientists and the Paris Agreement's call for temperature rise to be limited to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C" has led to a raft of world-leading countries to pledge to reach net zero around mid-century. These pledges encompass about two-thirds of the global economy, while hundreds of cities, scores of states and regions, and thousands of companies across most sectors have made similar pledges.

The International Energy Agency has shown that to reach this global goal of net-zero emissions the priority needs to be shifting away from fossil fuels towards efficient electricity-based heating and transport systems.

It's no small challenge, but done well decarbonisation can create jobs, future proof industrial sectors of the economy, improve air quality and cut bills for the public.

Innovative solutions like hydrogen are an important piece of this puzzle.

Hydrogen itself is a massive decarbonisation problem we have barely begun to tackle, given that almost all hydrogen in the world at large is currently made *from* fossil fuels, *without* carbon capture. There is some confusion about which kind of hydrogen should be prioritised and for which end use sectors. Many governments are considering widespread use of hydrogen in sectors where there are already cheaper, more efficient solutions available today.

Because truly zero emission hydrogen is essential but it is very energy intensive and does not yet exist at scale, we cannot expect hydrogen to have an impact on emissions or jobs within the next decade. Developing a hydrogen economy is a long path forward, yet climate science shows us we need to act today to reach our net-zero goals.

In light of this confusion, our aim with the Hydrogen Science Coalition is to bring an evidence-based viewpoint into the political discussion on hydrogen in the EU and UK.

We are a group of independent academics, scientists and engineers who are specialists in hydrogen from production to potential end use sectors. We want to ensure that policy decisions on hydrogen reflect the most effective path forward in our journey towards net-zero emissions by 2050.

It is with this in mind that our central recommendations for governments are the following:

1. Zero emission hydrogen is an opportunity for governments to speed up the energy transition. However the only true zero emission hydrogen is that made from renewable electricity.

Governments must prioritise support for the only zero emissions hydrogen - green hydrogen - which is made from additional renewable energy such as wind and solar power.

Hydrogen won't have the impact on climate we need if it is a fig leaf for continuing to burn fossil fuels which drive up emissions. Blue hydrogen, which is produced by burning natural gas and attempting to capture carbon emissions with CCS, should be approached with caution. That's because CCS is always partial, fugitive methane emissions during production and transportation are significant, and the risk of lock-in to expensive fossil fuels are very real.

A variety of emerging studies are highlighting the lack of understanding of the climate impacts of blue hydrogen, suggesting that its emissions can be as bad or even worse than simply burning fossil fuels, and at best is a very expensive way to mitigate GHG emissions from necessary hydrogen production.

Therefore we cannot assume hydrogen made from fossil fuels and CCS will by default be low emissions. However, assessing and mitigating the lifecycle emissions of blue hydrogen is a complex issue that could take many years, when we know we need decarbonisation solutions today without delay.

2. Deploy green hydrogen for hard to decarbonise sectors, starting with where grey hydrogen is used today.

Hydrogen presents a potential opportunity to decarbonise sectors of the global economy that do not have existing electrification solutions, creating jobs and a long term deep decarbonisation pathway.

The first sector to be targeted must be where grey hydrogen is used today. Grey hydrogen has been produced from natural gas for decades, but unlike blue hydrogen, the CO2 emissions aren’t captured. The grey hydrogen currently used for chemical feedstocks and fertilizer globally accounts for roughly 3% of the world’s greenhouse gas emissions – not dissimilar to the amount generated by aviation globally.

Hydrogen (in the form of synthesis gas) is already used to reduce iron ore to iron metal. The first production of fossil free steel in Sweden has already taken place, made from hydrogen and fossil free electricity. Scaling up green hydrogen to produce steel could be the beginning of developing a more competitive and sustainable steel sector.

3. Hydrogen shouldn't be used to delay deploying electrification alternatives available today, such as in heating and transport.

Hydrogen isn't the best solution if it's more risky or expensive than already deployable alternatives like electrification.

Research shows that it is too risky and too expensive to use hydrogen to heat buildings or to power road transport. Producing hydrogen uses vast amounts of energy, which is a fundamental flaw when comparing it with other electrification alternatives.

Heating buildings with boilers using green hydrogen takes about six times more electricity than using electric heat pumps. Similarly, it takes about 3.3 times more electricity to power a hydrogen fuel cell lorry than one running on an Electric Road System.

Certainly if affordable hydrogen solutions are ultimately developed for these areas, it shouldn't be at the expense of rolling out what we know works now, like heat pumps and energy efficiency measures. The latter of which can also help reduce citizen's bills.

Focusing on the wrong demand sectors for hydrogen, such as heating and transport, would be an expensive mistake that can be avoided with other cheaper alternatives. Prioritising electrification, energy efficiency and a focus on green hydrogen for heavy industries will bring jobs to the UK and EU.

4. Given how valuable green hydrogen is, blending it into the existing gas grid does not make sense due to its limited impact on emissions savings.

It is widely understood that current natural gas transmission infrastructure can carry a maximum of a 20% mix of hydrogen before needing expensive retrofits. Hydrogen-ready natural gas transmission pipelines do not exist today.

Studies also show that injecting 20% of green hydrogen into existing natural gas pipelines will only save around 7% of carbon emissions. Blending hydrogen with natural gas reduces the energy content, meaning more of the mix is needed to deliver the same amount of energy to the consumer. Furthermore, the safety of hydrogen in domestic environments is questionable and where hydrogen is burned in a gas cooker or gas boiler, it still generates NOx emissions.

To build on our previous point, hydrogen does not make sense to use to heat buildings, which is where the majority of the UK and EU natural gas grid services serve. Before blending our valuable green hydrogen into the natural gas grid, the priority needs to be

areas where we can have significant and immediate emissions reductions, such as replacing highly polluting grey hydrogen as outlined in our second point.

In conclusion, we encourage governments to consult independent experts, alongside the energy industry who stand to benefit from these policies, on the development of a hydrogen sector.

A successful climate action plan is no longer just about the rapid build out of wind turbines and the phasing out of coal plants.

It is about deploying all the solutions we have within the right sectors, ensuring that we tap into all expertise available to guide these decisions. A well thought through strategy on hydrogen is a key part of that climate action plan.

For more information, visit our website www.h2sciencecoalition.com.