

CARBON INTENSITY AND HYDROGEN PRODUCTION



All Party Parliamentary Group on
Hydrogen

Minutes

Date	Monday 12 TH December
Time	16:00-17:00
Venue	Zoom
Chair	Andy Carter MP, Officer of the APPG on Hydrogen
Speakers	<ul style="list-style-type: none">• Dr Nina Skorupska CBE FEI, Chief Executive, the Association for Renewable Energy and Clean Technology (REA)• Eugene McKenna, Commercial & Strategy Director, Hydrogen Technologies, Johnson Matthey• David Galloway, Head of Strategy, BOC
Theme and Background information	<p>Following BEIS' announcement that it will move the discourse and language to describe hydrogen production by carbon intensity other than "colours", this session will focus on what carbon intensity is and how to transition to carbon neutral hydrogen.</p> <p>Whilst the industry is increasing hydrogen production to meet future demands, we must accept that the process will be transitional via a mixture of renewable energy, nuclear and blue hydrogen to reach our Net Zero targets. This session considered this in further detail.</p>

Andy Carter MP formally opened the meeting and thanked attendees for joining online despite weather disruption. He apologised for having to leave early due to Parliamentary business. He spoke of his support for hydrogen policy and said that he looked forward to working with the Government on this issue. He introduced **Dr Nina Skorupska, Chief Executive, the Association for Renewable Energy and Clean Technology (REA)**.

Dr Nina Skorupska said that the REA promoted clean technologies and renewables and said that hydrogen is one of the main ways of decarbonising our gas network. At REA, whatever they do with hydrogen has to be done with the aim and vision of reducing the carbon footprint. They were very happy to read the hydrogen strategy and the hydrogen investment package, but they very much believe that focus needs to be on upstream emissions and downstream emissions at the point of use for hydrogen. The way that hydrogen is formed defines its emissions, so this needs to be addressed.

There are multiple colours to describe hydrogen, but we need to move beyond this language to make it more accessible and start categorising them according to their life cycle and carbon intensity. This requires a robust methodology. Dr Skorupska said that many members on the call will know about the low carbon hydrogen standard, and this will ensure that emissions are kept to a minimum. However, we have to recognise that this says low carbon and not zero carbon. BEIS hopes to launch a new low carbon hydrogen scheme in 2025, which will hopefully support future

international trade. Yet, the REA are keen for this to be focussed around a zero-carbon hydrogen standard to reflect net-zero goals. The REA would be supportive of this initiative and are supportive of a transparent communication stream to consumers, which would allow for further consumer education on the zero carbon emissions that can be produced by hydrogen or even negative hydrogen. The current low carbon hydrogen standard should be the baseline for all hydrogen standards in the UK rather than a optional premium. Without doing so, some hydrogen will be used with recognition of emissions that would otherwise be emitted in the gas's distribution. The reason the REA are supportive of negative emission hydrogen or zero carbon is because the UK is at the front foot of creating such a guaranteed system, but we need to take more concrete steps to do make this a reality. We cannot just produce hydrogen, but must produce the right kind with the correct kind of certification, so that we can continue to be a pioneer in this sector.

Andy Carter MP thanked Dr Nina Skorupska and introduced **Eugene McKenna, Commercial & Strategy Director, Hydrogen Technologies, Johnson Matthey.**

Eugene McKenna spoke of his own career in energy transition and decarbonising the energy sector, including sustainable aviation fuels. For the last two years, he has worked exclusively on the scale up and industrialisation of hydrogen. Johnson Matthey (JM) is one of the only firms in this sector. Johnson Matthey is over 200 years old. They are the largest refiner and recycler in the UK, the US and China. JM has been involved in the process of producing hydrogen at the start.

They have one of the largest factories producing green hydrogen. Hydrogen faces the typical challenges for most energy sources, whereby the technology is improving, the processes are growing and the industrialisation is rapidly changing. Clean hydrogen's place in the final energy mix is up for debate, as well as who the winners in producing this will be. Critical raw materials need to be available in sufficient quantities for production to happen. Blue hydrogen allows for the transition to green hydrogen, but this requires sufficient investment to help drive down the price of green hydrogen for a transition to take place down the line. The UK has a competitive edge for generating blue and green hydrogen due to our geography and industrial makeup, so we ought to make these steps whilst we can (and before we fall behind).

Andy Carter MP thanked Eugene McKenna and introduced **David Galloway, Head of Strategy, BOC.**

David Galloway said that hydrogen is an interesting business to be in – but turning to the future, hydrogen will change the way we think about energy and the way we think about business. As an operator, there are lots of opportunities and advantages that lie ahead. Not just for BOC as a manufacturer but for many others in the value chain. BOC is the largest producer of hydrogen in the UK. Supporting bodies have shown that electrolysis works for the production of green hydrogen and needs to be focussed on in policy explicitly for it to receive adequate investment. There are lots of challenges around what kind of hydrogen we need. Hydrogen (H₂) is a pure molecule and is made in a pure way. Hydrogen therefore as a decarbonising method is interesting as its manufacturing is what produces emissions, not the gas itself. BOC plan to decarbonise their fleet where possible and convert industrial plants to blue. Some plants are too small to be decarbonised, so the plant needs to be changed to an electrolyser. However, electrolyser technology is not currently mature. The scale we need to achieve by 2030 requires a rapid change in the manufacturing market creates mass-demand for renewable energy – much of the infrastructure is yet to be built to achieve this. Without low cost and demand energy input, this market is unsustainable economically. Blue hydrogen will have and continue to have a place in our energy mix. The BOC ambition is that we could grow green hydrogen as a product and use it wisely and intelligently to create a clean future, but achieving that standard requires far more certainty from Government policy.

The Secretariat thanked David Galloway and asked the speakers how the Government and the industry could work together better to produce a low-carbon hydrogen economy

Eugene McKenna said that the UK needs to produce a welcoming environment for hydrogen production. Europeans are very encouraging towards green hydrogen and the Inflation Reduction Act in the US has also produced a very good environment for investment. They are thinking in a joint up way especially in its storage and end use. From a policy perspective, whatever we do in the UK is only a small solution to the problem. We need to create technology that can be used globally. In the US and Europe, they are already doing this so we need to support our own here too.

Hillary Benn MP asked if the argument was really over the need for green hydrogen or trying to get an authoritative agreed plan around hydrogen. In the path towards net-zero, we are going to need all the paths in our disposal. For instance, if we look at home heating, we have no concrete plan. If someone's gas boiler broke tomorrow and they wanted to do the right thing, they would have to spend around £10k for a heat pump. Most people cannot pay their energy bills so there is no chance of this happening. If we can produce sufficient green hydrogen and safely put hydrogen through the gas works, it would be so much easier for consumers to simply swap boilers. But will we even have enough hydrogen to do this?

We have wind turbines and we pay owners to turn them off when we don't need their generation. What is the total energy capacity of all our turbines if they turned 100% time and how much did they actually do? It seems obvious that capacity should be put into green hydrogen production. Is that practical? How can we get the price down? Is it just about scale or are there other things Government needs to do to have a policy?

David Galloway responded, saying that making green hydrogen at scale requires power and the energy industry is not ready to adequately respond, so we need policy intervention. If we look around the world where green hydrogen is made, unfortunately most of those countries tend to be sunny. However, we do have wind and we sometimes do have excess generation. The problem is capturing, converting and storage. However, we currently have neither the investment nor the storage for this to happen. BCO are willing to invest, but they are not prepared to invest in something without return or end in sight. David said that he was speaking at a National Grid conference a week ago and concluded that we need a wind shot in this particular area. This is the only way we can produce green hydrogen at scale.

Dr Nina Skorupska thanked Mr Benn MP for his question, saying that we required a magic lever to be pulled for green hydrogen to be installed and produced at the scale Government desires. Both electricity power systems and our hydrogen design systems need consistency from Government for there to be proper investment. We need the Energy Security Bill to come through as this would unlock primary legislation that would support hydrogen and the 10GW for hydrogen by 2030. The REA would also like to see the CCS all brought to bear in tackling elements such as storage to learn from that industry. We also want to see how the industrial hubs plan takes off to see what will be done with high yet hanging fruit.

The UK is unique in having such an extensive gas network. Working out how to decarbonise homes is key to a net-zero economy. Heat is very local and regional, so we need to produce bio-methane into gas networks in places where hydrogen is not a reality. But that can only decarbonise about 15% of boilers. The REA have just had a report come out recently to say that we could have a further 30% in hydrogen after that. This gives a guaranteed offtake for hydrogen producers in the future. Industry also has ups and downs in manufacturing, so if the demand goes down, who will take the hydrogen production? We need to prove how we can utilise hydrogen production in the right way. Hydrogen ready boilers will require quite some time, so we can't just wait for 10-20 years. We need to get the industry moving through introducing industrial hubs and hydrogen transport to show consumers that they work – and this requires cooperation from the media too to publicise the work! There is simply no point in producing hydrogen if it contributes to greenhouse gases.

Eugene McKenna said that if you wanted to do HyNet with green hydrogen, you would need the world's largest wind farm to do it. This will require so much more time. On a day like today, with a cold snap, we need energy that is reliable and consistent. Making the transition to gas boilers required 1% of GDP so we need to focus on mass mobilisation, even if the cost is drastic.

Baroness Meecher asked about hydrogen aviation and its viability, as well as whether the speakers believed 100% hydrogen boilers were reliable enough to be put into people's homes in a non-trialled environment (i.e. with minimum oversight and checks)

Eugene McKenna said that kerosene is a wonderful fuel for aviation. It can be made green. For planes that last 20+ years, we need to ensure that the fuel they are using is being produced in a green way. Whether that's fuel cells or hydrogen as a fuel source. If we can transition from carbon kerosene to green kerosene to hydrogen over time, we will be making real progress in the sector.

Gas boilers are viable and they have worked in the trials. The problem is less about their engineering viability and more about their perception, as they are often not seen as the main way to change home heating. But we have to join up supply and demand. For example, how can we use excess hydrogen production to ensure that demand meets supply? Could we put it into sectors like glass production or farming?

Dr Nina Skorupska said that with time and money, we can decarbonise everything. It's a question of where should this be done and what should be done first? We have to think about infrastructure and grow our capacity. Think about 50GW of wind compared to 10GW of hydrogen. Clearly the world we want to see by 2030 is challenging greenhouse gas emissions through wind. Therefore, for these boilers to take off, we need to focus on wind as much as hydrogen.

If we think about aviation, I was part of the jet zero council, and we were asking how fast we could demonstrate guilt free flying. The first aspect was dropping fuel. But even that requires ramping up production rates. This is happening far faster in other hubs such as Amsterdam. The whole dialogue is too focussed on the long-term, and not creating ambitious enough targets for what could be done in the next 1/3/5 years.

David Galloway said that it is not trivial to expand infrastructure. Building plants requires 5-10 years, so it cannot be changed overnight and it would have to be built quite rapidly. There are issues about converting hydrogen and gases into hydrogen in the network. We need a vision of where the country wants to go and how we are going to achieve it. Hydrogen ready boilers being used in industry hubs will boost confidence, but in 1-2 years, we need big scale activity and long-term effort.

A member from the audience spoke of two main challenges for hydrogen. Even if it is green, it does react with other greenhouse gases and prolongs their life in the atmosphere. It is also the smallest molecule and that we do not know how well suited it is to our current pipe infrastructure. They asked whether this industry was worth the billions of pounds of investment if this would only lead to unforeseen circumstances.

Dr Nina Skorupska said that this is where the REA is coming from in terms of providence. Hydrogen does not occur naturally and it wants to be with other things. The infrastructure to manage it is there, but we have never looked at how it can be part of our everyday life, done at scale and done at pace. If we want low carbon hydrogen, hopefully zero carbon hydrogen, we need proper monitoring. But we do have the engineering talent to do that in the UK and said that we should not be afraid of innovation.

Eugene McKenna said that it is important to design our systems so that it does not leak. It is the most common element in the universe. We have handled it into the gas network for about 100 years. We have a wealth of experience doing this, so the right engineers and providers need the investment to continue with their work and ensure that it is done to the highest safety standards.

David Galloway reflected on his 10 years in business and said that he does not remember 1 incident on hydrogen producing an unforeseen circumstance. Hydrogen has an unfair reputation. Handled properly, it is a safe product. Technology today is very advanced, and we used to have hydrogen through our network decades ago, such as to power gas lamps in our streets. Like any industrial process, there will be an element of loss, but we need to mitigate loss and optimise production.

The Secretariat thanked the speakers for their contributions and asked for their final 20 second conclusions from the session.

Eugene McKenna said that continuing to have a standard of living of an advanced civilisation without destroying the planet really requires hydrogen, but to do so, we need the policy framework that allowed investment. Make the product profitable and it will sort itself.

David Galloway said that we need the policy framework to make this happen – the technology is there and waiting for the go ahead from policymakers.

Dr Nina Skorupska asked those on the call to come and work with members at the REA in terms of understanding and developing the markets. With support, the REA need to unlock the system to make hydrogen systems ready for the future. If we want industrial processes that make the most of carbon capture storage systems to create low carbon hydrogen, then we need proper framework from policymakers to make this happen.

The Secretariat thanked the speakers for their final words, and reminded those on the call that the APPG's Annual Report Launch will take place on the 23rd January from 4-5pm in Westminster Hall, Palace of Westminster. She formally ended the meeting.