

Unite response to the Department for Transport's Consultation into Infrastructure for zero emission heavy goods vehicles and coaches.



1. Introduction

- 1.1. This submission is made by Unite, the UK's largest trade union with over one million members across all sectors of the economy, including manufacturing, financial services, transport, food and agriculture, construction, energy and utilities, information technology, service industries, health, local government and the not-for-profit sector. Unite also organises in the community, enabling those who are not in employment to be part of our union.
- 1.2. Of particular relevance, to this submission, Unite represents almost 31,000 engineers and technicians in the Energy and Utilities sector carrying out every task from the most menial to the most highly skilled engineers and scientists in the country. Unite members in this sector are those who work in every area of the water industry and every aspect of energy generation & transmission. Unite also represents over a quarter of a million workers in the transport industry operating everything from bicycle couriers to heavy goods vehicles operators, including trains industry, every aspect of aviation and private hire vehicles. Unite also organises members in the automotive industry who design and build these vehicles and their component parts.
- 1.3. Although Unite operates in almost every other aspect of the UK economy, as well of course in all forms of transport and vehicle construction, in the supply goods or delivery of good and passengers safely .

2. General observations

- 2.1. Unite is concerned over the assumptions made by some, that the Infrastructure is simply a matter of turning up on site and the national grid will have the spare capacity to be able to allow the equipment to be connected. Nothing could be further from the truth.
- 2.2. If the vehicles to be charged are battery electric, then the volumes supplied mean that the local domestic substation will need to be replaced and often, so will be, the cabling to the location. Neither is an inexpensive endeavour. Given the volumes of power to be supplied to charge an entire fleet of buses/coaches or lorries, it may be possible to strike a deal with the grid to utilise the potential storage capacity. Reaching such an arrangement means that the supply can be cheaper on the understanding that energy can be put into the batteries from over generation and removed if there is a shortage of supply. This arrangement to draw power would only happen if there were no other options and it would only happen for a very short duration to bridge the gap between the fluctuation in power from a renewable source such as wind and other forms of generation coming on stream similar to the one trialed in North London¹.
- 2.3. As highlighted by the existence of the arrangements with the grid over battery storage, the supply to a charging facility needs to be matched with the supply of enough energy to the network. Currently any shortages are realised by burning natural gas to power a steam turbine, but efforts are being made to increase the supply of low carbon power to meet demand.
- 2.4. If the vehicles are to be powered by hydrogen, then it should be realised that the country does not have anywhere near enough electrolyzers to turn low carbon power to the gas and at present would also require additional volumes of natural gas to convert to hydrogen. At present this conversion is done in two ways.

¹[click her for the link.](#)

2.5. Firstly, through Steam Methyl Reformation (SMR), which has been the traditional way to create industrial volumes of hydrogen. This process does not convert all the organic gasses, however, leaving volumes of methane, ethane, propane etc. unreacted and the volume that does react creates carbon dioxide (CO₂). If the CO₂ is simply ventilated into the atmosphere, then the process is called Grey Hydrogen. Sadly this is still the primary source of hydrogen in the UK. As a result, Grey Hydrogen is inconsistent with an environmental agenda given it produces a greater impact on the environment than if the natural gas itself was burnt, as energy is needed to create the steam. This process also creates hydrogen with high levels of Hydrogen Sulphide as an impurity. The problem with hydrogen sulphide is that it is extremely acidic and will draw water vapour out of anything it is put into contact with, creating sulphuric acid which is highly corrosive.

2.6. Whilst it is possible to capture the CO₂ created by the SMR process, to create what is known as Blue Hydrogen, it does not mean that this gas is now sustainable. In a recent paper it suggested that Blue Hydrogen created more than 20% greater emissions than burning natural gas². According to Iberdrola³ there is also a major difference in the volumes of water required too. Of course, if deep sea or floating wind farms suffer difficulties in obtaining a national grid connection they could always convert in the mean time to hydrogen production as long as they remember to use reverse osmosis to remove the sodium chloride (sea salt) and replace it with another electrolyte. If not there is the potential to release Chlorine gas which would be far from ideal.

Type of hydrogen	Volume of CO ₂ produced per kg of hydrogen	Volume of water required (litres)
Green	0 kg	10
Blue	3.5-4 kg	25
Grey	10 kg	23.5

2.7. The alternative is to super heat the natural gas in a process called pyrolysis which super heats chemicals, in the absence of air, to break the chemical bonds between the atoms of the hydrocarbons to create what is known as Turquoise Hydrogen. This yields a greater volume of hydrogen and black carbon powder. One method that has been explored is to simply pass natural gas through a molten metal⁴. Any Sulphur is also extracted in this process as a yellow Sulphur powder. This means that the resulting hydrogen is almost as pure as that produced through the electrolysis of water or ammonia. Additionally, the black carbon powder can be used to produce anything from carbon fiber, graphene, or filters for fish tanks to industrial diamonds or simply stored as a solid.

2.8. The source material to produce hydrogen does not need to be natural gas, water or ammonia but could include any hydrocarbon. Sources can therefore include animal waste⁵ or by extension waste water⁶. Due to criminal underinvestment by the water companies, we have an abundance of untreated sewage that currently takes over 72 hours to treat using biological technology from the 19th Century. This treatment of sewage also releases methane and other greenhouse gasses so if we are to reach net zero this issue needs to be tackled as methane is 84 times as powerful as CO₂ as a greenhouse gas.

2.9. Unite is currently supporting the idea of using the waste heat and power from new build nuclear reactors to power both the liberation of hydrogen through electrolyzers to and the capture of CO₂ from the atmosphere make better use of the waste heat from such installations. The liberated hydrogen can be used to balance the grid if it is fed through a bank of fuel cells. Any excess could then be shipped for use in road transport. A further alternative use of the reactors waste heat and the sea water that is being used as a coolant would be to extract any dissolved carbon from it capture and store CO₂ out of the atmosphere. Combining the supplies of CO₂ and hydrogen it is

² [click her for the link.](#)

³ [click here for the link](#)

⁴ [click her for the link.](#)

⁵ [Click here for a link to a company that is converting animal waste to hydrogen](#)

⁶ Waste water is water run off from hard surfaces and human waste solids

also possible to produce a near zero synthetic drop in diesel for use in the preexisting fleets of road vehicles⁷.

- 2.10. The Committee on Climate Change's current assessment on the UK's progress to Net Zero has identified a lack of spare hydrogen generation and the consequential desire for more hydrogen imports to meet demand. This short fall is before short and medium haul aircraft transition to hydrogen for their flights to Europe.
- 2.11. Wherever you have hydrogen you have the issue of safe storage. From an outside independent assessment, it would appear that the utilisation of hydrogen metal hydride storage⁸ has numerous advantages, not least of which is the purification of the hydrogen. This separates the hydrogen nucleus from its electron and stores it within the crystal lattice of the metal crystal structure. As impurities cannot follow these are separated off during the combination of the hydrogen with the metal. This process was used successfully to power submarines, while on patrol, instead of a nuclear power plant.
- 2.12. For any move from fossil fuels to electricity or hydrogen transition to work, will require there to be an extensive network of charging points, with places to park up the vehicles, while they are charging and facilities for the drivers. Unite has long called for secure truck stops so that drivers may rest away from laybys and roadsides, so they may avoid the air pollution and attacks on drivers that can occur when they are resting. Similarly, Unite has also long campaigned for the access to toilets for all workers. The enforced rest that will occur even with drawn out charging times even on a fast charge cycle,
- 2.13. A far swifter refuelling alternative, refueling with hydrogen is parable with the diesel refuelling process and diesel vehicles can be adapted to run on hydrogen internal combustion engines (ICE). The downside with all ICE vehicles is that the combustion still produces Nitrogen Oxides thanks to the combination of oxygen and nitrogen from the air with the heat and pressure inside the engine. Nitrogen Dioxide (NO₂) is over 300 times as powerful as CO₂ as it transforms into Ozone in the presence of sunlight.
- 2.14. Currently it appears that the investment in infrastructure is delayed until there is the commitment from the transport industry and the transport industry, in turn, will not commit to the transition to new vehicles until there is the investment into infrastructure.

3. Conclusion

- 3.1. Unite would ask that the entire lifecycle of any fuels and their safe storage when they invest or support investment into the industry. There needs to be a strong enough message to encourage the industry to invest in the appropriate vehicles and fuels to maintain the delivery networks for both freight and passenger movement.
- 3.2. Unite would ask that, where possible, the DfT also backs the supply of the supporting infrastructure to provide access to a toilet and wash facilities in a secure area, especially if the driver may be there for some time.

Simon Coop
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⁷ This is using the Fischer Tropsch power to liquid methods as called for by the aviation sector in the creation of sustainable aviation fuel.

⁸ [Click here for a link](#)

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