

Unite the Union response to The Public Accounts Select Committee - Decarbonising the power sector¹



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 over 39,000 energy and utility workers; around a quarter of a million members in the transport industries and hundreds of thousands more in the various manufacturing industries. Unite also represents 68,000 construction workers who will hopefully be offered the opportunity to provide their services on terms and conditions that are commensurate with their skill set. Finally Unite also represents members across the economy from the oil and gas industry, in mining, in the chemicals, manufacturing and many more, both public, private and voluntary sectors, whose future will all be impacted by the move away from fossil fuels into a more sustainable world.

2. Response

- 2.1. Unite applauds the Government's ambition to decarbonise the power sector by 2035 but warns against allowing industry to put all the generation eggs in one basket. Unite is concerned, that producing the desired outcome, is leading to a Dash for Wind², when we should cover its bets to have a balanced energy policy, playing to the strengths of each generation option. Allowing developers to put the majority of the nation's generating capacity into one form of generation or another has proved to be one which endangers the future energy security of this nation. It also follows that endangering energy security endangers future investment as nobody will wish to invest in a nation where the price and security of supplies is in question.
- 2.2. This nation, has seen, following the invasion of Ukraine, serious financial hardships due to having over half of the nation's backup generation capacity, provided by to one source. Not only does this tie the national price for electricity to the spot market price of gas, or in the case of wind or solar, the weather conditions³. Jumping from natural gas to hydrogen may equally be short-sighted if we do not diversify supply. Current government plans are to support Blue hydrogen, which Unite welcomes, but this risks repeating the errors of the past and links the price of

¹ <https://committees.parliament.uk/work/7258/decarbonising-the-power-sector/>

² The due to the need to move away from coal fires generation. The relative cheap price of natural gas in the 1990's privatised generators hurried to build gas fired electrical generation turbines. The so called "dash for gas" where more than 60% of total electrical generation can now come from gas fired power stations. The need to move away from all fossil fuels, has now moved to a net zero programme, with a focus I on off-shore wind generation, due to the Government's successful contracts for difference programme causing a dash for wind where the government wants 7 times our current capacity potentially repeating the problems of the past.

³ Gas fired generation and limited pumped storage is currently used as a back up to the highly unpredictable renewable generation in all its forms, meaning that the UK needs a carbon free solution to balance the grid if we are to reach net zero.

hydrogen to that of natural gas. If the UK was had enough gas/electrical storage, we would only need to participate in the sale of our excess generation which would reduce our energy costs⁴.

- 2.3. There are also ways to split natural gas without producing additional greenhouse gasses (GHG's). Pyrolysis⁵ works by passing natural gas or biogas through an electrical plasma, which rips apart the molecular bonds reducing each element to a natural state. Therefore all the carbon is extracted as a black powder⁶. But pyrolysis and electrolysis both require electricity to work. UK electrical supplies may be in a greater demand, due to our failings of the past re our generation mix⁷, a chemical solution may therefore be the only current solution on the table. Whilst Pyrolysis is cheaper and greener than Blue Hydrogen, both will be dominated by the cost of the price of natural gas. Electrolysis of water⁸, sewage, and animal waste⁹ other raw materials, to break the molecular bonds to release the hydrogen, are future solutions as they also require electricity.
- 2.4. Deep Sea Generation powered directly from floating wind farms, to use hydrogen production to overcome the resistivity losses of electrical transmission to bring the electricity ashore.
- 2.5. Unite recommends a balanced energy policy approach to our energy needs. Where government investment, and licencing for supply, of electricity leaves room for doubt over supplies, there is a security of supply argument to support Blue Hydrogen or some other chemically based process, despite the environmental concerns¹⁰ until we have the electrical power to be Net Zero.
- 2.6. The UN has warned that we as a species have only two years to halt the growth in emissions¹¹. We will possibly see a year in the next 8 when the global average temperature for that year exceeds the 1.5°C limit of warming¹². Our planet is currently being singed, so we need every watt of green power we can muster to eliminate the release of carbon and where that is not possible we need enough DAC facilities to recapture that carbon from the air. In that way we may have a chance of reaching net zero. Unite believes, if there is not the investment now, we will not achieve this goal.

⁴ This is a major issue in the supply in that we are forced to sell excess at times when demand / prices are low and buy back when prices / demand are high due to the lack of storage capacity pushing up energy costs to UK consumers. A similar picture to that of natural gas storage.

⁵ Please see <https://pubs.acs.org/doi/pdf/10.1021/acs.iecr.1c01679>

⁶ This can be sold to form carbon fibre, carbon Nano tubes, Silver Carbon solid state rechargeable batteries etc. Please see <https://insideevs.com/news/405131/silver-answer-solid-state-cells-samsung/>

⁷ If past governments had ensured a balanced energy policy approach, as had been called for by the unions when contracting for national grid electrical supplies, the UK might have weathered the Ukraine fuel price crisis better and we would have more security of supply.

⁸ Please see https://www.siemens-energy.com/global/en/offerings/renewable-energy/hydrogen-solutions.html?gclid=CjwKCAiAioifBhAXEiwApzCztmAOlBS8xtAPMWoltzTDIYAJHrTIA3PUvhmrPUScWbSXBDOl5b-1yRoCHzkQAvD_BwE

⁹ Please see <https://fuelcellsworks.com/news/new-tech-turns-manure-into-hydrogen/>

¹⁰ <https://onlinelibrary.wiley.com/doi/10.1002/ese3.956>

¹¹ UN Secretary-General António Guterres speech <https://www.un.org/en/climatechange/un-secretary-general-speaks-state-planet>

¹² 1.5°C of warming of the planetary average temperature above the climate experienced in preindustrial times. A limit set in 2016 at the 21st meeting of the UNFCCC when they were told that above this there is the potential for the planet itself to start releasing huge volumes of GHG's irreversibly turning the planet into an oven which will end all life as we know it. Above 2.0°C this becomes a certainty. Currently we are on a path to 2.3°C of warming caused by our own actions.

- 2.7. Therefore when it comes to designing a new sustainable supply of power network, it should be recognised that the wind will not always blow¹³, the sun may be hidden by cloud. If we invest in tidal that will only work at best for 22 hours a day¹⁴ and the waves may be becalmed or too violent for safe electrical production. To be independent of external spot prices, the UK needs to be able to produce enough power to far exceed demand, 24/7 with any excess being sold or use in additional electrolysis¹⁵.
- 2.8. When it comes to balancing of the grid, Hydrogen electrolysis has great potential to be a very useful option. Hydrogen produced at a time when the grid is over supplied is viable. The current solution to over generation, is to use the excess to pump water uphill so it can later be used to regenerate the power¹⁶ when needed, turn off the wind turbines or sell the excess to Ireland or our Continental neighbours via interconnecting cables. Where there is too little, for economic reasons, we currently turn to fossil fuels and then to neighbours in Europe to supply what we need when demand is high¹⁷. In order to prevent a delay while the water is boiled and turbines start to turn, gas fired turbines are left running¹⁸, even if no power is generated causing the release of GHG's. By using a fuel cell the generation of power is instantaneous and avoids paying higher prices for energy from neighbouring countries.
- 2.9. Unite believes, Hydrogen electrical storage may offer a greater capacity scalability than traditional electrical storage options. When needed, the hydrogen could feed a bank of fuel cells generating, not just electricity, but clean fresh water for irrigation or consumption¹⁹ and deoxygenated air, which could be used as a replacement for CO₂ fire extinguishers. If Hydride storage²⁰ is used, the gas can be stored as a room temperature and at low pressure as a solid, avoiding the need for reinforced pressurised containers or cryogenics, making hydrogen an ideal

¹³ A between the speed limits needed for wind powered generation.

¹⁴ Tidal only works for 22 hours a day as there are 4 periods in every day when the tide is turning preventing any generation.

¹⁵ If used via electrolysis the hydrogen could be passed through a fuel array to produce power, clean water and deoxygenated air immediately with no need to keep gas fired stations fuelled without generation. This could hold the potential to reduce total demand and GHG release dramatically.

¹⁶ Pumped storage comes with some not insubstantial losses in power due to evaporation and friction. It also requires large areas at altitude to be repeatedly flooded and exposed. Geography we do not have in the UK in at the scale required.

¹⁷ Our time of need for energy often coincides with the needs of neighbours for energy so spare capacity costs both financially and environmentally

¹⁸ On standby to fill gaps in renewable generation supplies

¹⁹ The area around Sizewell is extensively used for farming but due to East Anglia being in a rain shadow it is also one of the driest. The same can be said for Bradwell and Essex and other locations around the UK. Therefore by creating hydrogen from sea water and excess generation, then passing the gas through a fuel cell, to balance the grid, results in large amounts of pure fresh water that is fit for human consumption. It would therefore be less energy intensive as desalination facilities.

²⁰ Hydrate storage holds the nuclei of hydrogen in a crystal lattice allowing it to be held as a solid at room temperature, reducing the volume required to store hydrogen but to the expense of the additional weight of the crystal lattice. To release the hydrogen the solid only needs to be warmed slightly leaving behind the crystal that can be reused in most cases.

<https://www.sciencedirect.com/science/article/pii/S2589004220311044#:~:text=The%20mechanism%20of%20storage%20through,to%20chemical%20reaction%20or%20adsorption> .

surface transport fuel replacement, avoiding the issues of range anxiety, and ones related to lithium sourcing²¹ and recycling²².

- 2.10. Whilst Unite supports the use of Biomass with CCS, scaling up production would require either a change to policy, or a far larger forested area than is currently used to fuel the current Drax boilers. Currently Drax uses just the waste from the lumber industry²³. If whole trees are processed an area the size of Northern Ireland, could be required to grow the wood for today's level of demand. While this process has its critics about harvesting mature trees at for lumber, if the trees were not harvested they would eventually die from disease, fires or other natural causes. Biomass currently uses up wood that would normally rot and produce methane. Using only waste wood they are following a sustainable path, especially as younger trees absorb more CO₂ than older ones.
- 2.11. Unite supports Carbon Capture, Utilization and Storage (CCUS) but would suggest that the CO₂ be stored in subsea aquifers that would eventually cause the CO₂ to become limestone in a similar way to that used in the Orca Project.²⁴ Unite believes that combined with Direct Air Capture (DAC) and Sustainable Aviation Fuels (SAF)²⁵ these can help tackle the problem of transport emissions. Chemical technology has moved on allowing DAC's to work using less than a quarter of the energy requirements of the past²⁶. The down side of DAC or CCUS is that it requires additional power but without DAC with CCS, the Committee on Climate Change (CCC) has warned that we will not reach Net Zero by 2050²⁷. Whilst waste heat from industry, a nuclear or conventional powered station would help reduce demand the scale needed to reach Net Zero requires large scale investment,

²¹ The world's lithium currently comes from two main geological sources: lithium-enriched brines, chiefly in the salt lakes of South America; and lithium pegmatites (an unusual type of granitic rock, enriched in a range of rare metals). Lithium pegmatites are mined at a range of localities in Australia, Canada, China and Zimbabwe; but they are known to exist across the world. The moral issue is the use of child labour to extract it. <https://www.bgs.ac.uk/news/lithium-a-critical-raw-material-for-our-journey-to-net-zero/#:~:text=The%20world%E2%80%99s%20lithium,in%20the%20USA.https://www.theguardian.com/environment/2021/jan/03/child-labour-toxic-leaks-the-price-we-could-pay-for-a-greener-future>

²² Lithium batteries are difficult to recycle due to the violent reaction the metal has with oxygen. Consequently any recycling needs to be carried out in an oxygen depleted environment. As a result there are not enough companies to handle the used battery recycling needs of the UK <https://www.bbc.com/future/article/20220105-lithium-batteries-big-unanswered-question>

²³ Drax Power Station uses compressed wood pellets, which, according to their website, are sourced from sustainably managed working forests, in the US, Canada, Europe and Brazil, and are largely made up of low-grade wood produced as a by-product of the production and processing of higher value wood products, like lumber and furniture and construction. Thus the pellets are carbon neutral. Some quarters, questioning its sustainability claims given trees are harvested, the waste pulped, and formed into pellets, which require shipment across the Atlantic to Drax. There the pellets need to be stored in a way that reduces the speed of the rotting, all of which requires power. Even if Biomass is not carbon neutral now with CCUS it has the potential to permanently lock away thousands of tonnes of carbon a day. Additionally if the lumber industry waste was not turned into pellets, the wood will simply rot and add methane to the atmosphere.

²⁴ Please see the Orca Project <https://climeworks.com/roadmap/orca>

²⁵ By SAF we include hydrogen, batteries and fuel made from everything from plants grown on soils not suitable for other crops, biomass, Municipal household waste to the CO₂ captured by a DAC chemically blended using the [Fischer Tropsch](#) process or where the oil is hydrogenated to provide a drop in fuel. SAF is the only sustainable solution for Civil Aviation flights over 4,000 kms

²⁶ Please see a review of DAC technology <https://iopscience.iop.org/article/10.1088/2516-1083/abf1ce>

²⁷ <https://www.theccc.org.uk/wp-content/uploads/2020/12/Sector-summary-GHG-removals.pdf>

which may be available from the world of commerce, aviation and even entertainment²⁸, as they seek to offset their emissions.

- 2.12. Nuclear Fusion is seen by many as the ultimate form of green unlimited power, but it has yet to be perfected. In the meantime, the nuclear engineers are desperately needed to help generate power and deal with decommissioning. With attacks on pensions the possible inclusion under public sector pay limits plus minimum service levels, many are leaving for pastures new. Unite believes that a new fleet of nuclear stations both large and Small Modular Reactors (SMR)²⁹ are desperately needed to provide the foundations of a new mixed energy generation model. Unite believes that existing sites are more accepting of new nuclear given the benefits to the local economy. Repartition of designs should save time and money. The problem with nuclear at any scale is the red tape and safety checks, that can take over 10 years. 10 years which we simply do not have if we are to stay below 1.5°C of warming.
- 2.13. Above all else our national grid needs a serious overhaul. Most of the network was built in the 1960's and it was never intended to carry the loads now placed on it. As we transition to Electric vehicles (EV) and from domestic and industrial gas heating and cooking to electricity supplies to every property need upgrading so they can handle the load. Decentralised generation due to domestic location solar and wind mean that the grid has to allow an easier two way flow of power. With domestic EV charging, every home needs a three phase supply. Currently if three EV's are charged at the same time the substation breaker will trip plunging the neighbourhood into darkness. These supplies are already going into new build homes.

3. Conclusion

- 3.1. Unite believes that, when it comes to energy policy, there should always be a balanced energy policy approach, to both electrical generation and the creation of hydrogen so there is security of supply and a sector free from the dominating impact of one parts disruption. We are currently witnessing such a dramatic disruption to the sector purely because of the dominance of natural gas generation and prices. Unite believe it is irresponsible to follow the mistakes of the past and put all our eggs in one basket. What applies to the supply of electricity today also applies to the supply of hydrogen in our future.
- 3.2. Additionally the government should be mindful of the need to recruit the skills requirement of these growing parts of sustainable industry and those displaced from fossil fuel extraction, to ensure a Just Transition, providing an our take on the scale of the work needed and questioning why the government is not heading the lessons of the past and not acting to smooth the transition. Due to population growth and greater demand, Unite believes there will be the need for more skilled personnel than are going to be displaced and these jobs may not have the capability to be passported from one sector to the next.
- 3.3. Therefore without a just transition there may be supply issues in our future re the skilled staff needed.

²⁸ <https://www.edie.net/boeing-netflix-and-microsoft-among-founders-of-new-business-alliance-on-sustainable-aviation-fuels/>

²⁹ Small Modular Reactors based around those previously found in submarines. The reaction vessel of these can fit onto the back of a HGV so can be built offsite, enabling a modular design, with each producing between 50 and 60MW.

- 3.4. Unite would stress the need for CCS projects to be supported and built rapidly. We only have a limited window to start turning the amount of emissions released globally, according to the UN³⁰. The latest science from the IPCC released earlier this year uses 2019 as a baseline, indicating that GHG emissions need to be cut 43% by 2030.³¹ It is therefore imperative that, like Unite, the government supports the biomass plant at Drax and ensures that its emissions and that of surrounding manufacturing are captured, utilised or stored in subsea aquifers as soon as possible.

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³⁰ <https://www.reuters.com/business/cop/how-close-are-we-passing-15-degrees-celsius-global-warming-2022-11-14/#:~:text=At%20the%20current,back%20down%20again>.

³¹ <https://unfccc.int/news/climate-plans-remain-insufficient-more-ambitious-action-needed-now>