Unite the Union response to Department for Business, Energy & Industrial Strategy consultation entitled Carbon capture, usage and storage: amendments to Contracts for Difference regulations - a consultation on three proposed amendments to the CfD regulations to facilitate power CCUS

1 Introduction

1.1 This submission is made by Unite, the UK's largest trade union with over 1 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. This response is sent on behalf of our members in numerous sectors of the economy from energy generation to construction regeneration, public, private and voluntary sectors, both in and out of work and on behalf of a quarter of a million members in transport.

2 Consultation Questions

1/ Do you have any comments on the proposed amendment to the definition of an eligible generator to specify that retrofit Carbon Capture and Storage (CCS) projects, involving the connection of an existing power station to a complete CCS system, are eligible generators?

2.1 Unite supports the retrofitting of all existing power generation facilities to enable them to dispose of all of its greenhouse gas (GHG) emissions that would otherwise be vented into the atmosphere. Unite equally supports the CCS of gasses from industrial processes, combustion and hydrogen production.

2.2 Unite also believes that any gasses need to be subject to treatment to remove any Nitrogen Oxides (NO_X) using a hydrogen peroxide solution. Whilst NO_X is not strictly speaking a GHG it does lead to the creation of Ozone (O_3) – a gas which is many times more powerful than Carbon Dioxide (CO_2) in trapping heat in the earth's atmosphere.

2/ Do you have any comments on the proposed amendment to the Contract for Difference (Allocation) Regulations 2014, which will allow the DPA payment terminology to be used?

2.3 Unite's experience of the role out of the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 (CfD) has been largely negative, due to the way it has been used in the wind industry to offshore the manufacturing of wind turbines and jobs installing these facilities. The lack of any health and safety on these turbine construction sites has led to numerous deaths and serious injuries as workers are pressed to work faster for as little remuneration as possible.

2.4 The use of CfD in the financing deal for the Hinkley Point C (HPC) project for example has led to the developer, EDF, to manage all the risks of the project, and so greatly

inflated risk premiums and the cost of capital. Analysis of the Hinkley CfD has suggested that financing costs and risk premiums ended up comprising two-thirds of the subsidised electricity price[1]. As a result, consumers have been left paying higher than necessary prices and fuelling opposition to further nuclear projects, despite their necessity.

2.5 Just because the wind blows does not mean that a wind turbine can harness that power to produce electricity[2]. To generate at maximum power a wind turbine requires a wind speed of between 10-15 m/s beyond 25 m/s and the turbine needs to be stopped to avoid damage.

2.6 Consequently Unite wishes to see a greater respect for health and safety and the rates of pay for the job rather than a race to the bottom to facilitate a Dispatchable Power Agreement (DPA) for CCS. Unite wishes to see the use of UK manufacturing to provide the equipment to be deployed too, in order to see UK employment maximised.

3/ Do you consider that the current definition of an "eligible generating station" (as defined in the Contracts for Difference (Definition of Eligible Generator) Regulations 2014 and set out in the Transport Options for CO_2 section of this consultation) allows for the potential forms of non-pipeline transport as could be used in operations of a relevant generating station?

3.1/ If not, please specify why not?

3.2/ Should any particular form(s) of non-pipeline transport be expressly included or excluded from the definition of a complete CCS system?

2.7 Unite understands that the addition of a CCS system may cause a reduction in the generational capacity not increase it, as is required to be an "eligible generating station". This is due to the potential back pressure or reduced draw caused by the obstruction in the flow of gasses from the flue. Unite therefore would broaden the definition to include every GHG generation facility.

2.8 Between now and 2031 the power generated from existing Nuclear will decline to 1 GWe of capacity hopefully enhanced by the output from Hiinkley Point C. This will still bring the indicative Installed capacity to less than half[3] of today. The Committee on Climate Change's (CCC) 'Balanced Pathway' scenario for reaching net zero emissions requires 10 GW of nuclear capacity by 2035. At present though we are on track to have less than half of that, as most of the existing nuclear stations are due to be decommissioned in the next few years. If action isn't taken soon then by 2035, only Hinkley Point C (currently under construction) and Sizewell B will be left on the system leaving a substantial capacity shortfall.

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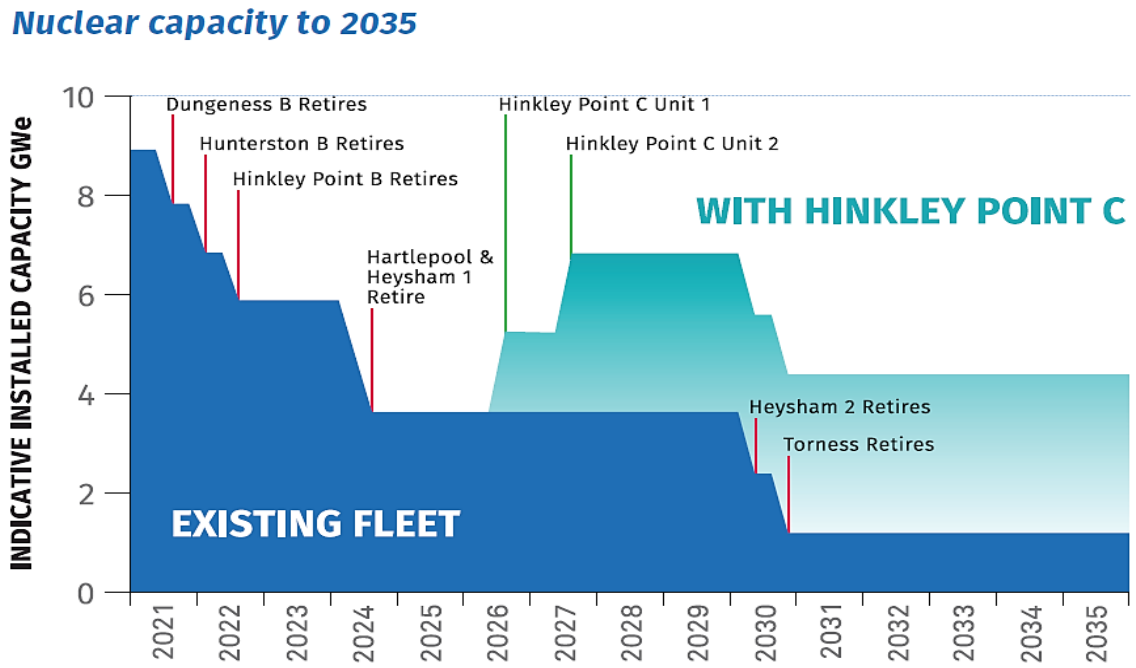
1 Nuclear Sector Deal Working Group on Cost Reduction (2020) Nuclear New Build Cost Reduction https://www.niauk.org/wp-content/uploads/2020/09/New-Build-Cost-Reduction-Sector-Deal-Working-Group.pdf

2 https://www.level.org.nz/energy/renewable-electricity-generation/wind-turbine-systems/#:~:text=Wind%20speed%20fluctuates,cut-out%20speed)

3 The last of the existing fleet of stations will go off line in 2035



2.9 Wind turbines are only designed to be operational, depending on the location and size for between 10 and 25 years. This means that every one of the Turbines built to date will need replacing between now and 2046. Hitting the government target of 40 GW of offshore wind by 2030 will be crucial, as will expanding onshore wind and solar. To rely on variable renewables alone, would be foolhardy, as it would cause the UK economy to rely on the weather to ensure national grid stability we need a reliable source of low carbon power that isn't impacted by changes in weather conditions and is always available when we need it. Nuclear is the only proven carbon free technology that can provide this at scale.

2.10 As Natural Gas provides around 40% of UK power, unless it can be converted to work with a CCUS network these too would need replacing before we can achieve net zero and move on to sequester increasing volumes of GHG's in the second half of the century, if we are to move away from the brink of a global environmental disaster. Unite does not believe that this can be achieved by replacing natural gas with Blue hydrogen created through a process called steam methane reforming. Unite understands that the creation of Blue hydrogen through this method could generate **20% more emissions** over its life-cycle than if natural gas was burnt instead[4]. The reasons for this are that only a limited amount of the tonnage of natural gas is converted to hydrogen and carbon monoxide during scientists at Cornell University, New York, and Stanford University, California found.

2.11 Together this means that unless there is a rapid deployment of new generational capacity (which should include both large and small modular nuclear reactors) there will be a power shortage that could scupper any plans to achieve net zero by 2050.

[4] https://www.edie.net/news/8/Blue-hydrogen-could-produce-more-emissions-than-burning-natural-gas--academic-study-finds/

2.12 According to the government's recent report, final energy consumption (that is, excluding non-energy use) was 142.0 million tonnes of oil equivalent (mtoe) in 2019, 1.4 mtoe (1.0 per cent) lower than in 2018, with all sectors contributing to the decrease"[5]. Total electricity generated in 2019 was 323.7 TWh (≅ 27.833 mtoe), a decrease of 2.8 per cent compared to 2018 (332.9 TWh). If we are to replace all fossil fuels with electricity, assuming a simple 1:1 replacement of one energy source with another the UK will require more than 5.1 times the current generational capacity[6].

2.13 The production of Green hydrogen uses electrolysers to effectively turn electricity into green hydrogen for use in alternative fuels. This form of hydrogen is far cleaner and has a higher calorific value than blue or grey hydrogen and when burnt does not create and particulates[7]. Unite estimates the energy requirements could grow to in excess of 7 times the current demand if we had to rely on green hydrogen production as it is not 100% efficient. As in excess of 40 % of current grid production is currently generated by burning fossil fuels this too will eventually need replacing.

2.14 Currently there is a limited but growing number of facilities around the world which accept shipments of CO_2 for injection into their CCUS network. These shipments can arrive by road, rail or by ship in pressurised containers. There is also currently a growing shortage of road haulage drivers, due to a combination of factors including increased drivers hours, the age profile of the industry, the COVID-19 pandemic and BREXIT. Such shortages are not confined to tanker drivers but spread across the logistics industry including those in shipping too, limiting the available capacity.

2.15 Whilst it is possible to lay a pipeline over several kilometres using a combination of horizontal drilling and tunnelling, such operations can take time to achieve. The world tunnelling speed record was set in Madrid when the engineers achieved 92.8 m per day, during the construction of the underground route between Atocha and Chamartin stations, in August 2008 using a double-shield tunnel-boring machine[8]. Tunnelling speed is determined by several factors including the type of material the tunnel is being constructed through and the bore of the tunnel.

2.16 In terms of distance the longest, the Alberta Carbon Trunk Line[9], when completed, will be the world's largest CO_2 pipeline. The 240-kilometre pipeline will collect captured CO_2 from a fertilizer plant and refinery near Edmonton, and pipe it to mature conventional oilfields near Clive, Alberta. The cost of construction of project totalled CA$ 900 million of which CA$ 470 million was the cost of building the pipeline. Such a pipeline could sequester 14.6 million tonnes of CO_2 emissions per year according to its backers.

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5 The Department for Business, Energy and Industrial Strategy press release October 2020

6 This assumes that we return to the economic activity seen in 2019 post the COVID-19 pandemic and that the UK population will not increase. It also assumes there will not be any losses in the replacement of one energy source with another.

7 The production of soot particulates is possible when burning Blue, Grey, Brown or Black hydrogen as it contains sulphur and other contaminants.

8 https://www.guinnessworldrecords.com/world-records/89753-fastest-tunnel-boring

9 https://www.jwnenergy.com/article/2019/4/10/worlds-largest-co2-pipeline-under-construction-alb/

2.17 Creating such a CCUS pipeline is therefore expensive and cannot be created overnight. It may therefore be necessary to utilise a tanker logistics network whilst the CCUS is built. Unite notes that every time a connection is made, or unsealed between a tanker and a loading or discharging pipeline, it provides the opportunity for GHG's to escape. Given the volumes that could be accommodated and the multitude of connections that would be needed over the course of a facilities lifespan, together with the emissions from the combustion of transport fossil fuels, Unite increasingly believes that a pipeline would be more sustainable. If alternative fuels were used to power the transportation then Unite would be willing to support the potential of a surface transport model.

2.18 Given that every remaining fossil fuel, biomass and waste fired energy generation facilities and Blue hydrogen facilities are all within tunnelling distance of a depleted oil or gas well, it is technically feasible to build a CCUS herringbone shaped network in the UK connecting numerous sources of GHG's for sequestration eliminating the risks associated with surface transport of large volumes of these gasses.

2.19 Unite would note, that the ongoing cost could be substantial, more if gasses were allowed to vent rather than those created whilst digging a pipeline both financially and environmentally.

2.20 Unite would stress that given there is no just in time requirement attached to the delivery of these emission gasses, that barges and the canal network could also be used. Shipment by water is the most energy efficient option available to move goods from A to B. Moving large tanks of captured gas in this way would avoid causing road transport disruption.

4/ Any other general comments?

2.21 The utilisation of GHG's from a CCUS network is critical in extending the life of a CCUS facility. The utilisation project would need to show that it would not result in the net release of additional GHG's Unite believe that each project should be investigated and if proven worthy deployed at scale.

2.22 There is a finite volume of underground storage and a desire to reduce environmental CO_2 if we are to remain below 1.5 ^{O}C of global warming. According to the latest report from the World Metrological Office (WMO) to the Intergovernmental Panel on Climate Change (IPCC) the planet has already warmed by 1.2 ^{O}C and is on track to exceed 1.8 ^{O}C unless there is some unilateral intergovernmental action to drive down GHG emissions. The WMO also reported that there is a 40% chance that we will see a year in the next 10 that will break the 1.5 ^{O}C barrier.

2.23 According to the IPCC the only way to avoid have even a 50:50 chance of keeping global warming below this threshold is the widespread deployment of sequestration of gasses from the atmosphere to offset the volumes being released elsewhere, in the next 10 years. Such sequestration may take the form of a substantial tree planting campaign, the reformation of peat bogs, or industrial CO_2 Direct Air Capture (DAC) deployment.

2.24 For such DAC facilities to be viable they need access to both a source of heat and electricity together with access to a CCUS network. The process, as operated by Carbon Engineering's demonstration facility[10], requires the use of natural gas to heat the saturated capturing medium to enable the release of the captured gas. The source of heat could be waste heat from an industrial process or even that from energy generation.

2.25 Given the critical nature of the timescales, Unite believes that the construction phase for the construction of a CCUS network and network of DAC facilities needs to begin as soon as possible. As such these developments will also require a significant amount of public funding for the deployment to be expedited through a fast track planning process and construction process.

[10] See:- https://carbonengineering.com/our-technology/

3 Conclusion

3.1 Unite supports the rapid deployment of CCUS technology but believes that the definition of "eligible generating station" is too narrow.

3.2 Unite has reservations about the use of a Contracts for Difference approach as previous use has led to a race to the bottom in terms of pay, terms, conditions, health and safety. The previous use to roll out offshore wind resulted in no UK jobs and manufacturing offshored to Indonesia!

3.3 Given the projected shortages that could occur in power generation every option needs to be explored (including new nuclear] to fill the gap if we are to move from a carbon to a hydrogen based economy.

3.4 Shortages in transport workers following the pandemic and a growth in demand means that if a CCUS network is to be achieved the most sustainable long term option is a pipeline. But given the lack of a just in time deadline, transport by barge should be considered to keep emissions as low as possible.

3.5 Given the WMO report to the IPCC ahead of the UNFCCC COP 26 talks in Glasgow later this year, Unite urges a wide scale deployment of DAC facilities to aid in the offsetting and reduction in CO_2 in the atmosphere. Unite would also recommend the use of the captured CO_2 to create sustainable fuels and replace the burning of natural gas in horticulture to increase CO_2 levels. Doing so could reduce the demand on CCUS storage capacity.

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