Unite response to the Ofgem RIIO-3[1] Sector Specific Methodology Consultation

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 within the nuclear energy industry.

2. Observations

2.1. Unite believe that there is a dire need to act swiftly and decisively to tackle climate change while ensuring that the public are provided with the ability to heat and light their homes without having to pay more than 10% of their income to do so[2]. Unite would also like to see RIIO-3 delivered in a manner that prevents the privatised energy providers from profiteering and the workers be more involved in the transformation process.

2.2. Unite welcomes the desire to use every means available to provide supplies of energy to industrial and individual customers in a manner that utilises every reasonable avenue. Unite believes it is better to have a diverse mixture of sources of energy rather than placing all the eggs in one basket. Unite hopes that Ofgem will look into all greenhouse gas emissions of the whole energy supply chain when deciding which technologies to favour rather just examining CO_2 reductions than at point of use.

2.3. Ideally Unite would also like to see the development of more green and turquoise hydrogen[3], to provide a way of storing any excess generation for deployment when the supplies of renewable energy fail to materialise. It should not be assumed that all renewable sources of electrical generation are unpredictable and Unite believes these options need further exploration. Tidal stream, lagoons and barrages for example, are, as the name suggests, predictable as the tides, and given the UK has some of the largest tidal reaches in the world, these are a resource that needs to be explored again.

2.4. Unite feels that if deployed correctly, hydrogen is an ideal substitute for fossil fuels. It is abundant, there are many ways to extract it and it can be used to create a net zero drop-in fuel replacement so that existing vehicles do not have to be abandoned wholesale. If these vehicles retain some value then it would be far more financially viable, for the public to trade up to something that operates without causing the release of greenhouse gasses, rather than starting from scratch.

2.5. Having competition for the supply of hydrogen will, drive up prices and make the UK dependant on imported hydrogen. Deep ocean wind energy power generation may need to wait years for National grid connections and the transmission losses may make the electrolysis of seawater and transportation of hydrogen a viable option. Without home grown solutions and instead banking on the international generation and supply lines may not result in energy security.

[1] RIIO3 stands for the third Revenue = Innovation, Incentives and Outputs (RIIO) price controls of a private market, with a new focus to 'deliver better customer outcomes' from the privately owned energy market.

[2] Government Definition of fuel poverty.

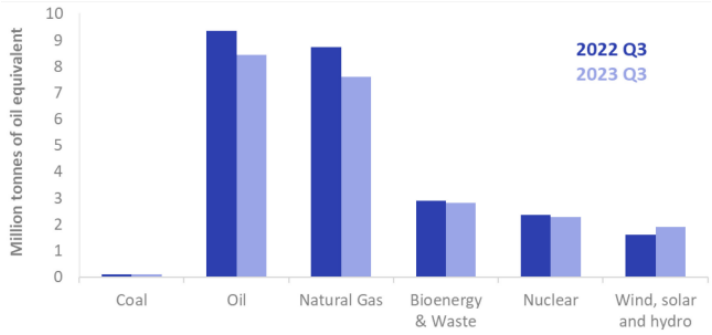
[3] See the appendix for the rainbow of terms used to describe hydrogen generation methods.

2.6. On the face of it importing hydrogen from, areas of the world blessed with year-round clear blue skies, like the Sahara are ideal for both solar farms[4] and concentrated solar/molten salt furnaces to generate power. Transmitting such power over huge distances by cables is not viable, as over 10% of all the energy would be lost, but transporting the energy as hydrogen gas cylinders is. There are fears, however, that covering large areas without such cooling could help raise the planets temperature[5]. This is just one example of the need to examine all options from every side of the argument before supporting the option.

2.7. Given the amounts of energy the UK currently obtains from fossil fuels, no stone should be left unturned to find alternatives. The UK has many options for energy generation not just at power facilities. Assistance is needed at these locations to encourage the delivery of energy back to the grid from these diverse sources in a way that does not incur such transformational losses. In order for this to happen, the grid needs to be transformed from the power lines set up in the 1960's to one more suited for the modern era.

2.8. For all the changes to occur to move from an economy based on carbon to one based on hydrogen and electricity, there needs to be the investment into the staff and importantly, the gathering and imparting of skills from experienced workers to new starters. Secretary of State for Energy Security Claire Coutinho said recently that the new hydrogen projects the current government was funding across the country, will boost our supply of clean home grown energy for use in buses, trains and local businesses. "*By backing the UK hydrogen industry, we can support over 12,000 jobs and up to £11 billion in private investment by 2030.*" Unite believes this is a low estimate given the need for hydrogen in this country if we are to decarbonise. The 7 projects they were discussing in their announcement[6] have the potential to increase our capacity to make hydrogen by 800MW as a stepping stone toward their 10GW by 2030 goal. Unite believes that this goal is too low given the scale of the challenges ahead.

2.9. The chart[7] highlights the scale of the challenge. In a year 10GW of capacity could produce the equivalent of 7.53 million tonnes of oil, thus matching the equivalent of the country's energy input from natural gas in Q3 2023. Therefore, if we are to match the input of all fossil fuels in the year around 85GW of capacity would be required and enough power generation to supply it with electricity. Given there hasn't been enough early investment into nuclear generation, our aging fleet will soon be reduced to just the output from Hinckley Point B. and when built Hinckley Point C. Since 2020 the actual generation has dropped from 0.75GW of realised capacity to just an average of 0.41GW of realised capacity[8] due to repairs and refuelling.



2.10. Given the age profile of the current workforce and the manpower requirements for the transformation, time is running out. In a previous response on home and industrial heating Unite highlighted the scale of the challenge to move away from gas central heating to an alternative based on hydrogen or heat pumps[9]. In others Unite has stressed the need for greater insulation and energy economy, to stop energy wastage. To make these changes requires more of a war style footing to deliver the numbers of workers to complete the task.

[4] It has been discovered that solar panels perform best if they are cooled, extracting this heat provides a secondary source of energy and the condensation from the water vapour that gathers on the backs of cooled panels can also promote plant growth, thus greening the desert and capturing carbon. See link

[5] Solar panels in the desert may not be a good idea. See link

[6] See article covering the announcement by clicking here

[7] The chart was taken from the Energy Statistics UK produced by the Office for National Statistics in December 2023 to highlight energy sources in the three months to September 2023.

[8] Use the links to see the real generation from the Hinckley Point B1 & Hinckley Point B2 reactors. To convert the output to realised capacity in a year simply divide by 8,760. To convert GWh to Million tonnes of oil equivalent (Mtoe) divide by 11,630.

[9] See the response on the Politics Home Unite the union pages link

2.11. Unite therefore believes in the need for a Just Transition of workers, to retain the skills of workers displaced due to the closure of work activities that are not environmentally sound to be deployed in areas where, with their assistance, can assist with the development of the energy industry to something we can be proud of. If the UK can lead the way, it can export that knowledge as an asset to guide other nations much in the way that it started the industrial revolution and industrialisation of generations.

2.12. This industrialisation needs be applied to the capture, utilisation, and storage of CO_2 and ideally its mineralisation. The United Nations' (UN) International Panel on Climate Change (IPCC), the UK's Committee on Climate Change (CCC) and many others agree that the time has passed when we can stand back and rely on nature-based solutions to global warming. We have already experienced a year that averaged 1.5ºC above preindustrial levels of warmth, so we are now in an era when the fate of the planet rests on government decisiveness and action to industrially extract CO_2 from the environment at a rate the more than compensates for the volumes of greenhouse gasses released. To do this there needs to be investment by central government of funds to at the very least attract investment and at worst fund the required changes. Nature-based solutions still need to be explored but the speed of required change demands action now not in 25 years' time.

2.13. In an open letter from Professor Piers Forster, Interim Chair of the CCC[10] he states that they *"congratulate the Government on meeting the latest emissions target – the Climate Change Act is working. But the path ahead is tougher and we risk losing momentum if future legal targets are loosened on a technicality. The UK is already substantially off track for 2030 and the Government must resist the temptation to take their foot off the accelerator."* "*Achieving future carbon budgets will require a sustained increase in the pace and breadth of decarbonisation across most major sectors. Carbon Budgets One to Five were set when the country's 2050 goal was to reduce emissions by only 80%. That commitment has been raised to Net Zero by 2050, in line with global climate goals. It is essential that an ambitious path of emissions reduction is maintained, increasing in pace over the next decade*."

2.14. RIIO-3 therefore needs to be fit for purpose, not reliant on a that'll do attitude, but going that extra mile to cause change. In this response Unite hopes to embody all of the above and more to assist the government and regulator in achieving its goals while leaving no party vulnerable and behind.

3. Consultation Questions

Future of Gas

Q1. Do you agree with our proposal for how RIIO-3 should interact with the Hydrogen Transport Business Model?

Q2. Are there any additional activities relating to the development of hydrogen transport infrastructure, or repurposing of natural gas assets, that you think should be funded through RIIO-3, and if so, why do you think this is justified?

Q3. Do you agree with the proposal that network costs relating to hydrogen blending at both distribution and transmission level should be included in RIIO-3 net zero related UMs? If so, which mechanism do you think is most appropriate for these costs and why?

3.1. Unite recognises the latest report by the Committee on Climate Change which reports that there will not be enough hydrogen produced domestically to satisfy demand[11]. Further if the country relies on the supply of Natural Gas via Blue or Turquoise Hydrogen[12] avenues for conversion, the price of hydrogen will forever be linked to that of natural gas. In order to convert a carbon-based source material to Black, Brown or Grey hydrogen, requires there to be a source of heat to convert the carbonous materials or coal (in the Brown or Black Hydrogen methods) to a gas and more heat to boil the water to create the steam to separate the hydrogen from the other gasses. If the government continues to support Grey Hydrogen the method

[10] The full letter can be found by clicking here

[11] See the Net Zero Power and Hydrogen: Capacity Requirements for Flexibility (AFRY) report

[12] See the appendix for the rainbow of terms for differing methods of producing Hydrogen.

is so imperfect as to may as well just continue to burn natural gas as burning natural gases as this would release less emissions.

3.2. Unite would favour methods to be deployed that do not involve carbon-based source materials, or if they are involved then they should be extracted using Turquoise Hydrogen methods to produce a carbon powder rather than Carbon Dioxide (CO_2).

3.3. Hydrogen is unique in that it can pass through solid metal pipework and structures creating storage and transmission issues, which would need to be overcome with internal or external plastic coverings or replacements if existing pipework were to be used. Whilst there has been the policy since 2002 has been to replace old metal natural gas pipework with plastic pipes, but this is in no way means that the entire 284,000km of pipelines within the network and importantly the pipework to and within homes and businesses in the final mile are still metal. 23 million properties are connected to mains gas. The leakage has been reduced as a result of the Iron Mains Risk Replacement Programme that is due to run until 2032. This has reduced leaks by just 22.4% by 2020[13] and it is obviously the case that further funding would be urgently required if that same network was to deliver hydrogen.

3.4. What cannot be over looked is that the combustion of any fuel in air causes the dominant constituent gas Nitrogen to oxidise producing a small, but not insignificant amount of Nitrogen Dioxide (NO_2) and other such Nitrogen Oxides (NO_X). These gasses are considered to be greenhouse gases by the UNFCCC[14], their International Panel on Climate Change assessment report highlights that Methane has a Global warming potential over 20 years of 56 times[15] that of CO_2 and Nitrogen Dioxide of some 280 times that of CO_2 over that same period. Indeed, while the potential of methane decreases to 21 years over a 100-year period due to the short 12-year lifespan of the gas on average, NO_2 has a lifespan of 120 years meaning that the warming potential over the same period increases to 310 times that of CO_2[16].

3.5. In the circumstances any move to replace natural gas with hydrogen may result in the removal of CO_2 emissions but this would not remove the impact of NO_2 making it impossible to reach Net Zero without some measure to capture, storage or the mineralisation of an equivalent volume of CO_2. Additionally, when burning hydrogen there needs to be some measure to deal with the considerable volume of water produced.

3.6. If these issues of supply emissions, supply volume, the continued offsetting of emissions and the issues created by the production of water vapour, can be resolved then the replacement of natural gas heating systems with hydrogen fed heating systems may be a viable alternative. If so then the option to blend hydrogen with natural gas during the transition would appear to be a sensible one.

3.7. The more sustainable and economic option would of course be to use heat pumps which have the capacity to return up to 7 watts of heat at the cost of 1 watt of electrical power. At best a gas or hydrogen boiler could deliver 0.7 watts of heat for that same amount of energy input. This is possible as the systems simply extract heat from the atmosphere and due to work being done to exchange this energy through the movement of air or fluids, this adds an additional amount of heat. What is more as the planet warms more and more properties will require both increased insulation and an air conditioning system to remove the heat from buildings to provide a refuge from the extreme temperatures. Such air conditioning can easily be provided by a heat pump while a gas option can only supply warmth.

3.8. Given the challenge of replacing all natural gas heating systems, we are running out of time and skilled engineers capable of make the transition before 2050. In such circumstances providing a hydrogen supply network appears to be a necessary interim option which should be funded through RIIO-3 price controls which will run from 1 April 2026[17].

Q4. What are your views on the proposal of using the GD specific Heat Policy re-opener, the RIIO-3 net zero related UMs, or a mixture of both to fund network costs incurred as a result of the government's

[13] According to the Energy Networks Association paper from 2020.
[14] The United Nations Framework Convention on Climate Change
[15] Lifetime in the atmosphere -12 years ± 3 years
[16] See the IPCC Second Assessment Report
[17] On the basis that the industry is not renationalized by an incoming Labour Government.

2026 decision on hydrogen for heating (where RIIO is deemed to be the most appropriate funding mechanism for these costs)?

3.9. Unite believe that hydrogen fuelled heating is solution to the replacement of Natural Gas that could be very costly and not reduce greenhouse gas emissions to zero as any combustion will generate a small but significant volume NO_2, and unless all the pipework from the chemical plant to the boiler are replaced with plastic pipework, the hydrogen will escape in huge volumes as the gas can pass through solid metal.

3.10. Unite recognises, however, that there has not been the funding from central government to support the creation of enough heating engineers to produce and install heat pumps in all 31 million homes let alone the businesses. Each heat pump takes a minimum of two or three at least 3 days to install due to the need to create space for a hot water tank and the connection of pipework out of the building to the heat pump itself.

3.11. Unite believes that any funds raised by this process need to be hypothecated for use in training the heating engineers of the future given the shortage of trained heat pump qualified engineers in the UK.

Q5. What are your views on our proposal to not enable funding for further evidence relating to repurposing the existing network for hydrogen heating ahead of government's decision on hydrogen heating in 2026?

3.12. Unite is very concerned that the existing network will not be ready to transfer the hydrogen from point of extraction or injection into the network until the point of its delivery. In Unites view given the numbers not connected to the gas network, especially in Northern Ireland, that hydrogen would better be seen as a potential solution for transport solutions and a backup supply for the grid electrical generation than the heating of homes, given the shortage of a green hydrogen supply.

3.13. If blue hydrogen is used as instead of natural gas, then it needs to be realised that it causes the consumption of a large proportion of the gas it is meant to convert creating the required steam. More energy is wasted as not all the methane or other hydrocarbons that make up the natural gas are converted and yet more capturing the CO_2 and warming the amines for reuse and the delivery of CO_2 into the CCUS Network. And if the plan is to utilise more natural gas to secure supplies of hydrogen, one has to remember, that due to the impurities even more hydrogen is required to deliver the same volume of power. In some Scientific estimates, it would be kinder to the planet to simply burn natural gas as burning Blue hydrogen create 20% more emissions[18].

3.14. Another major greenhouse gas to take into consideration is methane as it is, according to the IPPC's latest estimate, around 52 times as powerful at warming the planet than CO_2 over a 20 year time frame. While burning natural gas releases around half of the emissions of coal to obtain the same amount of energy[19], the transportation and leaks from the natural gas network add up. The latest IPCC AR6 synthesis reports[20] that methane has contributed 0.5ºC of the total global warming to date since the late 1800s, compared to 0.75ºC for carbon dioxide[21]. A major source of that methane comes from the leaks from gas networks and storage. In the USA, a recent report took the leaked methane into account when looking at the LNG exports and discovered that using natural gas could be worse than coal[22].

3.15. As stated by the IPPC "If warming exceeds a specified level such as 1.5°C, it could gradually be reduced again by achieving and sustaining net negative global CO_2 emissions. This would require additional deployment of carbon dioxide removal, compared to pathways without overshoot, leading to greater

[18] https://www.openaccessgovernment.org/blue-hydrogen-fossil-fuels-climate/133787/

[19] Coal emits around 950 gCO2 per kWh generated while Natural gas emits just 350gCO2 per kWh. Based on data from the French generator RTE

[20] The IPCC AR6 synthesis report can be read by clicking here

[21] According to the IPCC the warming relative to 1850–1900 can be assessed from radiative forcing studies are: CO_2 0.8 [0.5 to 1.2]°C; methane 0.5 [0.3 to 0.8]°C; nitrous oxides (NOX) 0.1 [0.0 to 0.2]°C and fluorinated gases 0.1 [0.0 to 0.2]°C.

[22] Click here for the link

feasibility and sustainability concerns. Overshoot entails adverse impacts, some irreversible, and additional risks for human and natural systems, all growing with the magnitude and duration of overshoot".

3.16. Additionally, if the existing fleet of Combined Cycle Gas Turbines (CCGT) is used as the method of converting the generated hydrogen to electricity, one has to remember that burning any fuel in air, in a confined space has the tendency to generate NO_2.

3.17. Unite believes that, before the government commits to a hydrogen heating strategy, that it should try and address all of the above points where there will be greenhouse gasses released and find a way to mitigate the long-term costs. The simplest way would be to commit funding to capture and store enough CO_2 from the atmosphere to offset the extra created by using blue hydrogen as heating and passing on the cost to the manufacturer. Of course, doing so could make blue hydrogen wildly uneconomic to produce, but better this would be better than to allow a change to blue hydrogen which damages the planet more than existing practices.

3.18. While heat pumps are initially more expensive than a hydrogen boiler, currently, but they can deliver up to seven times the heat energy for a given volume of power put into the system. As a result, they soon recover the initial outlay and while a gas boiler can only heat a home, a heat pump could, in theory, be configured to cool it in the summer as well, given it is essentially an air conditioning unit running in reverse, and depositing that heat into a heat storge[23].

3.19. Unite therefore, calls for more to be done to support the development of enough apprenticeships to provide the much-needed qualified heating engineers. Of course, the heat pumps also need to be far more affordable than they are currently.

Q6. Should RIIO-3 help to manage future gas network decommissioning costs? If so, do you have views on what these costs could be and what mechanisms should be used, including for anticipatory funding? Role of Scenarios and Planning Pathways

3.20. According to the subnational dataset for 2022[24], there were 24,750,400 metres of gas used in Great Britain delivering 1,022.8 GWh of consumable gas. If the pipe network is not utilised to delivery natural gas the network could still be utilised by other utilities, so Unite would not recommend removing the pipework, as such a plan could undermine a future need. Pipes from industry could be used to collect and deliver CO_2 from industrial processes like the manufacture of concrete or fertilizers for example, such a transition from delivering gas to removing CO_2 once the conversion takes place could enable the repurposing of the network.

3.21. In addition to the pipework to the homes and places of work, there are the sweetening plants[25], pumping stations, storage and rigs to be considered. Before these, the first consideration should be to the workforce, to ensure their Just Transition[26] into alternative employment. Clearly the question as posed does not provide enough clarity as the wording could include or exclude part of the natural gas infrastructure. Unite believes that the cost of the infrastructure should be met by the owners of that infrastructure rather than passing that on to the consumer.

Q7. Do you agree with the proposal to use the FES framework for selecting the RIIO-3 scenarios?

3.22. The Further Education and Skills (FTS) framework provides a basic structure around which specialisms can develop as long as it stays consistent with CCC forecasts. As such Unite agrees that this should be used as part of selection process for selecting the RIIO-3 scenarios.

[23] A heat store can be as simple as an insulated container filled with sand that retains the heat supplied to it for later use.

[24] Published on 25th January 2024

[25] A facility that reduces the volume of CO2 found in natural gas supplies.

[26] As defined by the International Labour Organisation. https://www.ilo.org/global/topics/green-jobs/WCMS_824102/lang--en/index.htm

Q8. Do you agree with the proposal to use FES Leading the Way as the planning scenario for ET in RIIO-3?

Q9. Do you agree with the proposal to use two FES planning pathways for the gas networks, ie Leading the Way and Falling Short as the additional common conservative scenario? Consultation - RIIO-3 Sector Specific Methodology Consultation - Overview Document

3.23. Unite also agrees with the proposal to utilise the FTS Leading the Way document as the basis for skills provisions regarding the Electrical Transmission (ET) planning for RIIO3. Of the four scenarios published by the ESO, this one represents the fastest credible decarbonisation pathway. This is a positive sign that network companies are being pushed to fully enable the energy transition and be proactive in delivering change.

3.24. Unite notes, however, that this does not incorporate sufficient training for the development of the grid at the pace needed for the deployment of Heat Pumps and home Electric Vehicle (EV) charging points etc.

Q10. Is Falling Short the most appropriate common conservative planning scenario to be used for the gas networks? Or is a common gas network developed scenario more appropriate?

3.25. Unite would argue that for the gas networks to be developed with the required capability all the pipework would need to be converted to or lined with plastics. The timescale to achieve this goes way beyond what is required if we are to convert 31 million homes[27] to a sustainable method of heating. Unite therefore does not agree that there is enough focus on the delivery to the standard required if we are to repurchase the network for the delivery of hydrogen.

Q11. Is it feasible for all network companies to initially plan against FES 2023 before updating business plans in line with FES 2024, as proposed? Outputs and Incentives

3.26. Unite believes with enough funding, information gathering and planning anything is feasible, but given the commitments around the Future Energy Scenarios (FES) Unite believes that there does not appear to be the urgency or investment into the skills required.

Q12. Do you agree with our proposed approach on the role, scope and format of PCDs?

3.27. With respect to the Price Control Deliverables (PCD's) Unite would highlight the amount of profiteering that appears to be an ongoing practice, which Ofgem is doing little to control. Energy companies are still extracting vast sums and paying executives vast amounts of money at a time when workers' salaries have not matched the Retail Price Index (RPI) increases and the general public has slipped further into fuel poverty since the Conservative took office. Unite would therefore argue that more should be demanded from the suppliers for less, in such an economic environment.

3.28. Unite would argue that the mechanistic approach to the multiple price controls have failed in the past and continuing to use them will allow suppliers to overcharge. Such price controls need to be examining the amount of profit suppliers make from their activities especially regarding the most economic purchasing of energy for resale at a far higher price. Where there are substantial differences, caps need to be applied.

Q13. Do you agree with our proposed framework for setting financial incentives? Are there any additional considerations that we should take into account?

[27] This is a low estimate, based on the rate of home building in the UK and current housing stock, that are currently supplied with a non-electric method of heating, in Great Britain and Northern Ireland. While it is recognised that Northern Ireland is not covered by the scope of Ofgem as it shares its energy supplies with those of the Republic of Ireland the UK still has the responsibility to ensure that it meets its climate change commitments by ensuring that the overall level of emissions reach Net Zero by 2050 and no estimate could be found that reflect the total number of new homes built between today and 2050 and given that some residential number estimates suggest much higher levels of building.

3.29. Unite would normally argue against financial incentives as they can encourage corners to be cut to meet targets and those corners can lead to issues in the long run. That said however incentives that are based on the reputation of the output of the service provider are to be applauded if they are truly earned without greater transparency.

3.30. Whilst this could be argued to be part of the Financial Output Delivery Incentives (ODI-F's), Unite would argue that this should be extended to include the relationship with the workforce. Industrial disputes can quickly cause disruptions to service even if it stops short of strike action, and as such would not be to the best advantage of the industry as a whole.

3.31. It was the failure of Ofgem's ODI caps and collars that were the main reasons why Ofgem failed to prevent the profiteering of energy companies who hedged supplies prior to the invasion of Ukraine yet charged consumers at the market rate on the day. Unite is not against profits but these need to be reasonable and not of the scale that requires the government to assist the public in paying the bills. Unite would strongly suggest that caps and collars being set not based on the market rate of the day but the price at which the supplies were hedged for later delivery.

3.32. Whilst it is agreed that coordination and transparency between all parties in the sector will be vital if we are to enable the transformation of the energy system, this is no guarantee it will be a transformation that will be at a low cost. Cost benefit analysis should guide the decision-making process. Ultimately false economies need to be avoided as they cause a race to the bottom, which has the potential of causing a reduction to the numbers of skilled personnel, as they leave for better pay and conditions, causing a net loss to the industry as more expense is required to find their replacement.

Q14. Do you agree with our approach to setting reputational incentives? Are there any additional considerations that we should take into account?

3.33. Reputational Output Delivery Incentives (ODI-R's) are very vague in their description as they apply "where value to the consumer cannot easily be demonstrated or quantified, or when we" (Ofgem) "require greater transparency or data on network companies' activities in a certain area". There is no detail over when these are applied Unite assumes that this is a reward for supplying Ofgem with the requested information they seek in all areas promptly, rather than how well or poorly they treat their relations with the customers or workers. Understandably, Unite would favour the latter and greater transparency.

Q15. Do you agree with our proposals for bespoke outputs? Are there any additional considerations that we should take into account?

3.34. Unite would agree that bespoke PCD's should apply based on scale and the markets the company is active within. Unite would also agree with the prospect of more stringent bespoke targets or incentive rates for common ODI's but Unite does not agree that there should be bespoke ODI-F's or ODI-R's as the relationship with customers and the rest of the sector should be universal. What is good for one should be good for another on the proviso that the ODI's are proportionate to the scale of the operation.

Q16. Do you agree with our proposal to retain the EAPs and AERs in RIIO-3? Please provide reasonings for your position.

3.35. Environmental Action Plans (EAP's) and Annual Environmental Reports (AER's) provide Ofgem with details of what they wish to here with respect to the company's Business Carbon Footprint (BCF). The plans to ask the companies to mitigate environmental impacts that arise from their network activities and provide increased transparency of their network's actions and plans to decarbonise in line with the target of reaching Net Zero (NZ).

3.36. For an Electrical supplier like the National Grid or the retail arm of Octopus the task of calculating their Carbon foot print is relatively simple. The data on the amount of carbon released into the atmosphere can be calculated as you know the source of the energy and that methods carbon footprint per kWh so can multiply, the amount purchased, and you can then swiftly total the carbon footprint of the supply per kWh. Reducing this again is straightforward as the retailer purchases more of the energy from the producer that has the lowest footprint. The only issue here is the amount of carbon the company itself, produces by driving around to meetings, or the amount of carbon released as a result of operating their call centres and

offices. This too can be calculated but I very much doubt that the data does not include the impact of the staff journeys to work, or the non-CO2 greenhouse gasses released.

3.37. Once the company has completed this task the next question is how to offset their footprint and how much of this obligation to offset can they pass on to the consumer, for them to reduce their emissions to a Net Zero by purchasing the required amount of carbon credits. What would be better of course would be to directly capture CO_2 emissions from the atmosphere for mineralisation or long-term storage as this is severely underfunded.

3.38. The issue with decarbonisation is obtaining the correct the information on the number of kilograms of CO_2 or its equivalent (kg CO_2e) greenhouse gas, is released and how much can each company do to reduce this amount over time to zero.

3.39. If a natural gas supplier was to offset all their emissions, they would quickly go bankrupt as escapes of the gas from leaks or extraction release a mixture of some very powerful greenhouse gasses into the atmosphere. The most common of the gasses being CO_2 of course methane and when burnt NO_2[28]. According to the latest IPPC Global Warming Potentials[29] although methane remains in the atmosphere for an average of 12 years, its warming potential has been found to be 56 times that of CO_2 over a 20-year policy period and 21 times that of CO_2 over 100 years. NO_2 however lasts in the atmosphere for 120 years and is 280 times as powerful over a 20-year policy period and 310 times that of CO_2 over 100 years. As a result, even the smallest release of NO_2 is hugely significant.

3.40. Consequently, where the gas supply is being augmented with a supply of Blue Hydrogen, it introduces a small but significant volume of NO_2. Efforts to create hydrogen from natural gas using Steam Methyl Reformation (SMR) with Carbon Capture (Blue Hydrogen), the industry must burn a small amount of natural gas in order to create the steam and more to warm the amine solution that removes the CO_2 from the exhaust gasses. This conversion of gas to create steam also creates NO_2 gas as happened whenever there is a combustion and because the conversion of methane to hydrogen is not perfect some methane also escapes. As a result, depending on the efficiency of the process it may be more sustainable just to burn the natural gas as that at least converts all the methane to energy and CO_2 rather than the release of these more powerful greenhouse gasses.

3.41. Because some of the gas is used to create the steam in the SMR process, the amount of natural gas energy in, does not equate the amount of hydrogen out. Therefore, to replace natural gas with hydrogen requires either more natural gas, a reduction in demand or hydrogen from additional sources. Liberating hydrogen from water using electrolysis equally causes a loss of some energy, but it does not liberate at the same time any greenhouse gasses.

3.42. There are other methods to produce hydrogen from natural gas without releasing any CO_2 but these have rarely gone beyond the demonstration of the technology, due to the lack of support. If pyrolysis were adopted industrially, for example, the industry would have a secondary product that it could sell, carbon powder. This carbon powder could be used to make pencils or enrich farm land or used to produce carbon fibre, industrial diamonds or even graphene nanotubes.

3.43. Natural gas providers and companies can of course work with their staff to reduce corporate emissions and work to prevent leaks. But as with the electrical supply sector the issue is still one of complete transparency over exactly how much is released and the problem of double counting both emissions or the savings if more than one party is involved.

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[28] Average concentrations of gasses commonly found in natural gas pipeline supplies = 94.4% Methane (CH4) 0.5% CO_2, 3.1% ethane (C_2H_6), 0.5% propane (C_3H_8), 0.1% Isobutane (C_4H_{10}), 0.1% N-Butane (C_5H_{10}), 0.2% Pentanes (C_nH_{n+2}) etc., 0.0004% hydrogen sulphide (H_2S), 1.1% nitrogen and trace volumes of Helium (He), but the amounts of each gas vary greatly depending on where the gas is extracted from, according to the IPCC. The concentration of H2S varies depending on the geology of the location and con also be inadvertently increased if the hydrogen is stored with access to a sulphur deposit. Given how corrosive the H2S gas is, especially if it comes into contact with water, geographical surveys need to be thorough before any natural gas storage is reused to store hydrogen.

[29] (IPCC Second Assessment Report) https://unfccc.int/process/transparency-and-reporting/greenhouse-gas-data/greenhouse-gas-data-unfccc/global-warming-potentials

3.44. Unite would therefore welcome any moves to provide complete transparency and would be willing to try and elect a workplace environment representative as a go-between and advisor to try and highlight where a company or organisation could make savings. All this workplace environment representative would need is facility time and access to assessments of the business's energy use and hence carbon footprint. Each workplace environment has its own querks, and solutions which will not work, but it is guaranteed that given the training that Unite can provide, the industry will make savings. Therefore, Unite would like to see in the EAPs and AERs the requirement to reach Net Zero

Q17. What are your views on the new proposed AER format with Commentary and KPIs?

3.45. Unite believes that there is a considerable amount of wriggle room in the broad topics of the AER. Obviously, a natural gas distribution network (GDN) would struggle to procure a sustainable procurement of natural gas, but they can have electric or plug in hybrid fleet vehicles. Unite feels that the impacts of climate change on any supplier should include the amount of energy used on air conditioning and energy used to pump out of flooded access points. Unite would advocate that all energy companies contribute to the cost of decarbonization going beyond the commitments that will eventually be applied and required under the UK ETS scheme.

Q18. Do you agree with our minded-to position of retaining the reputational incentive on TOs and GDNs for reducing their BCF?

3.46. Unite believe that all Transmission Operators (TO) and GDN's Business Carbon Footprint (BCF)'s will be different and setting a common standard without a proper assessment will no doubt be too tough on some to achieve because of improvements they have already made, while a company who has done little to date could find substantial savings. Unite agrees that this should form part of the business's reputational incentive during their RIIO2 assessment.

Q19. Are there any other suggestions you would like to make regarding reporting standards?

3.47. Unite would, as suggested earlier, like to see proper staff engagement to work with staff to achieve their goals. Unite has a number of courses to guide prospective environmental representatives, who, if given the access and facility time to do the job properly, can help the businesses achieve their goals.

Q20. Do you agree with our minded-to position to withdraw the Environmental Scorecard and incentivise improvements in environmental impacts through the Annual Environmental Report (AER)? Please explain your reasoning.

3.48. Unite would not like to see the scorecard disappear and if anything, we would like to see it more prominently displayed on the Ofgem website so that consumer groups can vote with their wallets and chose the provider with the best carbon footprint. Such publicity may encourage those at the bottom of the list to invest more. Unite would suggest that a figure for the kgCO2e per kWh should be displayed enabling a direct comparison.

Q21. Do you consider that there are other areas which require financial incentives which cannot be captured by the AER? Please explain your reasoning.

3.49. Unite would not like to venture an answer to this at this time as it would require more specific feedback from the membership on a location-by-location basis. Unite believes that the basics are contained in the AER.

Q22. Do you have any views on our proposals for the NARM framework?

3.50. Unite feels that the Network Asset Risk Metric (NARM) framework to assess degradation may work if the infrastructure was all buried in similar soil conditions or maintained in areas of similar weather conditions. Clearly, in areas prone to high winds, snow or flooding like Bradford will impact the network significantly more than one in one of the dryest council areas like central Essex[30]. Equally if the area has been mined,

[30] The Chelmsford council area is one such example see the link

there is a greater chance of sink holes, has very acidic soil, like in the North York Moors or more alkali like in the East Riding of Yorkshire[31] as this could impact the corrosion rate of any metal pipework.

3.51. What Unite is suggesting is that while a NARM is a reasonable idea it could never replace a visual inspection of the infrastructure nor the need to replace the pipes with an inert plastic pipeline.

Q23. Do you have any views on our proposed long-term approach to embedding climate resilience, including the principles for embedding climate resilience?

3.52. Unite would welcome the proposed long-term approach to embed climate resilience principles into any Ofgem planning for RIIO 3 and beyond. To do otherwise when there is such a focus on reaching Net Zero by 2050 would appear to ignore the government's climate change adaptation priorities.

Q24. Are there any early learnings we should be aware of/incorporate to make progress on this in RIIO-3 or beyond?

3.53. Unite has already called earlier for more staff engagement into the process to enable the business to adopt any new promising initiatives and for greater transparency. If the staff are to be enthusiastic about changes, then there needs to be engagement and ideally reward for performance. Engaging with staff at the right level also helps the nation achieve goals as it imparts to the workforce the need to change, meaning that companies are not battling apathy.

Q25. Do you agree with our suggested approach for embedding climate resilience into RIIO3, namely: introducing resilience strategies; developing forward-looking resilience metrics; and introducing climate resilience working groups?

3.54. Unite could not agree more with the idea. Unite calls to be closely involved in these working groups to ensure there is worker to management buy in of any proposals. Unite would highlight that the Trade Union Sustainable Development Advisory Committee (TUSDAC)[32] has been in existence for almost 26 years offering the Secretary of State the opportunity to engage directly with all TUC recognised trade unions. Unite believes by reengagement with the unions through this body the path to a sustainable future could be achieved.

Q26. Do you agree with the proposals that we have set out around the resilience metric?

3.55. As stated earlier Unite would agree that it is important to include the resilience metric proposals, but these should not be the end of the story. Unite would suggest a metric to cover the amount of the network that has been inspected and if required adapted to cope with future demands should be carried out to frequently inform the path to a sustainable outcome.

Q27. Do you agree with our proposals on workforce resilience? Truth Telling and Efficiency Incentives

3.56. As stated in the consultation, "*A resilient workforce is essential to a network company's ability to deliver the services that its customers expect over the longer term*." Unite is concerned over the age and gender profile of the workforce at several employers as they are failing to invest in apprenticeships preferring instead to entice workers from rivals. Sadly, there are too many of these companies and Unite fears that there will be a significant shortage of staff in the coming years. The majority of the workforce are white men in their mid to late 50's and hence Unite feels that employers need to do more with schools, colleges, universities and career advisors to create a skills pathway.

3.57. Unite finds it a pity that the only seat on the green job's delivery group provided to the TUC was taken away and where trade unions have been invited to attend subgroups the experience has been one where the

[31] On the Soil associations website there is a map of the ph. of the soils around Great Britain.

[32] TUSDAC was set up in 1998 to work collaboratively with DEFRA on sustainability Government, jointly chaired by Michael Meacher, Minister for the Environment and John Edmonds, General Secretary of the GMB, who is also the TUC's General Council spokesman on the environment. DEFRA archive page or TUC TUSDAC page

work had already been completed. If this government had any sense it would talk to the workforce and identify issues before they arise.

3.58. The Net Zero target will be missed by a very long way if there are not enough workers to deliver the changes. Estimates by various environmental groups suggest that there will be more roles to fill than workers in the coming years and employers may need to offer increased incentives to encourage them to work for their company.

Q28. Do you agree with our proposed key objectives for truth telling and efficiency incentives?

3.59. Unite is not convinced that the Business Plan Incentive (BPI) has worked, and some businesses remain secretive and have failed to reach Stage 1 on the provision of an accurate assessment. The Stage 2 consumer value propositions (CVPs) where companies go beyond business as usual would not be unusual if every provider was completing this task. Unite agrees that going above and beyond should be rewarded, but on an ad hoc basis rather than it being a stated requirement.

3.60. Unite understands the frustration when setting Stage 3 goals in a vacuum, non-the-less, reliance on company for information in setting allowances would appear to be a recipe for disaster. Fortune telling and gazing into a crystal ball are things that should be reserved to a 1970's show on a pier not the arena for a regulator. Any attempt to do so for Stage 4 has to be in relation to a very short window. Who could have clearly predicted the COVID-19 pandemic or the invasion of Ukraine and the blackmail attempts of Russia. It is clear from these that the UK needs to be less not more reliant on imported energy.

Q29. What are your thoughts on our proposals relating to minimum requirements under an evolved BPI approach?

3.61. Unite approves of the RIIO-2 Business Plan Incentive Penalties/Rewards, especially the league table. In isolation, however, it would be important to stress the size of the business compared to the size of the penalty/reward. Cadnet for example owns a very large slice of the gas network delivering gas to 11 million homes through 132,000 km of pipes and yet it received £0.6 million, while Scottish Hydro Electrical Transmission (SHET) comprises of 5,334 km of high voltage overhead lines, underground cables and subsea cables covering around 70% of the land mass of Scotland in small villages and on remote islands and yet it obtained £21.8 million in rewards. Clearly, given the scale of each business these rewards have a vastly different impact on the company's bottom line. Unite feels therefore that this reward/penalty needs to be provided as a percentage of the company's turnover or physical size.

Q30. What are your thoughts on an 'in the round' assessment of cost forecasts as opposed to a high/lower confidence breakdown and assessment?

3.62. Unite feel the high/low confidence breakdown assessment is a far more informative way of providing forecasts based on imperial data. Clearly such forecasts need to include assessments of the stability of nations and potential threats wherever possible to hopefully be better prepared for the situation felt in late 2022 early 2023.

Q31. What are your thoughts on an 'in the round' assessment of business plan ambition as opposed to requiring and assessing CVPs?

3.63. As stated earlier where companies go beyond business as usual with respect to their CPV's Unite agrees that going above and beyond should be rewarded, but on an ad hoc basis rather than it being a stated requirement. Despite it being considered difficult to obtain, and some stakeholders believed they added little value. Unite feels that they would say that if they fear poor performance in the future. Often in these cases it is not usually corporate policy but the actions of one individual and Unite would like to see them rewarded appropriately.

Q32. What are your thoughts on the size and strength of any truth telling incentive?

3.64. Unite believe that a lot of the plans rely on the providers behaving honourably and honestly, with a lot taken on trust. If the providers are being honest in their own self assessments by providing the homework

requested, then the plan works but where are the checks and balances to carry out audits to ensure truthful assessments.

Q33. What are your thoughts on any alternative approaches that could be used instead of an evolved BPI?

3.65. Unite would strongly recommend audits of corporate activities and severe penalties for delayed or noncompliance. Perhaps the union is just being cynical but there have been too many not so open discussions in the past for Unite to be convinced the BPI's work.

Q34. What are your thoughts on the options for calculating the sharing factors and do you see strong reasons for changing the overall strength of the sharing factors relative to RIIO-2? Managing Uncertainty

3.66. Unite would agree with the idea of a financial penalty for cost forecasts that are high relative to the benchmark and reputational incentives with greater publicity for the Ofgem assessments. The size of the reward/penalty should either reflect Ofgem's judgement of the overall level of ambition of the proposal, but this reward / penalty should be proportional to the scale of the business. A company the size of National Grid could live with a £1 million penalty but equally apply the same penalty to Wales and West Utilities and the impact could hit them far harder.

Q35. Do you agree with our proposal to retain the Net Zero Re-opener with its current scope and parameters for RIIO-3?

3.67. Unite does agree with the retention of the Net Zero Re-opener with its current scope.

Q36. What are your views on our proposal, in principle, to retain the Net Zero and Re-opener Development Fund UIOLI for RIIO-3? What are your views on the types of projects it could fund and how it would interact with other sector specific price control mechanisms?

3.68. While Unite does agree with the principle, to retain the Net Zero and Re-opener Development Fund Use It or Lose It (UIOLI) allowances for RIIO-3, it believes that the size of the fund be increased in value so that it cannot be ignored without questions being asked in the board room. As to the specifics of projects that it could fund, Unite can only suggest that Ofgem speak to various universities to see what ideas the students can come up with. Unite is a supporter of pyrolysis to break down a fossil rich source material into hydrogen and solid carbon so there is the potential for fossil fuel reserves to be used without damage to the environment. There are several ideas out there, from bubbling natural gas through a liquid metal at a refinery to extract hydrogen and solid carbon, but none as yet has, to our knowledge, reached commercial scales.

Q37. Do you think we should retain the NZASP for GD and GT? What should its scope be and what kind of projects would you expect to be funded through this re-opener in RIIO-3?

3.69. Unite believes that the Net Zero Pre-construction Works and Small Net Zero Projects (NZASP) re-opener for gas distribution and transmission should be retained but strengthened to carry more weight, to encourage action.

Q38. Do you have any views on consolidating the net zero related re-openers and the UIOLI allowance?

3.70. Unite believe that the 'Use It or Lose It' allowances should be increased in value beyond the £88 million level as highlighted earlier and should remain separate. These need to be at a level where questions need to be asked as to why these allowances were not used.

Q39. Do you agree with our proposed position to retain the Coordinated Adjustment Mechanism for RIIO-3? If it were to be retained, what design and incentive considerations could we implement to enhance the utilisation and value of this mechanism?

3.71. Unite members have not expressed a position on this.

Q40. Do you agree with our proposal to allow physical security costs to be submitted through a broader resilience re-opener?

3.72. Unite members understand the need for heightened security especially given the worlds international political climate. The increased reports in the public domain alone about

Q41. Do you agree with our proposed approach to introduce a resilience reopener?

3.73. Unite strongly believe in resilience and reserves to weather political storms more easily. Unite continues to be concerned over the lack of storage capacity or the lack of a strategic reserve.

Q42. Do you have any views on whether the opex escalator should be retained and if so, how we could evolve the opex escalator for RIIO-3?

3.74. Unite is concerned that there is an automatic volume driver mechanism to ensure electricity and gas transmission companies are funded for varying operational costs associated with capital investments delivered through specified uncertainty mechanisms (UMs). While it is understandable that there needs to be a safety net provision, Unite is concerned about the abuse of this system.

Q43. Do you have any views on how we should effectively monitor the delivery of UMs? Cost of Service

Q44. Do you have any views on whether to evolve the RIIO-2 methodologies for RPEs and ongoing efficiency for RIIO-3, and if so how?

Q45. Do you have any views on the potential application of RPEs and ongoing efficiency to re-opener applications?

3.75. Unite members have not expressed a position in this area.

Q46. Do you agree with our proposed approach to cyber resilience in RIIO-3? Innovation

3.76. Unite members are understandably concerned about cyber security especially given the potential for state sponsored attacks on the industry. From the limited information in the public domain there are major concerns when the network is not isolated from the internet especially given the rise in tensions with the likes of Russia. For this reason, Unite would support the Ofgem approach to cyber resilience but would ask that there is a greater atmosphere of transparency and openness with the senior workplace union reps of the need for security, and the types of threats faced. Working collaboratively with central government to understand the treats and trends would help the company level teams ensure their part of the industry is secure. Like any defence it is only as strong as its weakest link, and it is important that staff are made aware basic security measures even down to the ways of constructing secure passwords and recalling them without the reliance on a web based single point password memory storage service like Google.

Q47. Do you have any views on our proposal to retain a flexible allowance, providing evidence for why you think that it should, or should not be, retained?

3.77. Unite members have not expressed a position on this.

Q48. Do you have any views on our proposal to retain a competitive network innovation funding pot, that continues to focus on key challenges facing the energy sector, with phases to de-risk the pot?

3.78. Unite members believe that to grow sustainably there is a clear need for innovation to discover new ways to provide the service without increasing cost or damaging the environment further, and hence Unite members support the provision of an innovation fund. However, as with any innovation, until it is tested in a real-world environment, it is next to impossible to predict every outcome. Even where the modelling predicts advantages, there needs to be an independent assessment, or the myopia of the designers could overlook some points that they had not considered. Unite firmly believe that without independent assessments, you cannot de risk the pot. For this reason, Unite would encourage trade union engagement at the earliest opportunity to advise of the practicalities, and smooth the way for the transition to any new ways of working.

Q49. Do you have any views on how the structure of the price control innovation funding could be adapted to better focus on whole systems problems, and ensure strategic alignment with other public sector initiatives?

3.79. Unite would suggest that more closely focussing on whole system issues is the only way to properly design innovation funding. Although savings can easily be made in a company, which move the problem to someone else's arena, this should not receive innovation funding as it may be increasing the scale of the challenge.

3.80. An example may be drawn regarding the policy to move away from the use of coal. The conversion from coal to biomass and in some cases to natural gas fired ex coal power plants around the world has in some cases increased the volume of greenhouse gasses entering the atmosphere. The inclusion of municipal waste to energy via anaerobic digestion to extract methane or wood pellets to produce power from land management uses a resource that would otherwise rot in landfill or in nature creating the uncontrolled release of methane. In this respect the capture and combustion will reduce the concentration of methane, but this could equally cause a net to increase the release of CO_2 and NO_2 during transport, processing and combustion depending on how the waste is treated. Equally the municipal waste can be used as the source material for the creation of Sustainable Aviation and Maritime fuels (SAF & SMF). Using SAF, it would be possible to continue to fly over 3,700 km, reduce radiative forcing, reduce fuel burn volumes, and therefore enable the world of fast passed international travel, commerce, tourism etc on which so many economies rely. The synthetic crude produced in this process can help all forms of transport decarbonise and enable the continued manufacture of materials previously derived from crude oil such as naphtha. Therefore, public sector initiatives to decarbonise and deal with the problem of landfill can create competition for this resource which until recently has been a net cost to local authorities.

3.81. Without CCUS the total volume of greenhouse gasses could rise significantly beyond the savings made by not burning coal, even after the amount of CO_2 captured by nature, while any vegetation is growing, is considered. Furthermore, if every country used biomass to CCUS (BECCS) as their main way to reduce emissions, at the scale used in the UK, there simply would not be the landmass or water resources available to grow enough trees and food.

3.82. Unite is a supporter of BECCS and would encourage more haste in the installation of the CCUS side of the facilities at the likes of DRAX so that becomes a carbon sink. The major concern is that the reliance on biomass to save the day overlooks the impact of NO_2 emissions. According to an article by Doctors Fajardy, Köberle, Mac Dowell, and Fantuzzi[33] "*Depending on the conditions of its deployment, BECCS may be beneficial, but it can also be detrimental to climate change mitigation, due to its lifecycle CO_2 balance, energy balance and resource use*". Unite would agree with this reports recommendation in that it concludes "*It is likely that only a limited amount of bioenergy will be available if social and environmental sustainability constraints of feedstock production are met. Therefore, this sustainable potential should be allocated in a way that yields the most benefits. One way to maximise CO_2 removal is to impose a requirement that any bioenergy deployment should be accompanied by capture and storage of as much CO_2 as possible, effectively requiring that any bioenergy used from now on should be in the form of BECCS."* The paper does suggest that BECCS enabled plants should also be included in the required format but Unite cannot stress enough the need to turn enabled facilities into fully functional BECCS plants as a matter of some urgency.

3.83. The myopia of focussing on CO_2 can do more harm than good. The focus on reducing fuel consumption and CO_2 in the automotive industry for example has driven a focus on diesel as a way to improve fuel consumption before the complete U-turn in the governments support for diesel. Similarly focussing on the CO_2 savings by focussing on hydrogen CCGT does nothing to consider the source material used or NO_2 released. While there are models to predict the NO_2 emissions from a Natural Gas CCGT power plant[34] to date no such estimate has been made of a blend of Hydrogen and natural gas even though the increase in calorific value should in theory increase the NO_2.

[33] BECCS deployment: a reality check by MATHILDE FAJARDY, DR. ALEXANDRE KÖBERLE, DR. NIALL MAC DOWELL, DR. ANDREA FANTUZZI

[34] https://www.sciencedirect.com/science/article/abs/pii/S001623612200895X

Q50. Do you agree with our proposal to continue with a similar level of innovation funding, and if not, could you provide evidence for why a different amount is required, including consumer research you are aware of into their willingness to pay for network innovation?

3.84. Unite agree with our proposal to continue with a similar level or if possible, a higher level of innovation funding. Without innovation, it is the assessment of Unite that the industry will currently struggle with the goal of achieving Net Zero before 2050. Currently the trajectory of the UK economy will miss Net zero without reliance on its neighbours and imports of things like green hydrogen, for example. Our plans to decarbonise homes and offices need a solution that can cope with the volume of water produced by a 100% hydrogen flame in a boiler for example, and what to do about the NO_2 produced if we simply replace Natural Gas with hydrogen in the gas turbine power stations. Unite recognises that there are some interesting designs out there and feels that this need investigating in an industrial setting to see just how viable they are. For this to happen there needs to be innovation and the potential funding. Therefore, any assistance Ofgem can provide is always going to be welcomed.

Q51. Do you agree there is a need to expand the scope of innovation funding to be more inclusive of third parties?

3.85. Unite firmly believe that the industry should not ignore great ideas just because they come from third parties and expanding the scope, expands the opportunities for a successful outcome as well as the possibility choosing a lemon over something that is more closely aligned with the industry goals. For this reason, Unite would strongly suggest close oversight of third party innovations.

Q52. What are your views on us establishing an accelerator to support early stage innovators?

3.86. Unite believes that an accelerator is a very good idea as it provides both funding and an incentive to succeed. What is then needed is match funding by the industry.

Q53. What are your views on our proposal for this to be a smaller part of a future challenge fund and to be sponsored by networks?

3.87. Unite would suggest that the Ofgem proposal is sponsored by the networks is a good one but would suggest that there is match funding from Ofgem to ensure that the regulator is invested both financially and intellectually in selecting and directing the outcome of any projects. This way Ofgem would have a more powerful seat at the table.

Q54. Do you have evidence of potential innovation projects that have not been implemented or sought funding due to the five-year structure of the price control? How could this issue be addressed?

3.88. Unite is aware of several such potential innovation projects that have yet to be implemented but has no idea as to whether the companies/universities have sort funding from UK networks. As highlighted earlier there are several ways of liberating hydrogen, from simply putting calcium or a similar metal into water too industrially splitting carbon powder and hydrogen from natural gas in a pyrolysis-based method of splitting the gas as opposed to the wasteful and heavily polluting Grey and Blue hydrogen methods currently employed.

Q55. Do you agree with our proposal to run FRS trials with an explicit focus on informing changes to the rules governing energy network activities – incentivised through SIF or other price control mechanisms?

3.89. Unite would welcome the introduction of a new Future Regulation Sandbox (FRS)[35], to try out new ideas before exposing them to the public. Unite would hope that such a sandbox would more easily highlight the challenges of decarbonising the network and maintain control over the maximum the energy providers

[35] an innovative policy instrument to test and trial changes to the energy rulebook before making them. see link.

could charge. One hopes that in isolation that this would have indicated just how many families would be driven into fuel poverty to provide the providers with record profits. Unite believes that benefits should be awarded through the Strategic Innovation Fund (SIF)[36]

Q56. What topics could FRS trials usefully focus on and why?

3.90. Unite members as stated would suggest cost and pricing data as well as the full greenhouse gas impact of changes in the energy supply mix. As stated earlier Unite believes that these provide the minimum level of reporting to assist Ofgem to make decisions on what could and could not be supported in the future, to plan for any future dramatic swings in price availability or understanding of the damage done to the environment.

Q57. Do you have any feedback on the view that not enough network innovation funded projects have been rolled out, and can you share any evidence you have to support your position?

3.91. Unite members believe that despite the scale of the RIIO-2 innovation stimuli[37] there has not been that much of a reward for the money invested. For the fund that runs to in excess of a quarter of a billion pounds that there should be radical changes that have sped up the path to Net Zero. It is clear to Unite that given the scale of the profit margin achieved that even this scale of available funding is insignificant.

Q58. What are your views on the design of potential new mechanisms to address this? Data and digitalisation

3.92. Unite members believe in transparency and hence would welcome the development of the development of the Minimum Viable Product (MVP) to enable data sharing in the context of the price control, as part of the development of a Data Sharing Infrastructure (DSI) to include other factors such as emissions per kWh of the main Greenhouse gasses. Such reporting to include raw product to end user emissions and not simply focussing on point of use emissions. Unite believes there needs to be evidence of real-world reductions in the greenhouse gas emissions as part of any licence to transmit and supply energy agreement.

Q59. Do you have any views on the timelines for modernising regulatory reporting? Consultation - RIIO-3 Sector Specific Methodology Consultation - Overview Document 140

3.93. Unite members have not expressed a position on this but would hope that any changes should happen as a matter of some urgency given the limited window to adapt and avoid a runaway climate.

Q60. Do you have any initial views on opportunities for improving efficiency in providing the data that Ofgem receives as part of regulatory instructions and guidance?

3.94. Unite members would suggest that monitoring of the levels of Non-CO2 gasses and particulate emissions also be taken into account given their impact on the environment as stated earlier. As NO_2 is such a powerful greenhouse gas[38] this is critical if we are to beat a pathway to a Net Zero outcome by 2050.

Q61. Are there areas of regulatory reporting that would be most beneficial to start with in the modernising project?

3.95. Unite members have not expressed a position on the specific reporting areas as highlighted other than to ensure that there are price controls to ensure that Ofgem is fulfilling its legal objective, to protect the consumer not the energy provider despite their claims of poverty and unaffordability. As has been seen, the energy companies have reacted with fear over a short duration price hike being all to quick to increase prices but not as slow to reduce them when the international price for fossil fuels dropped back. Unite believes that Ofgem should have acted far sooner to enforce caps on charges to prevent profiteering.

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[36] Details of the 2021 to 2028 SIF see link.

[37] £278m across all RIIO-2 licensees according to the consultation.

[38] According to the UN's IPCC report NO_2 is **280 times** as powerful as CO2 in warming the planet over a 20 year time frame and **310 times** as powerful when compared over a 100 year policy time frame lasting in the atmosphere for around 120 years!

3.96. Thus, Unite would be very interested in the reporting of the hedged purchased price of supplies and the eventual charging margins added to the cost price that were required by the consumer. If disclosure is made publicly available, it would highlight just which energy providers were and were not acting in their customer's best interest.

4. Conclusion

4.1. In the above Unite hopes to provide ideas and potential solutions to issues that will be faced by the upheaval from an economy based on fossil fuels to one based on hydrogen and electricity. There are major issues that need to be overcome, but there are solutions.

4.2. There are only 25 years to achieve this transformation to turn 31 million homes and every business and mode of transport to be Net Zero before 2050, and to continue this net carbon negative future to undo any damage caused by the Paris 1.5ºC target[39] overshoot before the century is out.

4.3. Key to this development of the energy sector is the adoption of these changes by the workforce and ensuring the ready supply of qualified personnel. Given the age profile of the energy industry, and the duration of this challenge, however, it will not be long before a very large section will be retired or died. Even those joining the industry today will not be employed there by 2100. Unite is therefore calling for a Just Transition as defined by the UN's International Labour Organisation (ILO).

4.4. Given the scale of the challenge we need to utilise every opportunity and not place all our eggs in one basket. Unite firmly believes in the use of a diverse range of methods to produce energy where nothing can be overlooked. Every option has its challenges, advantages and disadvantages, raw materials issues and hidden sources of greenhouse gas emissions that need to be unearthed and accounted for. Unite suggests that emissions from extraction to point of use should be adopted as the metric and not simply point of use emissions. All greenhouse gasses need to be included not just CO_2, with a particular focus on methane and NO_2 as they are the next most common and gasses with a far greater warming potential. While this may make calculations more complex, it will provide a better picture of which industries to support and discourage.

4.5. Renewable energy sources and nuclear power have the ability to provide the UK with the much-needed energy security so these are key, but during the transformation we should not ignore others as a way to ensure the lights stay on at UK plc. Equally there needs to be a platform to provide the energy to where it is needed. This is where grid improvements and hydrogen for mobile solutions and storage becomes critical. In such an environment RIIO-3 will need to deliver the investment to where it is needed to navigate our way to a bright future.

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[39] This refers to the goal of keeping global warming to below 1.5ºC above the average levels found between 1850 and 1900, as set out at the UNFCCC COP21 talks in Paris. All the experts agree that we will exceed this level and hence now risk permanent damage to the ecosystem causing the release of natures vast stores of greenhouse gasses. The belief is that as long as we do not exceed 2.0ºC of warming we may still bring us back from the abyss.

Appendix 1 Rainbow of Hydrogen Production Methods

Hydrogen is a colourless gas that burns with a very pale blue, almost colourless, flame when pure. The colour therefore, does not refer to the actual colour of the gas produced or the colour of the flame but the name given to differentiate between different methods of production or extraction.

Colour	Method to generate hydrogen
Green,	Normally used to describe the electrolysis of water or ammonia, to create hydrogen, the term also includes any other method that creates hydrogen, without creating or releasing any greenhouse gasses.
Yellow,	The electrolysis of water or ammonia using renewable energy as a way of storing generated electrical power. This is the method which is to be used on deep sea floating wind turbines platforms. I could also be used on renewables awaiting grid connections to provide a return on investment while on the National Grid's waiting list.
Pink,	The electrolysis of water or ammonia using Nuclear Generation as a way of storing generated electrical power generation. This is also referring to a method of returning the power back to the grid by passed the gas through a bank of hydrogen fuel cells as and when required. As there is no combustion there is no release of any greenhouse gasses not even NO_2 or NO_X and the "exhaust deoxygenated air can be used to replace CO_2 as a fire extinguisher.
Grey,	The production of hydrogen using **Steam Methyl Reformation**, where natural gas passes through a chamber filled with steam, in a two-stage catalytic process. The steam breaks the methane into large quantities of hydrogen but also Carbon Monoxide, which then reacts further thanks to a catalyst to release CO_2 and some more hydrogen. The process is not perfect causing some unreacted methane and other hydrocarbons gasses, to escape into the atmosphere. $CH_4 + H_20 \Rightarrow CO + 3\ H_2$ $CO + H_20 + 206\ kJ/mol \Rightarrow H_2 + CO_2$ The reaction is endothermic, requiring heat to be supplied to the process for reactions in the temperature range 700–1,000°C. In general, the heat source is provided by combustion of up to 41% of the methane feedstock, causing 24% reduction in product energy content compared to the feedstock. There is also a requirement for large volumes of water compared to other methods.
Brown,	The production of hydrogen, using gasification, where carbonous materials like municipal or industrial, carbon-based waste, is heated into a gas. The gas is then treated in a method the extracts hydrogen, usually Steam Methyl Reformation. The method releases large volumes of Carbon Dioxide and other greenhouse gasses into the atmosphere but does reduce volumes going to landfill.
Black,	The production of hydrogen by using gasification of coal or oil, by heating it strongly in the absence of air to create "Coal Gas", sometimes known as "Town Gas" or "Syn Gas" = a mixture of Carbon monoxide and Hydrogen. By-products from the production process can included coal tars and ammonia. The process releases large volumes of CO_2 and other greenhouse gasses into the atmosphere.
Blue,	The production of hydrogen using either the Brown, Black or Grey methods above but where the gasses that would otherwise be vented to the atmosphere are passed through an amine solution to extract and capture the CO_2 for later utilization, disposal via mineralization or long-term CO_2 storage/disposal. Sadly, the amine solution cannot also extract the other greenhouse gasses and unreacted methane that can still end up in the atmosphere.
Turquoise,	The production of hydrogen from a fossil fuel or carbonous material, such as anaerobic digestion methane, or the gasification of waste, where that material is then turned into carbon powder and hydrogen.

	One method achieves this by bubbling the Syngas or hydrocarbon gas source through hot liquid metal. Another uses pyrolysis (super critical heating of a substance to break the molecular bonds and release the elements in their natural state) by passing the gas or other material through an electric plasma in the absence of air. Early experiments allowed unreacted methane to escape but hydrogen separation can ensure any escaping gas can be recycled. While this remains largely experimental there have been examples of deployment in Germany[40] where it is used to turn sewage into drinkable water and hydrogen, plus carbon powder that can be used to manufacture anything from carbon fibre to industrial diamonds or Graphene nanotubes, using a high frequency electrical plasma[41]. Other experimental methods use an Isothermal Ceria Redox Cycle powered by concentrated sunlight.
White, sometimes called Gold	Naturally-occurring geological hydrogen found underground, normally discovered as the by-product of industrial processes such as drilling for oil or natural gas extraction (fracking). As with any drilling or mining there can be pockets of radioactive substances unearthed too.

[40] Innovator Graforce claim that their method of methane electrolysis only needs 10 or 20 kWh from wastewater to make 1 kilogram of hydrogen, as opposed to water electrolysis, which takes 50 kWh/kg of hydrogen.

[41] This can be used to purify water and produce valuable gasses sorted via membranes as has been deployed by Graforce as the world's first plant for the generation of hydrogen from wastewater (3,000 l/h) on the premises of Berliner Wasserbetriebe at the Waßmannsdorf treatment plant.