REA response to the Future Biomethane Framework: Call for evidence.

The Association for Renewable Energy & Clean Technology (REA) is pleased to submit this response. The REA represents industry stakeholders from across the sector and includes dedicated member forums focused on green gas & hydrogen, biomass heat, biomass power, renewable transport fuels, thermal storage and energy from waste (including advanced conversion technologies). Our members include generators, project developers, heat suppliers, investors, equipment producers and service providers. Members range in size from major multinationals to sole traders. There are over 500 corporate members of the REA, making it the largest renewable energy trade association in the UK.

Biomethane has a wide range of benefits. In addition to the GHG savings, Russia's invasion of Ukraine and high energy prices have led to an increased emphasis on the importance of energy security – not least in the change of name for the energy department. Given the progress made in decarbonising the electricity grid and higher conversion efficiencies, it makes sense for biogas and biomethane production to be recognised for its continuing ability to decarbonise transport fuels and the gas grid. A zero-carbon gas grid can allow an easier and cheaper change for domestic heating and also allows a greener choice for those that are restricted by alternatives such as electrification or economics.

Anaerobic Digestion (AD) is the optimum treatment technology for many wet wastes, with the resulting digestate from wastes, residues and crops supporting the circular economy by supporting soil health and reducing the need for mineral fertilisers, but recognition of other technologies for biomethane production, such as syngas production from Advanced Conversion Technologies, is also compatible with ambitions. There is also compatibility with other strategies such as with the H2 Boost project investigating hydrogen production as a pre- process to AD.

The REA welcomes the opportunity to provide evidence for a Future Biomethane Framework. Having recently engaged in the Green Gas Support Scheme Mid scheme review we note the inclusion of many of the points raised in our response for inclusion in this Call for Evidence. We look forward to continuing to engage with the department on these and related policies.

Chapter 1: Design and scope of a new framework

1. a) Do you agree with the principles as a basis on which to develop the policy framework? b) Are there any crucial factors missing?

It is widely recognised that Anaerobic Digestion (AD) plants have relatively high CAPEX and OPEX costs and therefore, deployment of new plants is less likely without financial incentives. This has been compounded by rising costs due to high inflation and supply chain issues which has had a knock-on effect since Covid and Brexit. Additionally, the deployment of plants experienced since the period of the FIT and Non-domestic RHI has declined significantly, despite the introduction of the GGSS. This can be attributed in part to barriers that have been acknowledged in this call for evidence but also noted in the REA response to the GGSS mid scheme review. It is therefore positive that the GGSS will be extended by more than 2 years to capture those that were unable to apply previously. This is expected to increase further once the extension is passed into law

and the date for project completion can be set beyond Nov 2025. However, despite this, there is a danger the GGSS could be seen as indicating a lack of need as opposed to not being indicative of the ambitions of the sector, particularly for smaller scale plants, as we believe the case to be.

The industry is keen to push the positive benefits of biomethane production, particularly from AD, as a way to manage waste material, a means of nutrient recycling and capture of biogenic CO2, in addition to biogas production. These benefits extend to the ability to decarbonise the gas grid which will still be needed for the future even if reduced in scope, whilst enabling production which is uninhibited by weather and seasonality (provided the gas grid can adapt sufficiently to receive it). Biogas is versatile with a variety of end uses, providing the flexibilities needed to adapt and futureproof, thereby providing confidence for the decisions on long term contracts as well as having compatibility with other strategies.

In addition, we have members that are adapting through innovative programmes such as regenerative farming methods, biogenic CO2 capture and partnerships with decarbonising industries which are meeting the barriers head on. The only concern may be the ability for small and on farm projects to compete with the financial costs brought by economies of scale and the reason for a lack of take up since the option of FIT was closed. In conclusion, all the principles that have been suggested in this framework (Sustainability, Security, Commercial viability, Adaptability and Compatibility) are good measures to ensure future decisions are effectively made and futureproofed. In fact, the principle of adaptability particularly supports both use of existing gas grid infrastructure AND maximising opportunities for development/expansion of existing AD plants. We believe the sector is already well placed to positively contribute to the principles suggested.

2. Are there any other important current or future barriers to market growth not mentioned in Chapter 1 and what actions could the government or industry take to address them? Please provide supporting evidence, including any that highlights the scale of the impact.

The barriers listed in the Call for Evidence are broadly aligned with those indicated in the REA response to the mid scheme review, although noting that planning issues are covered in more detail in Chapter 5 rather than here. We suggested the industry had been experiencing supply chain delays, primarily as a result of Covid and Brexit, but with some knock on with rising inflation impacting further on costs, made worse due to project delays.

Additionally, we suggested the delays in other government policy, particularly the separate food waste collections, now known as Simpler Recycling, have created uncertainty for projects, limiting geographical flexibilities when considering feedstock supply. And this is listed as one of the barriers under government messaging. As previously mentioned, delays in important policy implementation such as Simpler Recycling has had an impact in the deployment of new plants. Lack of certainty of feedstock has meant that in some areas, feedstock which traditionally incurred a gate fee to the operator has shifted to no gate fee or a purchase fee for supply. In the case of AD, operation requires a constant supply and minimum volume of feedstock to maintain operation and optimal performance. The mandatory food waste collections from homes and businesses, when finally implemented, will provide additional feedstocks and project assurances that will be further increased with the response following the consultation on near elimination of biodegradable waste to landfill.

And most significantly, and highlighted in the REA mid scheme review response, was the time taken for not only planning decisions to be made but also the permitting process through the Environment Agency. The need for a more joined up approach across government will also

extend to DEFRA through the links to agricultural practices and regulation but also from regulators, which can have a significant impact, such as the Quality Protocol reviews via the Environment Agency and potential changes to the WOBBE index by Ofgem.[1]

This can also extend to how government policies are managed within the local authority level, as often the planning process can be stopped through local objection rather than cohesion of national strategy. So, we would strongly agree this barrier needs addressing. But this also feeds onto another of the barriers identified being the environmental and societal benefits, as often anything that is `waste related` can raise local objections that can often mask more justified concerns such as for example the water quality in the River Wye through pollution. The concerns or at least objections of the public can also increase where the upscale of plants is being encouraged, as was experienced through the GGSS with an extended tier 1 range above previous RHI schemes and also more recently the increase to the tier 3 rate.

Previous concerns raised in the REA mid scheme review response on supply chains have similarities with the barrier of undeveloped supply chains. It is true to say that delay in supply can also be an impact of reliance of supply from a small pool nationally and/or from imports. This can be said from the supply of parts as well as the supply of expertise of staff. There is some correlation of work with investigations through the GIGA fund consultation[2] which is trying to address hydrogen and CCUS supply chains issues with options for `packaging` of parts being considered.

In terms of operating staff, REA were involved with a separate task and finish group as part of the Green Jobs Delivery Group (GJDG) workstream but focussed on AD, and we surveyed our members to feed into this work. We identified the difficulty of having a supply of staff that had a broad enough skill set to cover the varied work required for AD and related biomethane production plants (plant operation including mobile machinery, electrical, technical etc). Therefore, this often leads to additional training expenses and courses being procured to upskill the workforce but also apprenticeship schemes being widely recognised in the industry (although not necessarily though national programmes). Retention in the industry can vary with the skills gained providing options for migration to other sectors.

On the barrier of potential revenue streams, this has already been touched on with feedstock uncertainty and gate fees. But this is also true for digestate, which has similarly been restricted from holding value and for CO2 capture, both of which will be covered in more detail in later questions and chapters. However, the point which is important to note is that industry has experienced inconsistencies in generating additional income other than the gas injected or electricity and heat generated from the gas. The exception is the Green Gas Certificates or GGCS/RGGO although this has been limited to provide only a modest amount and with no inclusion through the UK ETS yet. The Green Gas Certification Scheme is run by REAL, which is a wholly owned subsidiary of REA. REAL runs a number of schemes in the area of environment and consumer protection, including the certification schemes for both compost (Compost Certification Scheme) and digestate (Biofertiliser Certification Scheme) for demonstrating end of waste.

The GGCS has stated on their website that,

[1] https://www.ofgem.gov.uk/sites/default/files/2024-01/Call%20for%20input%20upper%20limit%20of%20Wobbe%20Index%20February%202024.pdf

[2] Green Industries Growth Accelerator: hydrogen and CCUS supply chains - GOV.UK (www.gov.uk

> "*Sale of RGGOs – prices have historically been over £1/MWh. This means that the RGGO market has never suffered from the extremely low values seen in the electricity GoO system, which underpin many of the accusations of greenwash and the lack of additionality in that sector. In the £1-3/MWh range RGGOs represent a small percentage of the total income secured by biomethane producers but do represent a useful value stream to help ensure the economic operation of plants.*"

Despite a high of ~£20/MWh last year, this has already fallen to just below £5/MWh, which although shows higher values are possible and have been achieved from certificates, but more significantly it also confirms that although it's an important revenue stream, it can fluctuate. This along with additional income through CO2 and the UK ETS will be discussed in more detail later in this response, however it's important to note that the basis of long-term investment will be dependent on assurance of a high enough value and consistent income stream in order to reduce the future use of subsidy models. To attract more investment into the biomethane industry, a scheme which sees a significantly valuable and dependable revenue from the green credential is vital. The ability to engage and therefore trade within the EU ETS will also be and the current stance on the Union database for third countries would significantly affect the possible revenue opportunities. Significant clarity is needed on this along with the urgent need for assurance that companies can use biomethane in their Market Based reporting for the GHG protocol and SBTi.

The remaining barriers are all relating to the gas grid (propanation, Grid capacity and future demand/future of the gas grid). Our members include mostly producers but also some gas networks, and REA sits on related forums. The issues experienced in some instances of excessive, inconsistent calorific values (CV) (not only variable to the site but regionally) and what is considered by some members as unnecessary propanation can not only increase the operating costs but also can impact on the ability to inject, the need to flare and the total system GHG savings, assuming fossil-derived propane is used.

This is also the case for capacity, which has led to discussions for injection to the transmission system (NTS) rather than the distribution network (GDN) and solutions such as reverse compression. It's recognised that there needs to be a way forward for both parties to ensure that projects can not only access the grid but without the restrictions currently experienced. GDNs are investigating the options through projects including "Biomethane and hydrogen: maximising the role of green gas" which is being collaborating under ENA's Gas Goes Green[3] programme, exploring how biomethane can be managed and used in areas of the gas network which may be converted to dedicated hydrogen. But there is concern about the perception of the future of the Gas Grids for investors of both the network and production plants when competing with messaging from reports such as the National Infrastructure[4] and as such a clear message on the future is needed to provide the assurances for growth in the sector.

In addition, some in the sector may suggest that the support for hydrogen has created more drive for investment through the hydrogen production models which may be working less in harmonisation with biomethane production and increasingly more in competition. This may also be the case for gasification plants where there may be cross over to more incentivised hydrogen models.

[3] Gas Goes Green - supporting hydrogen - Energy Networks Association

[4] Second National Infrastructure Assessment - NIC

The production of biomethane is already contributing to decarbonising the gas grid as well as being similarly placed as a versatile and flexible gas for use as a fuel, in heat networks and providing a means to decarbonise high energy use/ unabated industry though long-term partnerships whether virtually or directly linked. However, there will be room for all particularly as there will be regional bias for hydrogen as the system organically grows so there will therefore be a strategic role for biomethane.

3. In your view, what are the most important barriers to market growth that need to be addressed and why? Please provide supporting evidence.

Reasons for why the barriers identified are important have been provided in the answer to Q2. It's difficult to attribute priorities to them as they all have significant importance, however without gas grid injection being affordable, accessible and consistent the roll out of new plants will be hindered. Schemes focus less on the virtual pipelines system and transportation can provide a resource particularly locally. Similarly, although biomethane production for grid injection has been the focus of the GGSS, recognition that this may have limited the deployment of plants that may provide benefit for the production of biomethane for use for fuel production such as Bio-CNG or Bio-LNG or biogas through small scale and on farm size. The locational aspect of grid connection has also been a significant barrier to deployment where injection has been the only incentive offered. Although the RTFO has been an additional option for plants that can combine with RHI and GGSS or considered when the FIT is nearing the end of contract, it is unlikely to provide enough revenue for a newly built plant. RTFO will be covered in more detail in question 11.

4. Are there any production methods that could have significant potential which are not included in Chapter 1?

We are unaware of any production methods that should be considered beyond those already indicated in this consultation and are happy that those listed are consistent with what was suggested in the REA Mid scheme response.

5. Please provide evidence related to the outlined assessment criteria for any of the production technologies listed in Chapter 1 (or for any additional technologies not included).

For the specifics of costings, given the limited time to respond, it has been difficult to provide information for this response on behalf of all our members that would provide an accuracy that would help decision making rather than provide something that may be at detriment. Therefore, we have answered the information as best we can but in all cases further information can be provided as a follow up to our response if required.

AD plants for biomethane injection into grid

It is true to suggest that based on the current GGSS, the take up of projects has been limited. However, we believe this is not a true reflection of the ambitions of the sector and evidence was provided as part of the discussions on extending the closing date of the scheme accordingly. However, it is true to say that new projects tend to need to be a certain scale in order to maximise returns and given the current barriers that exist such as planning delays/objections, supply chain issues and limitations/ costs for the gas grid injection, it is increasingly more likely that only a larger organisation will be in a position to proceed with new projects.

New plant at an agricultural site will have to justify the choice of site, which becomes harder if the feedstock used is not from locally-produced agriculture. It is also very difficult to obtain

assurances of supplies to the level needed by funders before that digester has begun construction. This gives developers that effectively control these materials a considerable advantage over the rest of the market. It is not likely to be a coincidence that new applications to the GGSS (i.e. excluding those that previously applied for an RHI tariff guarantee) were dominated by projects from a single such developer.

Economies of Scale and proximity may also be restricting in terms of CCUS where location of permanent storage may mean this is out of financial reach for the majority of inland or smaller/single plant operators. It's true that most newer plants are being considered with the option of Carbon Capture however not all are in the same position as Future Biogas with their Carbon Harvest project[5] to capture, liquify and transport the CO2 to geological storage. Therefore, the consideration for more short-term due to the significant GHG savings compared with the use of fossil gas. The capture and use of CO2 is also more preferably to the option of venting.

Combined Heat and Power (CHP) conversions and expansions

In terms of expansions, as we stated in the REA Mid Scheme Review response a major opportunity lies in **expansion** of existing plant, where instead of producing essentially the same amount of biogas and ceasing to claim its current subsidy (conversion) the plant **increases** its capacity, continuing to produce/claim its current subsidies **and** injects biomethane which could be an option. The RHI for biomethane allowed interaction with Feed in Tariff (FIT) and Renewables Obligation (RO) plant (and also with support for heat from biogas under the RHI) and we are not aware of any perverse outcomes that resulted, or problems with tariff calculation methodologies. Also as previously mentioned, the principle of adaptability particularly supports both use of existing gas grid infrastructure AND maximising opportunities for development/ expansion of existing AD plant. This was a limitation of the GGSS which provided an uncertain future for legacy plants.

The arguments in favour of conversion also apply to expansions:

- A far wider range of projects could be supported than currently under GGSS which has so far under-performed on expectations – and within that, the majority are either legacy RHI tariff guarantee applications or linked to a single developer.
- Expansions would also enable more general stimulation of the market and would be **additional** renewable energy, rather than shifting the same biogas from electricity generation to biomethane production, although for conversions there are also benefits in not losing gas generation when schemes close as will likely be the case for the majority of smaller sites.
- By setting the tier one limit at 60,000MWh annually, GGSS provided a strong push for projects to be at least this size – i.e. 50% larger than was typical under the RHI. This can lead to sub-optimal outcomes, particularly when interacting with the feedstock rules on wastes/residues/crops[1]. It is far more likely that expansion and conversions based on an existing site will be optimally sized to reflect the wastes/residues in the local area.
- It should generally be cheaper to expand an existing brownfield site than build from scratch. Funding costs may also be lower since there is an existing asset to help fund cashflow of the build/commissioning phase and in the case of conversions only the upgrading of technology will be needed.

[5] UK Biomethane Production & AD Plant Management - Future Biogas

- For similar reasons, delivery should be faster since it should be quicker (and with less uncertainty on the final result) to get changes to planning permissions at an existing site rather than a greenfield one.

The additional capacity based on the total biomethane injected at the site is currently managed through auditing for e.g. interaction with the RHI and RTFO, so similarly would guard against risks of double counting and allow for greater adaptability.

Similarly, there are a number of areas where biogas or biomethane could beneficially be produced but without the option of connecting to the gas grid at all.

Small-scale / on-farm AD

There are significant advantages to incentivising small-scale and on-farm AD as they can treat wastes not normally captured or treated by AD and deal with some of the environmental impacts of these materials when not treated. There has been a distinctive lack of similar scale plants since the FIT closed to new applications. Wet manures have relatively little value as biogas feedstock and to provide enough to make a serious contribution towards the restrictions would need to be sourced from a vast herd and/or be transported over long distances. Apart from being undesirable on GHG impacts, this is also unlikely to make sense economically given the costs of haulage. Also given the waste to crop mix required through the GGSS, experience has shown that achieving 50:50 ratio is harder for farm-based projects as this would require importing feedstock.

Given the geographical layout of farming in the UK, large herds are also not generally found in the same areas as the bulk of arable farming. Chicken manures are a current source of interest as they have relatively high dry matter. If used in significant quantities, they can disrupt the biology of the digester but mitigation strategies for this are available and there are plants processing this waste stream successfully. Recent enquiries from developers have suggested that interest in chicken manures has significantly increased the prices projects would have to pay to obtain this material, which may be too high for projects to be viable. Developers can seek other wastes and residues, such as residues from food production or processing, although there may be restrictions on this within their environmental permit or planning consents.

Advanced Gasification Technology

We support the inclusion of Advanced Thermal Conversion or Gasification technologies within the Biomethane Framework, and agree with the analysis of the Biomass Strategy, as referenced within the consultation, for the potential for alternative feedstocks such as waste wood and municipal solid waste to be used to produce significant volumes of biomethane by 2050.

While there is potential for future competition for feedstocks, especially given its potential for production of hydrogen and sustainable aviation fuel (of which the mandate consultation response has just been published[6]), we believe the Biomethane framework could still provide an important step in establishing more commercial sites and getting the sector going. Given the nascent nature of both the hydrogen and SAF markets, compared to a relatively established biomethane market, inclusion in the biomethane framework will help establish supply chains and skills which will also help the Government decarbonise further complex to decarbonise sectors. Ultimately the market can be used to determine the best product from gasification and

[6] Supporting the transition to Jet Zero: Creating the UK SAF mandate (publishing.service.gov.uk)

its feedstocks, but only if the sector is enabled to get started. Inclusion in the Biomethane framework therefore has potential to be highly cost effective from the point of view of the UK's full decarbonisation ambitions. We note that the limitations that exist through identification of the optimal location for a new plant where restrictions to connection with the gas grid exist, may also incentivise considerations of alternative routes for the gas such as for renewable fuels and direct use by industry/heat networks. This is likely to be an issue for conversions and expansion of existing sites where the majority may not be as close to a gas grid connection option as they were for electricity, where currently they use a CHP.

Opportunities for this technology may be based on Chemical Complex's in which case a model akin to Private Wire but with private gas pipes will evolve. It will therefore be necessary to accommodate solutions where plants do not connect to the main gas network within the framework. The expectation for plants beyond this is that they are likely to be larger compared to Anaerobic Digestion with gas therefore be injected into the high-pressure parts of the grid. As these plants will have investment windows of 15 to 20 years, the future of the grid will be as important as the initial injection capacity. A strategy for the grid up to 2050 and will determine the on whether to focus on production of Methane or hydrogen. Therefore, indications on potential volumes form this technological route is dependant on the framework and strategy that's established.

Landfill gas capture and upgrading

Since 2002, the Renewables Obligation has incentivised landfill site operators to maximise the amount of methane they capture. As well as providing affordable renewable electricity (around 3TWh annually), it helps minimise leakage of methane to atmosphere – which is has a global warming potential many times worse than CO2. A number of reasons for inclusion were given in the REA's Mid Scheme Review response. The REA has commissioned an independent consultancy with considerable experience in the sector (WSP) to produce a report on the costs of electricity generation from landfill. This shows that, in the vast majority of cases, continuing generation will not be viable if reliant on electricity sales income alone.

Around 87% of current generation loses RO support in April 2027, with the remaining support ending by April 2031. We have discussed this report with both DESNZ and Defra and continue to work closely with both departments on this issue. Given these timelines, there is a need for urgent action before engines are decommissioned and skills and experience are lost as teams are disbanded. Managing the emissions of methane from landfill are a key concern here, as well as wanting to maximise renewable energy production.

There is interest in upgrading landfill to biomethane so that it can be injected into the gas grid. Several of our landfill members are investigating this and we also have members on the technology supply side.

There is very limited information available on the costs or performance of plant upgrading landfill to biomethane – at least to the level of detail that is likely to be required when companies are making investment decisions in the technology. It is unclear how much methane would be required for this technology to be economically viable (assuming direct subsidy from government is not greater than that already available under GGSS) and for how many years it would need to operate in order to meet reasonable expectations of financial returns. Given that methane production from a landfill site declines at a steady rate once it is closed, this means that the starting volume of methane produced would need to be relatively large if it is still to be viable at the end of the operating period.

Other concerns reported by members include the cost of removing contaminants from the gas, particularly H2S. Landfill gas is considerably more contaminated than conventional AD and the levels of contamination can vary widely – both between sites and within the same (open) site over time. Several of our members have engaged directly with the department on the options to them within their existing sites.

In order to understand the size of the potential market for producing biomethane from landfill gas, we have commissioned WSP to produce a further report. We will be happy to share this report with the department once it is complete, which we anticipate will be May/June.

Whatever the scale of the potential opportunity, in the short term, time is a problem. Given the scheduled loss of ROCs from April 2027, it is not plausible that decisions on supporting biomethane from landfill gas, direct support via a new business model and any wider changes to make investment more attractive will all be in place before current landfill generators have to make decisions on whether to remain in or leave this market.

We have been working with DESNZ, Defra and other actors to make the case for an interim support measure to enable current electricity generation to continue while long term policy is put in place.

Other technologies

Although there are parallels with both landfill gas upgrading and New AD plants deployment, it is important to state that sewage plants are another process technology that is not otherwise explicitly referred to in this framework and need to be highlighted. Sewage plants are similarly approaching the end of the ROC scheme and so decisions on what to do following the drop off from 2027 need to be made now. There is huge potential to convert to biomethane production. One of our members has predicted to have the potential of 100GWh per year additional biomethane production on top of an existing 290GWh. This shows the potential value if all similar companies followed suit.

Sites are restricted by their location, being unable to move the main infrastructure with the need to build in new locations low with expansions of older sites common practice and investment from the broader company (from shareholders and customer bills), will be focussed on the provision of additional capacity for an increasing population. Therefore, incentives will be needed to provide the additional investment for AD and biomethane production in the future plans. Although there are positive effects with sites generally able to secure planning more easily. Also there are no feedstock gate fees,

As significant energy consumers there would also be a need to keep the carbon benefit. Schemes where the energy incentive is coupled with selling carbon benefits e.g. the RTFO are hard to justify, and the counterfactual values for carbon are low / non-existent. If choosing to retain the benefit of acting as producer, support for paying off capital invested as per the RHI and RO schemes will be needed.

In addition, the opportunities for additional revenue form digestate is limited due to a sewage plants inability to qualify for PAS110 or product status. Therefore, financial consequences of digestate disposal can be more severe with a net cost to dispose of the digestate currently at £25-30 per wet tonne. This is coupled with the challenges around carbon capture – with no viable financial route currently available as captured biogenic CO2 will be added to the companies' carbon targets. Drink and food manufacturers are also unlikely to use sewage derived gas for human products even if it is scrubbed and given an End of Waste label.

Innovation

Innovative approaches are being considered for projects where connection to the local transmission or distribution network does not make sense. One of these projects is looking at networking multiple smaller production sites from dairy farms into a single larger point of injection to the gas grid. The merits of these and other approaches need to be considered carefully and supported where they meet overall policy goals.

Chapter 2: The role of biomethane in meeting net zero and energy security

6. What are the most important end-uses for biomethane in the transition to net zero by 2050, and what are the implications for the framework? Please provide supporting evidence where possible.

At present biomethane is useful for decarbonisation where the optimal uses are in sectors with fewer low-carbon alternatives, such as high-temperature heating, petrochemical feedstocks, heavy-duty transport and maritime shipping. Initially and while we still need to maintain the gas grid in its current form (ahead of anticipated ramp up of a hydrogen supply grid), biomethane is the only contributor for decarbonising the gas grid.

The use of biomethane as a fuel is increasing for heavy duty transport particularly for those looking to change fleets now, due to technologies that are not as widely available or fuel accessible such as hydrogen and for the concerns that are present around the use of HVO. Zemo have increasingly advocated for Biomethane as a viable option for heavy duty vehicles particularly HGVs.[7]

However, the ability for AD production to be able to provide a mechanism to decarbonise agriculture from the benefits for the individual farm for managing local wastes and generating biogas for multiple uses can provide similar benefits but on a smaller scale.

The ability to be flexible in the use of biomethane is one of its main strengths and so the ability to diversify depending on the needs of the market will mean a changing picture of the coming years as the markets decide. This will also be determined with a changing gas grid where in some areas the desire may be to change to a more hydrogen grid so that needs may change on a regional basis as we move to 2030, 2040 and reaching 2050.

7. What might be the impact on the UK biomethane market if government were to set a form of biomethane volume target? Please provide evidence.

Production targets are widely in place to provide the stimulation to achieve an end goal and shows the importance of the sector being represented. In the case of biomethane, where implemented, such as the 35bcm by 2030 for the EU, it provides an ambition of a measurable scale, where review and actions can be implemented to ensure the target is being achieved. At present the ability to provide long term investment is hampered by the uncertainty for the future of biomethane where predictability and investor confidence is needed, particularly where there are concerns about the future of the gas grids. Estimations in the Biomass strategy of 30-40TWh

[7] Section 4 of Renewable Fuels Guide - July 2023 (zemo.org.uk)

by 2050 have provided some ambition but without the `target` there is not enough assurance that the UK will support biomethane production into the future, particularly if the aim is to move away from subsidies. There is also a danger that we could be `left behind` Europe with their target already set.

From the members feedback so far, there is broad support for introducing a production target, the question seems to be more what to set it at with the belief that 30-40TWh by 2050 is not indicative of what is possible but also may not be ambitious enough. It is hoped given the timescales in this Call for evidence that if there is agreement to move forward to a target, more consultation on what to set this level at would be required through a more evidence-based report which can't be achieved by the CFE closing date. There have been several reports produced recently about the possible production that can be achieved and these have contradictory levels. The previous analysis report from ADBA had an estimated target of 57TWh but other have more recent prediction of up to 100TWh especially with rotational crops included in feedstock allowances, we are aware of a report that has been commissioned by Grissan and the REA are currently working on a project with Imperial Collage with the aim of providing a realistic biomethane volume up to 2050 to drive the next Carbon Budget. There is sufficient evidence out there combining Gasification, AD and imported Renewable Natural Gas that a Biomethane Grid of 250 to 300 TWH pa could be sustained. What is clear is that with so many potentially differing numbers/figures across industry, there a need for consistency on what is achievable. A target, without setting ambitions too low to be underwhelming and unambitious whilst also being realistic with competing sectors. Therefore, rather than suggest a target volume or to default to the figures form the biomass strategy that I agreement is made on the need for a target, we would suggest establishing a cross-industry workshop for key players and including DESNZ to agree the volume.

The other important note to make is that we have seen a drive for hydrogen projects and general interest that is a reflection on not only the targets for hydrogen that have been made but also the funding and business models that have been borne as a result. This shows how much stimulation can come from government support with clear ambitions set. There are also parallels with hydrogen, and they could similarly be under a combined green gas target.

Europe has drawn up a Biomethane Action Plan and although some of this may be duplicated in the framework and formed part of the Biomass strategy, it could be suggested that as part of setting up a production target, a UK biomethane Action Plan could be published to incorporate all things in one document and link to the framework.

8. What are the benefits and risks associated with the different approaches (to Time Horizon, Scope and Volume) listed under the production targets section?

There is broad alignment that a production target will need to be set against a timeline, so time horizon and volume would be the most important approach. When considering the lifespan of a project and current contract lengths for e.g. RHI and GGSS we are already tying in production for 15 years as a minimum, so setting an achievement for 2040 may be more realistic than setting one for 2030 or even 2035. Importantly it also provides an end point to the commitments which may provide government with some cut off point to further strategic delivery. There is a possibility to have a staged target so one that sets out similar to the assumptions from the biomass strategy (2035 and 2050) although it's agreed this can add a level of complexity and concern about getting future assessments correct when setting far into the future so better to have a single target date and review progress at regular intervals. However, the alternative

would be to have a target with some key milestones that help raise awareness but without being binding. Carbon Budget 7 could establish phasing of the ramp up in not just for Biomethane but Biogenic CO2 and even potentially Digestate.

Although there are likely to be regional disparities to achieving the target, Europe has set a single target. The UK should do similar and focus the ability of areas to deploy where there is the optimal location. Similarly with the subsidised Vs nonsubsidised issue, it's more likely that larger plants will be able to achieve unsubsidised models in the future. Particularly where Carbon markets and certificates can improve the financial incentives enough that a move to partnership models with industries such as the case with Future Biogas and AstraZeneca[8] becomes more possible. However, this is less likely to ever be the case with smaller plants so although it would be a useful model to measure into the future allowing for changes to the type of mechanism that is required, it's unlikely to be a target that would be inclusive for all technologies and rather a potential barrier.

Also, for the reasons provided in other question responses (Question 5), setting production targets against each production model would be difficult and not all will be able to financial justify biomethane production due to costs or proximity to grid. Therefore, this could be seen as overly complicated and likely to limit the overall achievements. However, in the case of small scale and on-farm plants there may be a benefit to set something specific to this group to provide a measure of success where there has seen a significant decline in deployment since the FIT, especially as they are the group more likely to be managing waste streams such as slurries and manures.

9. To what extent will the framework described in Chapter 1 help support an industry that can attract investment and produce enough biomethane to meet the strategic aims in Chapter 2?

The GGSS has successfully attracted interest from mostly larger scale plants. This along with its predecessor, the NDRHI, set feedstock limits on non-waste crops and also a series of sustainability criteria that must be met including the lifecycle GHG emissions as detailed in the extract below:

> *(10) For the purposes of this regulation—*
>
> *biomethane produced from biogas meets the greenhouse gas criteria if the lifecycle greenhouse gas emissions associated with that biomethane are less than or equal to 24g ofCO2 eq per megajoule of biomethane injected,*

Therefore, industry is increasingly experienced in operating to meet the requirements of sustainability measures and have, in the case of AD plants, always advocated for the environmental advantages by providing a best option for treatment of food waste and for digestate as a nutrient recycler and biofertiliser over conventional chemical fertilisers. It's true that this is also the case for gasification/pyrolysis plants and landfill gas which are operating under Health and Safety regulations whilst also required to diligently monitor to ensure compliant operation under a permit. A significant point is that if all the sustainability criteria measures require increased monitoring or data capture/input, this will increase costs so it should be kept to what is strictly necessary and of most value to ensure costs aren't prohibitively higher or regulations too restrictive to deter investment. An example of this is the requirement to calibrate meters every 10 years under the RHI and GGSS which is likely to mean complete

[8] AstraZeneca Announces Partnership with Future Biogas - Future Biogas

replacement of working stock due to the issues to complete the work to the requirements. This has been investigated by the REA meter working group and a recommendations paper issued.

On security, the ability to inject into the grid is less likely to be an issue for the plant and more based on restrictions set (i.e. variable CV, propanation requirements and limits, seasonality) once the injection point has been commissioned. However, this is on the assumption that the decision on the future of the gas grid is assured and may need to be considered as part of the RIIO3 process. The advantage for all the technologies included in the call for evidence is their ability to produce gas (and electricity/heat) all year round. Adaptability is already happening with sites making decisions on whether to go for all the RHI payments or to be flexible with the options for RTFO. This ability to be flexible will allow the varied end use markets to continue to be maintained and therefore allow for future proofing, providing one is not more incentivised than others.

Generally, the ability to be commercially viable should be possible but due to the economies of scale, smaller and single plants may struggle to compete at the same support level. Therefore, in order to compete, there may need to be other routes made available for finance. Investment from the agricultural sector will need less of an administration burden to incentivise deployment. This is also the case for compatibility as the need for permitting and digestate management through DEFRA can sometimes be contrasting and off-putting for smaller plants which can mean the benefits can be undervalued.

Innovation can serve to assist in investment decisions and where there may be the option of networking smaller plants into a single injection point facilitating particularly in an area where multiple plants may not be in a position to connect directly. There have been some recent experiences of multiple injection points which have had some delays due to the added complexities but in theory this could be a solution to encourage more deployment with grid injection. The Gas Networks may be able to provide this as a service if encouraged to do so (and where a suitable `hub` of possible plants within an area is identified). Rather than requiring this to be also managed by a third party which could increase the costs the GDNs may be able to manage this. However, other options beyond biomethane injection may also make a site more viable based on geographical need, limitations and market forces.

Chapter 3: Accelerating growth of the sector

10.What is the current and potential scale of revenues from the green gas certification market? To what extent can this revenue enable future biomethane deployment, and how could the future framework support this? Please provide evidence to support your response.

As previously mentioned, the Green Gas Certification Scheme provides a mechanism for generating additional income for biomethane injection and increasingly through industries seeking to attribute GHG and Carbon savings on their production/process/business. However, this can be limited by the current position of lack of clarity on market-based reporting, specifically whether businesses can use environmental attributes for gas in their scope 1 emissions reporting for either the GHG protocol or SBTi. Clarity and assurance of this will boost the market for such Green Gas certificates and Guarantees of Origin (GoOs). As it currently stands, the GGCS have a statement on their website as follows,

"*Sale of RGGOs – prices have historically been over £1/MWh. This means that the RGGO market has never suffered from the extremely low values seen in the electricity GoO system, which underpin many*

of the accusations of greenwash and the lack of additionality in that sector. In the £1-3/MWh range RGGOs ***represent a small percentage of the total income secured by biomethane producers*** *but do represent a useful value stream to help ensure the economic operation of plants."*

Despite a high of ~£20/MWh last year, recent reports indicate that this has this has already fallen to just below £5/MWh which although shows higher value has been achieved from certificates, also confirms how much this can fluctuate and is therefore not a reliable source of income. This along with additional income through CO2 and the UK ETS will be discussed in more detail later in this response, however it is difficult to predict what could happen. Therefore, it's important to note that the basis of long-term investment will be dependent on assurance of a dedicated and consistent income stream in order to reduce the future use of subsidy models. To attract more investment into the biomethane industry, a scheme which sees a significantly valuable and dependable revenue from the green credential is vital.

There are external factors which impact on the ability to raise the revenue stream from certificates and so the framework itself, other than working to establish biomethane is positively included in the UK ETS, needs to ensure this is included in scope 1 emissions reporting. But acknowledging the barriers and working across departments to alleviate will help future decisions. This can also include ensuring policy valorises carbon savings from biomethane and not just energy content.

11.What is the current and potential scale of revenues from RTFCs? To what extent can these revenues enable future biomethane deployment, and how could the future framework support this? Please provide evidence to support your response.

Renewable fuels and particularly Biomethane, Bio- CNG and Bio-LNG are an increasingly viable option, not only for those already upgrading for grid injection but those that are currently under the FIT scheme, looking at options when their contracts end or an additional revenue.

RTFO mechanism is unlike the GGSS scheme in that the fuel has to move from the production plant to the refueling and is demonstrated as entering a vehicle (usually using Fuel Duty records as evidence) in comparison to the GGSS scheme where the gas only has to enter the grid. The RTFO mechanism was extremely successful in decarbonising heavy transport with well over 90 percent of HGV's and Buses running on natural gas in the UK in 2022 being on biomethane.

Some already operational sites use the value in the RTFCs to provide a flexible option in conjunction with the RHI and GGSS, particularly where an expansion of the plant would not be able to receive increased revenues from the RHI or GGSS. Even where the existing subsidy would support increased injection, the RTFO is likely to prove particularly attractive when compared to the lower (tier 2 and 3 tariffs). These rewards are also greater where most or all of the feedstock used is waste or residue, since biomethane produced from these feedstocks currently receives double rewards under the RTFO. The work on GGSS and RTFO, with the implications of many plants gaining ISCC registration (the main mechanism for biofuel recognition) has provided a strong evidence base to establish split claims but also mass balancing through the gas system in a highly regulated environment between OFGEM and DFT.

Despite the useful flexibility that the RTFO provides for existing plant, the RTFO is a relatively weak policy in terms of supporting investment in new production capacity. This can be seen in the RTFO as a whole, not just from the biomethane side.

There are a number of reasons for this:

- The RTFO does not accredit or register individual plants – it just creates an overall market in which there is demand for renewable transport fuels and the Renewable Transport Fuel Certificates (RTFCs) which are the means of accounting for them.
- Increasing targets have only been set out to 2032. Although the Department for Transport has consistently stressed that this does not necessarily mean the scheme closes on that date, they have yet to set out their medium-long term ambition. Given the lack of protection for individual plant noted above, this means new investments are entirely dependent on the wider market.
- Unlike the Renewables Obligation, the RTFO buy out price is not effectively a guaranteed minimum value per certificate. In fact, the buy out price sets a ceiling for the maximum possible value, with the actual value entirely dependent on the market. Unlike all other production support schemes for renewables, the buy out price is not indexed to any measure of inflation[9]
- A gaseous fuel can only obtain RTFCs if there is demand for methane as a vehicle fuel. So a funder considering a biomethane plant for which RTFCs form an essential part of the income is obliged to take a view on overall demand for methane as a transport fuel. Since RTFCs can be obtained from biomethane produced outside the UK, they must also take a view on their likely competitiveness with other producers both within and beyond the UK.
- The market is dominated by a handful of large, obligated parties and the vast majority of the RTFO targets are met through liquid biofuels blended into liquid fossil fuels. This means that the procurement and commercial priorities of those parties have far greater impact on the value of support than other revenue support schemes.
- As a result of the changes to the RTFO rules around importing all the biomethane not just the green credentials of the gas, meant that Non-UK gas was paying a premium as the gas element in Europe was at a higher level than UK, and was incentivising increase in UK supply.

Until or unless these points are addressed, we do not believe it is likely that a new project could be funded if dependent to any significant extent on revenues from the sale of RTFCs. We note that DfT has a legal obligation (via the Energy Act 2023) to publish a consultation on ways to provide confidence in future revenues for UK producers looking to supply the Sustainable Aviation Fuel mandate and it may be that there are useful proposals that can also be applied to the RTFO itself.

12.Please provide any evidence on the current or expected costs (capex and opex) and revenues relating to carbon capture on AD plants.

As a trade association we are concerned about trying to produce costings which given the timescale provided for this Call for Evidence may be far from accurate to be used for financial decision making. Therefore, as feel that as DESNZ have consulted trade directly and will be having responses accordingly, and are best placed to build a better picture on this. Alternatively speaking with project developers and suppliers will be a better source.

[9] The buy out price increased from 30ppl to 50ppl in January 2021, so DfT could fairly state that they have taken action when it looked like the buy out price might be too low to incentivise the continuing supply of renewable transport fuels. The difficulty is that, without a set process in place for adjusting it, there is no guarantee they would do so again in future.

Most new plants will be applying with a carbon capture as part of the permit application. Most operators currently applying would be under the GGSS and they would therefore be of a certain size. However currently permit guidance requires all CO2 to be processed to Food grade regardless of the use[10] and limits the volume stored to 150 tonnes, specifies a capture rate of 80% but will also require a permit or permit variation after 1 October 2024.

Costs will also be dependent on the barriers as covered in more detail in Question 13

13.What are the most significant barriers to store and transport the CO_2 to sequestration sites? Where possible, please answer with reference for a range of different sizes and types of biomethane plants.

There is much focus attributed to sequestration of CO2 and this is understood to be as BECCS with long term geological storage options. Dependant on the location and size of the plant operations/operators, the ability to tap into one of these sites is currently limited. Unless there is a direct pipeline connection to the Track 1 and 2 clusters, the ability to join those storage options is not possible. Therefore, sites are having to consider further afield such as Norway in the case of Future Biogas (Carbon Harvest) or alternative and more short-term routes. Also, despite the business models already developed and those planned for future deployment there is a race to get the infrastructure online with little certainty largely due to permitting and policy decisions. There are dates of between 2026 and 2030 given for some stores but no confidence in those dates and no clarity on what the reward mechanism will look like. Without those it is difficult for an AD plant to make any investment choices tied to this route.

Although there are benefits to Carbon removal, the requirements to transport which involves capturing, storage, compressing and transporting to wherever is available, can limit the ability for the more long-term storage in favour of other routes such as short-term CCU for food and drinks grade manufacturing or construction. All of which can place significant costs on a plant operator above and beyond the upgrading process which for biomethane production would be already required/in place. Currently sites routinely vent, and it's widely acknowledged that although this is carbon neutral, there is value to capture and store the CO_2. Certainly, new sites or a condition of conversion/ expansion could be on the basis of being able to capture and store even if this is initially being carbon capture ready.

The effects of COVID have were reported to affected other sources of food grade CO2 via fertiliser by-products. Previously thought to have limited the overall value through volume and ow purchase costs, have reduced with some production plants having closed. Biomethane production can provide a useful biogenic route for CO2 for these end use markets. As the BECCS routes establish, more options and availability will happen however given the initial advantage Power BECCS may have had in the market for GHG removals mean there are some concerns that Biomethane BECCS will not be able to complete in this market unless there are measures in place to ensure a level playing field.

If there were local grids provided as part of a future strategy, which may mean a central collection point was possible into geological storage, this might open the opportunities for more plants to access BECCS especially given a reported 78 billion tonnes of Carbon storage capacity that has been identified in the UK. Members are supportive of the need to capture CO2 and

[10] Treating, storing, and using carbon dioxide from anaerobic digestion: RPS 255 - GOV.UK (www.gov.uk)

effectively use or store but the ability to access routes and financial burden will be the determining factor.

14.What is currently preventing the industry from maximising the revenue from selling CO_2, for example to the food and drinks industries? Do you expect opportunities for revenue from this bio-CO_2 market to change over time? If so, how?

Previously there were other routes available for food and drinks manufacturers to obtain CO2 as a by-product at a significantly low cost which hampered a competitive market. The effects of wider world events have meant some of these other routes such as through fertiliser production have reduced, and biomethane production can provide a useful, domestic and Carbon neutral source of CO2 for these markets. This should provide an initial market that provides incentive to capture and process for resale.

Food safety is paramount and there is a requirement for an HACCP to be conducted by the plant to look at its ability to manage risk from feedstocks through to processing and delivery to customer. A lot of work has been done in recent years to qualify new feedstocks such as manures as well as the original crop-based plants that began to produce around 2016 following the approval of Anaerobic Digestion in the global standards. But this is a complex area as it is self-regulated. The challenge for any producer is understanding a long-term price for CO2 and how markets for existing use, storage and new markets such as for e-methanol and e SAF will evolve and be supported. Especially given the recent high levels of volatility in pricing for the traditional markets in the UK, and potential swings from under supply to oversupply in the near term.

Given the dispersed location of AD plants across the country and the need to diversify and secure sources of food-grade CO2 supply, much of the focus on AD CO2 capture has been to potentially service the agri-food utilisation markets. However, further CO2 usage markets can be expanded across a variety of sectors including construction and the availability of local CO2 could provide additional outlets if incentivised such as for long term storage/batters.[11] There is also carbon sequestration and bio char with more processes and applications being adapted.

15.How can gate fees play a role in underpinning new biomethane capacity and what barriers must be overcome?

The issue with Feedstock is whether being able to meet the needs of sustainability eligibility under the later RHI and GGSS with a 50% waste requirement. A lesser amount of overall annual volume input means a reconciliation for payments. This is expected to get easier with increases to the availability of waste feedstock through the implementation of mandatory food waste collection (Simpler recycling). However, it should also be understood that currently with the issues facing agriculture through the loss of the common agricultural policy and routes to maintain profit can be seen through diversifying as crop supply for AD and Biomass plants and production for renewable fuels. There is therefore a need to ensure that the supply of feedstock is not at the detriment of the environment but complementary such as ensuring the right crop for the right area (i.e. Maize can be a particular issue when grown in succession and on the wrong soil type) or through regenerative farming techniques. The important note is that a constant feedstock is required and therefore routes to gain a gate fee are limited and more likely

[11] Energy Dome | The Only Alternative For Long-Duration Energy Storage.

this is a cost to the operator unless as supplied by the plant operators. Generally, this can therefore not be considered as a revenue stream.

Currently the value of digestate is not always recognised in the marketplace and costs of storage, haulage and spreading can mean that recycling digestate to land is a cost to the producer and can make further processing of digestate difficult. There needs to be incentives and support for the use of digestate above mineral fertilisers or peat-based products such as more recognition of the biofertilizer standard (PAS110) in the Environmental Land Management Scheme, to support the use of digestate, being suggested by NFU. There is already much work on quality protocols for digestate and this can feed into this work. And it's recognised that due to the consistent process for AD, digestate will still be produced at times when land spreading is not appropriate and very weather dependant. At present there is little incentive for further treatment of digestate such as dewatering (or thickening, pressing, pelletisation or evaporation processes) and there is limited ability to store on site which is restricted to temporary due in part to permit constraints.[12] Additional treatment would be possible if the product was valued for its role in providing good nutrient management practice, control of diffuse water pollution, enhanced soil health and soil carbon storage an attributable cost and a market would be consistently available.

16.Please provide further evidence on the potential costs and revenues for production methods discussed in Chapter 1, where you have this information available.

As a trade association representing members across the production methods, we are concerned about trying to produce costings which given the timescale provided for this Call for Evidence may be far from accurate to be used as evidence for financial decision making. Therefore, as we are aware DESNZ have consulted trade directly and will therefore be more likely to move beyond commercial sensitivity issues and are better placed to build an accurate picture on this. However, we can consult further for any technologies that may be needed if required.

However, the costs will significantly vary across the production methods dependant in the case of AD plants, however the CAPEX costs will be significantly less for those where they are existing sites that are expanding, converting or upgrading (in the case of landfill). Gasification plants are likely to be in need of both Opex and Capex given their current deployment status. More information is available direct through ABSL[13] and Kew technology.[14]

It should also be noted that the key consideration for RO facilities and to a lesser extent those dropping off FIT in the future will need to convert from engines/ CHP and the costs to convert will depend on the ability to access the gas grid or alternative gas markets. In the case of Landfill gas there are some experiences of conversion to biomethane production that have been reported particularly in France and there are companies pursuing this route such as Waga Energy[15] however industry would need to ensure that the choice is viable before removing and converting all the energy generation kit, and the REA are currently working with members on a report looking into the possible benefits and sites that could be viable. Further details are contained in our response to question 5.

[12] SR2021 No 10: anaerobic digestion of non-hazardous sludge at a waste water treatment works, including the use of the resultant biogas - GOV.UK (www.gov.uk).
[13] Welcome to Advanced Biofuel Solutions Ltd (absl.tech)
[14] Home • KEW Technology • Delivering a world beyond fossil fuels (kew-tech.com).
[15] Renewable natural gas for all - Waga Energy (waga-energy.com)

17.How could biomethane emissions be reliably differentiated from fossil fuel emissions following the combustion of gas extracted from the gas grid (which is a mix of biomethane and fossil-derived methane)?

Currently the Green Gas Certification Scheme and Guarantees of Origin system provides a mechanism to account units of biomethane injected to green gas purchasers. A Renewable Green Guarantees of Origin RGGO is issued when a kWh of green gas is injected into the grid. Each RGGO contains information about where, when, and how that kWh of green gas was produced. RGGOs allocated to consumers are retired and listed on Retirement Statements. This system works well, ensuring an accounting procedure to stop double counting and shows there is a way to effectively separate the emissions in a mixed system.

There is precedent as this is currently being managed through certificates under the European model providing evidence for several purposes including ETS and transport fuel quota in DK. There is also the added ability to provide the check for sustainability criteria as required for the RHI and GGSS in the UK and for RED in the EU. Both systems operate a Book and Claim approach so compatible although not necessarily advocating for Book and Claim over a mass balance approach which is being used increasingly and is likely to be the approach for Hydrogen certification.

18.How could the UK ETS account for biomethane in the gas grid to make biomethane production more financially sustainable?

In order to provide value, help the UK achieve decarbonisation and particularly of the gas grid and encourage increased deployment of biomethane, it should be treated differently to fossil fuel in the UK ETS. This is already the case in Europe when the new Monitoring and Reporting rules (ETS MRR) facilitated the deployment of biomethane at ETS installations by introducing a zero-emission factor for biomethane which, following the ETS extension, will also finally categorise biomethane under the zero emissions fuels in road and maritime transport.[16] Traders and some larger producers are increasingly being asked why this isn't the case and stating they would be happy to pay more for green gas where they could include it in their carbon accounting. Companies need government assurance that they will be able to use biomethane to decarbonise and meet emission targets/ caps to bolster market confidence. Investment will only come into the biomethane industry where there is a significantly valuable and dependable revenue from the green credential. This won't be the case without the inclusion in the UK ETS.

Therefore, not including this in the UK ETS is significantly impacting on the drive for purchasing certificates and thereby reducing an income stream that could help drive down the need for government support.

This approach would also be consistent with the proposals to bring biomass within ETS, but seeing it zero rated as long as it is compliant with sustainability governance arrangements, and bringing energy from waste into the ETS by 2028.

Finally, we stress, that such moves to evolve the ETS must also be accompanied by the inclusion of Greenhouse Gas removals in the UK ETS. This will create an obligated demand for negative emissions and help create investable case for more biomethane plants, (along with other bioenergy technologies) to look at the addition of carbon capture technology. This will be critical to the delivery of the governments net zero targets.

[16] EBA-position-on-the-ETS-extension.pdf (europeanbiogas.eu)

19.How might UK ETS recognition of biomethane in the gas grid affect UK ETS markets?

Forecasting from some members have indicated that a way to move away from a subsidy model would be to encourage Gas Sale Agreement (GSA) opportunities and also on a long-term basis (~5 Year). This confidence reduces the risk and therefore the need to have the safety net of continued subsidies as often the GSA will require unsubsidised green gas to fully attribute the Carbon savings.

The ability to engage and therefore trade within the EU ETS will also be important as Europe and particularly Germany have been a large purchaser of UK GGCS over recent years and the current stance on the Union database for third countries would significantly affect the possible revenue opportunities. Significant clarity is needed on this and is something that the REA have worked alongside other gas organisations, ERGar and Eurogas on requesting this issue to be resolved. However, it also indicates how the inclusion of biomethane in the EU ETS can influence and drive the market for certification.

However, it should again be reiterated that there needs to be assurance that companies can use biomethane in their Market Based reporting for the GHG protocol and SBTi.

20.Which mechanisms are most likely to ensure we meet our strategic aims in Chapter 2, and why?

We recognise that CfD are increasingly being used by Government to drive value for money where there is a consistent mechanism that has been successful in the past. Both the CfD and Supplier Obligation (SO) options would provide the potential of a minimum guaranteed value to provide some assurance. However there have been some benefits and some concerns raised about both options for meeting the needs for all production methods and scales.

The Call for evidence has already stated that a CfD will be more likely to attract larger scale plants due to the ability to benefit from the economies of scale and as they will be competing on more of a level playing field it would be unlikely to attract smaller plants to compete. We would therefore see more similarities to that experienced in the GGSS where only larger scale gas grid injection would apply. With larger scale plants there can be benefits for a scheme where there are fewer plants contracted with production capacity at improved cost margins and with the increased ability to access long term carbon capture storage opportunities. However, there are increased implications for feedstock (unless managed by the operator through a farm partnership) and digestate management that covers a wider area, implications for local planning issues (through community objections) and so there would potentially need to be considerations made on meeting some of the sustainability objectives. Also, the ability for maximising the potential for other, more expensive, production methods would be limited and the only way to avoid this would be adding of 'pots' or the use of minima/maxima as seen in the power CfD. If this is the preferred approach, there has been members support for this option where they in an organisation have both producer and supplier responsibilities and can see this as preferable from a supplier perspective.

The SO would provide an alternative option that is already well known in the UK through the RO and RTFO schemes, however the same concerns could be raised as for CfD with the difficulty in being able to provide a level playing field for all technologies. It is therefore likely that the SO may also need some further banding. Also, there is a very different scheme if adopting the RTFO system to that of the RO. The RO provided longer term investment security whereas the RTFO is

a far weaker policy if the aim is to secure investment in UK production. These points are set out in detail in our response to question 11.

Therefore, the consideration on the scheme would need to be more closely aligned with the RO for investor confidence for the long-term commitment for a plant with a lifespan >15yrs. If this is the preferred option, there has been members support for the growth this could stimulate and with a line of sight for the trajectory. Although far from simple, the level of paperwork required to access policies such as the RO (and GGSS) is far less onerous than the existing Contracts for Difference for power or the equivalents for hydrogen (Low Carbon Hydrogen Agreement). It would therefore be likely to be more manageable for the typical scale of biomethane projects than a CfD. It would be possible to design a supplier obligation so that rewards provided were adjusted in line with variations in the wider gas market – although if this were felt necessary then this would suggest a simplified CfD might be a better approach.

Although grants such as Anaerobic Digestion Loan fund (ADLF) and On Farm Anaerobic Digestion Loan Funds have been used in the past it's understood that, in particular for agricultural applications, this was seen as unduly cumbersome and bureaucratic and take up for such schemes has been traditionally low. It remains unlikely that smaller scale and on farm sites would be attracted to a CfD mechanism however this is also the case for a Supplier Obligation (SO) style commitment as particularly on farm sites are more likely to benefit from a tax incentive scheme. Take up for plants below 250 KWe would find likely CHP technology less complicated and a reason along with access to grid and costs of upgrading is why the FIT was so well applied in this lower production bracket. So, the suggestion would be a separate and limited budget could be made available away from the rest of the group to stimulate further growth, provide a more diverse biomethane production whilst also helping develop a more secure supply chain through numbers of plants engaged. While not contributing substantially to the national biomethane targets in the case of on farm plant, these can play an important role in terms of decarbonising agriculture, feedstock utilisation for treating manures/slurries and play a strong role in the 'social acceptance' of AD.

21.Which mechanisms are most likely to comply with all the principles listed in Chapter 1, and why?

Many of the principles listed in Chapter 1 would be affected by other interactions such as what can be included in the contract for ensuring sustainability through for example a threshold limit, and in addition there will need to be a concerted drive to ensure gas grid and planning barriers are alleviated. However, it is unlikely any of the two options of CfD and Supplier Obligation (SO) would be able to better impact any of the principles more or less with the exception of commercial viability.

Under a straightforward SO, the amount of support provided per unit of biomethane is unaffected by wider gas market pricing. This means that it is easier to predict the costs of the scheme and so manage impacts on consumer bills, and this is the approach taken in the Green Gas Levy that funds the GGSS. The biomethane producer would be exposed to volatility in the gas markets, such that they could benefit when prices are high but would have lower income if prices are low. In practice, they would be likely to engage in some hedging to manage this risk as is widely seen in the electricity market.

With a Contract for Difference, the amount of subsidy paid varies with changes to the wider gas market price. This has benefits for producers in that their total income (subsidy + power sales) remains stable, regardless of market volatility. If the CfD payments are paid for by gas

consumers, this means that subsidies are higher when gas prices are low but conversely consumers pay less (and may even have money paid back) when gas prices are low. Thus, the policy could also be said to support stability in the prices seen by consumers. As a result, however, the total cost of the policy is harder to predict in advance.

For most of the industry, either mechanism could be made to work. As set out in our response to question 20, if an SO is chosen, this would need to be designed to mirror the effectiveness of the Renewables Obligation rather than the comparative weakness of the RTFO. If a CfD approach is taken then every effort must be taken to streamline the policy and contractual approach so they are appropriate for the typical scale of biomethane plants.

In either case, we would wish to retain the flexibility that currently exists with the RHI and GGSS to access the RTFO (and SAF mandate when introduced), always understood that a given unit of energy can only be supported under one of those schemes. This would also help enable projects to respond to future changes in demand for renewable fuels and optimise routes to decarbonisation.

As mentioned in response to Question 21 it's unlikely smaller scale and on farm sites would be attracted to a CfD mechanism or Supplier Obligation (SO) style and without their participation the new framework would not be as adaptable, meet compatibility with wider policies or provide the domestic mix for security. It certain would miss out on the sustainability benefits of a localised and in case of the farm AD a complete management of feedstock and digestate whilst also dealing with emissions and decarbonising the agricultural sector.

22.Which mechanisms are most likely to assist with overcoming the barriers to market growth listed above, and why?

As mentioned in responses to questions 20 and 21 CfD s likely to favour larger plants and therefore inhibit market growth unless contingencies such as a combined option may be needed to secure the growth in the small scale and on farm. Its likely that if covered under an SO this may also need to see some banding to ensure all technologies are included and pots in the CfD.

Chapter 4: Sustainability

23. a) What are your views on the criteria set out in Chapter 4 for assessing feedstocks? b) Are there any additional criteria that we should consider?

REA supports the proposed criteria for prioritising waste feedstocks used for AD as stated in various models and the Biomass Strategy. We appreciate that the proposed criteria balance costs with environmental impacts as it is important that AD continues to be a feasible option for biomethane production and recycling food waste.

One of the greatest environmental benefits of biomethane production through AD is recycling feedstocks that would otherwise be sent to landfill. For this reason, we would like to see recycling rate as an additional minimum criterion. Organic waste varies greatly in composition depending on a variety of factors; type (food waste versus garden waste), source (households, businesses, farms), moisture content, nutrient makeup, etc. Based on life-cycle analyses to date and current government policy, food waste is better suited to AD and garden waste is better recycled via composting or dry-AD. Maximising the separate capture of these biowastes at the highest practicable quality, via a recycling rate measure, will ensure our biowaste streams continue to be recycled as effectively as possible.

The quality of biowaste streams also varies greatly. Physical contamination (e.g. by glass, metal and non-compostable packaging and non-packaging items / pieces / fragments) of biowaste feedstock varies depending on where the biowaste is collected from. Typically, food and garden waste collected from households has some level of physical contamination, whereas such contaminants can be absent or minimal from plant and food processing wastes from agricultural sources. The proposal indicates an interest in measuring soil contamination. We agree that ensuring quality digestate is important for the environment and for AD revenues. Creating a specific criterion that captures the sourcing of biowaste or levels of physical contamination may be a more effective criterion compared to soil contamination because (1) contamination is easier to measure before processing and (2) it could encourage biowaste providers to reduce physical contamination in their feedstocks. In addition, there are already limits for physical contaminants in place for digestate (when spread to land as a product under the Quality Protocol or waste under landspreading deployments). These limits should not be undermined nor duplicated. If this criterion is incorporated into the biomass priority use principles, the burden of measuring contamination in feedstocks should be placed on providers rather than processors as they have a duty of care to provide biowaste that has the least amount of physical contamination reasonably possible and complies with processor permit conditions.

Separately, we would also stress the importance of ensuring there is a clear joined up approach to the development of sustainability Governance arrangements within the biomethane framework and the development of the cross-sector sustainability framework, as committed to within the Biomass Strategy. The potential for there to be a contradictory impact on the sector if these two sustainability programmes are not well aligned, leading to uncertainty within the sector.

24.With reference to the feedstock sustainability assessment criteria in Chapter 4 (or any other suggested criteria), please provide any data on AD feedstocks that you think we should consider in future policy.

Regarding the Water Quantity Requirement (WQR), we agree that WQR, including minimising water use where possible, should be part of minimum criteria for assessing feedstocks. The criteria framework will need to factor in whether the AD process is 'wet-AD' (typically for waste streams with < 15 % total solids), 'dry-AD' (typically for waste streams with 15 - 40 % total solids) or 'semi-dry-AD' as this too influences WQR.

Bio-based carbon* in compostable kitchen caddy / food waste bin liners** and in compostable packaging** and food service-ware** should be included in feedstock sustainability assessment criteria. This can be determined through standards that specify testing of 'bio-based' content and schemes are established that independently assess and certify the product's bio-based content.

* Comes from plant, algal and fungal sources and which has not been fossilised.

** Whether plastic-like, fibre, fibre-based or a combination of other compostable materials.

NOTE: Compostable food service ware is beneficial in situations where using crockery, glassware and metal cutlery is impractical and/or unsafe, e.g. in offices without catering facilities, sports stadia, festivals, and fast-food outlets.

Non-compostable liners (usually made of polyethene) and non-compostable packaging that arrive at AD facilities are unsuitable for digesting and will be rejected as best as practicable. (Local authorities have so far been free to choose (taking account of their biowaste contractor's requirement or preference) what type of kitchen caddy liners / food bin liners they supply to

residents or advise them to find and buy (compostable ones or any liner type). Each local authority's choice therefore affects which type(s) of liners their biowaste treatment contractor(s) receive.) Rejected non-compostable liners will have to be recovered elsewhere (e.g. in EfW facilities) or sent to landfill, and any non-compostable liners or packaging that makes it to the digester can become contaminate in digestate or drive loss of digestate solids at the screening stage as operators separate digestate into 'separated liquid digestate' and 'Separated Fibre Digestate with plastic content'. Significant percentages of SFD should not go to EfW or landfill, as this is a loss of valuable organic material. Therefore, we believe that if non-compostable liners and/or non-compostable packaging are included in a biowaste stream intended to be digestated, this should be factored into the feedstock sustainability assessment.

However, although there is recognition on including Crops as feedstock only if they meet sustainability criteria, and more focus is on waste and food crops for understandable reasons such as land use competition, some crop production can meet sustainability criteria if specified as such. For example, regenerative farming methods, including use of rotational/cover and break crops can provide not only diversity, but improve soil health, reduce pest/weeds and improve productivity/ crop yield and carbon sequestration/sink. This also extends to the use of digestive. This can provide sustainability improvements to farmers and a controlled and flexible accounting for land use change. In a time where farmers are facing reductions to subsidies and price volatility a more balanced farming system can be a more harmonised one, providing choice and security through different revenue streams. Although we also recognise that this would be difficult to capture fully in this framework but also important to ensure potential limitations.

25.With reference to the feedstock sustainability assessment criteria in Chapter 4 (or any other suggested criteria), please provide any data on feedstocks that are specifically used by non-AD biomethane production methods (outlined in Chapter 1).

We have been unable to accurately obtain this data in the short time provided for a response so have decided to leave this unanswered at this time. If further information is required, we can investigate a response and submit at a later date.

26.What are your views on the approaches set out in Chapter 4 for prioritising feedstocks? Are there any alternative approaches that we should consider for future policy?

While all the approaches for prioritising feedstocks have advantages and disadvantages, we are likely to support the **waste feedstock threshold model.** We appreciate that this model is familiar to industry, making it easier to implement in existing facilities. The waste feedstock threshold model appropriately balances both flexibility and enforcement. It allows flexibility for operators to take in a variety of feedstocks as the feedstock market changes and AD technologies advance over time. In addition, operators have existing procedures for checking and recording waste feedstocks accepted, making measurement and enforcement relatively easy to implement. This model is proven to be enforceable across industry which instils higher confidence in operators who are required to comply with the new policy. Consistent and fair enforcement that ensures a level playing field for all operators is important to our members given competition for desirable feedstocks and gate fees.

We believe the proposal to set **specific thresholds on a per-feedstock basis** is too prescriptive and inflexible. Removing the ability for operators to change the types of feedstocks they accept depending on market forces could cause compliance issues. When feedstock-type shortages or contracting issues occur, a site could involuntarily fall out of compliance with a per-feedstock threshold. Sites could also face issues if the waste feedstock received does not fit a specified

feedstock type, e.g. if int includes a mixture of feedstock types or the supplier's waste code / description does not fit the Biomethane Framework scheme's definition.

While the **sustainable feedstock targets model** does allow flexibility, we are concerned about its enforceability. Specifically, we are believing that it would be difficult to prioritise feedstocks in true sustainability order without clear and consistent life cycle analysis boundaries and guidance for operators that supports consistent assessment/calculation of feedstock sustainability. We anticipate that it will be very difficult for regulators to measure and enforce sustainable feedstock targets consistently across the UK, even if they are set appropriately. This presents real concerns about unfair advantages for bad actors and disadvantages for operators who are not located near sources of highly sustainable feedstocks.

Despite concerns about the measurability and enforcement of a sustainable feedstock targets approach, we would be in support of an approach that pairs a waste feedstock threshold model with sustainable targets. Because a waste feedstock threshold model is familiar, implementing a threshold in the first instance would allow processors to move into compliance relatively easily and quickly. Once the threshold is in place and being consistently enforced, it could be useful to introduce gradually increasing sustainability targets that encourage AD processors to improve the sustainability of their feedstocks in a more holistic manner. A phased approach provides an opportunity to refine measurement and enforcement mechanisms. By progressively raising the bar, we can steer the AD industry towards a more sustainable trajectory without causing undue disruptions to the feedstocks market.

27.What is the current and potential scale of digestate revenue? To what extent can this revenue enable future biomethane deployment, and how could the future framework support this? Please provide evidence to support your response.

The potential scale of digestate revenue varies based on the quality of the digestate, if it is certified compliant with End of Waste rules (PAS110 and, in applicable countries within the UK, the AD Quality Protocol), the geography of the market, further processing, other organic materials available and other incentive schemes.

The quality of digestate is largely based on the quality of feedstocks used for AD. While the upcoming Simpler Recycling reforms will likely increase the availability of food waste as an AD feedstock, there are ongoing issues with physical contaminants (PCs) in food waste. While AD operators have technologies that remove most physical contaminants during waste pre-treatment, the technology is not advanced enough to remove all physical contaminants all the time. In addition, PCs removal drags adhered biowaste out of the process[1] or drives extra costs and water usage for washing the removed PCs and drying them and for feeding the washings onwards for digestion. Therefore, preventing contamination at the point of disposal is incredibly important for maximum digestate yield and for producing quality digestate that can be safely applied to land for soil health benefits. The International Solid Waste Association (ISWA) report on 'Preventing and Managing Contaminants in Organic Waste Recycling' includes a 'Contaminant Management Hierarchy' which is useful for understanding (1) the importance of reducing organic waste contamination and (2) the preferred steps for reducing contamination. They recommend careful selection of feedstocks, separate collections, and targeted communication and education for waste producers as the most effective steps for contamination prevention.

The nutrient makeup of feedstocks also affects the quality of digestate. Because AD plants take in a variety of feedstocks depending on the proportions of feedstock types fed in at any one time, geography, and time-of-year, their digestate can vary greatly in nutrient makeup. Whether

digestate is separated and/or further processed also influences its dry matter and nutrients concentrations. Ongoing research on the nutrient quality of digestate is essential for understanding its efficacy within nutrient neutrality requirements. Ensuring the nutrient quality of digestate is fit for purpose and clearly communicated to end-users is essential for building market confidence. Research that helps to open additional markets for digestates – e.g. markets for digestates derived from particular feedstock types - could bolster the revenues AD operators receive from selling/supplying digestates.

Certification of digestate compliance with End of Waste (EoW) criteria and communicating the benefits of applying digestate to soil also play a crucial role in building trust in the market and ensuring consistent quality digestate. Certified digestate must meet minimum quality criteria set out in PAS 110, be 'fit for purpose' (i.e. meet the quality limits in PAS110 and any extra quality requirements the customer agrees with the digestate producer) and have been produced using a quality management system at the AD facility. The Biomethane Framework could provide a higher level of support to AD facilities that produce digestate certified compliant with EoW criteria, to aid UK production of quality digestate that is fit for its intended purposes.

The geography of markets also impacts the revenue gained from digestate production. The distance between AD plants and potential markets directly influences transportation costs. Higher transportation costs can make recycling digestate to land a cost rather than a revenue stream. Also, the regulatory requirements(and related enforcement) for application of digestate to land can vary between regions, creating unequal regulatory costs for AD plants across the UK. Varying nutrient requirements amongst farmers, and the geographic makeup of farms, can also affect their demand for digestate. Regions with a strong organic farming community or consumer demand for sustainably produced food may offer better opportunities for selling digestate. To improve the potential scale of digestate revenue in different geographic markets the future framework should ensure consistency in regulation and enforcement and invest in market analysis and strategic partnerships to reduce transportation costs.

Finally, further processing and agricultural incentive schemes improve the profitability of digestate. Further processing of digestates into alternative products, such as pellet fertilisers, granulated fertilisers and aerobically matured separated fibre digestates, is important for expanding market opportunities and quantities demanded by markets. Sustainable farming incentives for farmers using digestates and composts as fertilisers and soil conditioners can stimulate demand and enhance revenue opportunities. There are multiple reports out that emphasize the environmental and economic benefits of replacing artificial fertilisers with organic fertilisers and soil conditioners like digestates and composts, this includes WRAP DC agri project: https://wrap.org.uk/resources/report/digestate-and-compost-agriculture-dc-agri-project-reports. The recent POSTnote on the future of fertiliser use captures the benefits and barriers to expanding organic fertiliser use well.

28.What are the barriers, if any, preventing UK AD sites and farmers/landowners from implementing additional ammonia abatement methods, such as the ones identified in the 2023 WRAP study for DESNZ?

Clarity on requirements for implementing additional ammonia abatement methods is crucial to implementation. AD sites will often avoid implementing new technologies, especially when they are costly, may involve the need for planning permission to be revisited and if an uncertain regulatory environment exists. Clearly communicating the benefits of and requirements for

implementing new abatement technologies would be useful. Defra is currently running a regulatory co-design process with stakeholders that is evaluating how ammonia abatement from various sources can be best managed and REA are feeding into this process. Additionally, the Scottish Government recently closed a consultation which requested feedback on exploratory proposals to reduce ammonia emissions from livestock farms.

Covering stores is one way of reducing ammonia emissions. Any requirements for covering stores should apply to new stores but need to take into account that it is not always technically possible to cover existing stores even if it was financially viable to do so.

29.How do you consider nutrient balancing in relation to your handling and use of digestate? We particularly welcome views from landowners, farmers, and AD operators.

In general, the proposals for nutrient balancing seem beneficial. We would recommend seeking feedback from agronomists and other consultants as nutrient balancing is most commonly managed by them rather than AD operators and landowners.

Legislation around biosolids disposal is already tightening – phosphate management has seen a 15% YOY reduction in available farmland with more restrictions expected. Microplastics and PFAS are 2 huge public issues currently being investigated which will mean digestate may have to take significantly different routes in the next 5-10 years. Certainly, plants may have to deal with a major change during the life of any incentive.

30.What are the practicalities, costs, and potential environmental impacts associated with transporting digestate to areas with a nutrient-deficit? Please provide evidence to support your response.

Whilst digestate is an excellent source of readily available nutrients, it is largely produced as a liquid which has implications for storage, haulage and spreading. Cost of haulage have increased as a result of increasing fuel costs, increasing staff costs and demand. Digestate should only be spread to land when there is a crop requirement for the nutrients, so there is a requirement for digestate to be stored to enable it to be used at the appropriate time. Storage is costly and requires planning permission to construct new stores. Digestate spreading should be done using low emission spreading equipment which farmers may have to hire, or bring in a contractor to spread, giving additional costs. Further processing of digestate may help to mitigate some of these challenges but there are additional costs for this, some regulatory challenges to overcome (further processing not recognised in the AD Quality Protocol) and the current value of digestate may not lead to a favourable business case for this.

31.Can all AD food waste plant operators accept and process food waste with caddy liners or other food packaging included?

It depends on what ‘accept and process’ means. This can be interpreted as accepting in the waste reception hall, with the caddy liners and food packaging being largely removed during waste pre-treatment such as depackaging (before digestion). Using this interpretation, yes, all AD food waste plant operators (with pre-treatment equipment) can accept and process food waste with caddy liners or other food packaging included, regardless of whether those liners / that packaging is compostable. N.B.: pre-treatment machinery tends not to remove all non-compostable items (it is imperfect). Although the removed packaging and liners is an additional cost for the operator for disposal or further treatment.

Alternatively, the question can be interpreted as 'Can all AD food waste plant operators accept food waste with caddy liners and food packaging and then pre-treat it so that compostable liners and food packaging items are fed into the digester along with the food waste (and most of any non-compostable liners / food packaging items are rejected during pre-treatment?'. Using this interpretation, no, all AD food waste plant operators cannot accept and process food waste with caddy liners or other food packaging included.

Food-waste-fed AD facilities can manage food waste with caddy liners or other packaging if they have the appropriate pre-treatment equipment. How they should manage those liner and packaging items depends on whether they are compostable and what kind of process is at the facility.

32.If liners and food packaging are included, what material types a) are AD plants able to process? b) are preferred? c) are least preferred and why?

Ability to process different material types depends on the AD plant's infrastructure (e.g. whether a wet-AD, dry-AD, or semi-dry-AD process and whether it has an area for aerobically maturing Separated Fibre Digestate fibre or for co-composting SFD with 'new' biowaste), technology (e.g. whether it has a pre-AD autoclave & screen set-up), and operational procedures.

Many food-waste-fed wet-AD sites are front-end removing all packaging and liners because:

1) wastes arriving from some source types contain a mixture of compostable and non-compostable liners and/or packaging but the facility does not have technology that separates compostable liners and compostable packaging from non-compostable ones; or
2) wastes could arrive from some 'closed environment' source types that generate a dry-ish used compostables waste stream or a 'food waste plus used compostable items' waste stream. These waste streams have not so far been sought by food-waste-fed AD plants because a) the AD plant's waste reception hall is not set up for separating and temporarily storing compostable items before their onward supply to in-vessel composting, or b) the current on-site treatment process is unsuitable for feeding them in and breaking them down.

As part of a current Innovate UK funded research project, a Thermo-Pressure Hydrolysis (TPH, aka autoclave) pilot plant was used for treating test materials under a direct steam pressure of 6 bar (160^{o} C) for 40 minutes. In trial runs on a mixture of compostable packaging items (made of bagasse, cardboard, PLA, and wood), they were treated in the TPH unit, and the output was passed onto a vibrating screen with 12 mm holes. These tests yielded 81.8 % and 90.4 % of the packaging as a pumpable < 12 mm floc. This floc then underwent a 30-day Biomethane Potential (BMP) testing, yielding 314 – 317 m^3 CH_4/t of packaging (fresh weight, abbreviated as FW). (The highest yield for an individual item type was for PLA-based coffee pods, yielding 337 m^3 CH_4/t FW, which included a contribution from the coffee grounds.) These very high yields, while largely related to the high dry matter of the items (as received), were around triple typical food waste (100 - 125 m^3 CH_4/t FW) or maize silage yields (105 – 120 m^3 CH_4/t FW). In coverage of findings in the Autumn 2023 edition of REA's Organics Recycling and Biogas magazine, an example was provided that if 7 % of a 50,000 tonnes per annum AD facility's inputs were compostable packaging, TPH treatment could bring a potential gain of > 10,000 MWh per annum of biomethane. In a different trial run, compostable food waste bags showed a recovery rate of 96.7 % of the bags as a pumpable input to digestion, and a BMP test yield of 100 m^3 CH_4/t FW.

REA's policy (https://www.r-e-a.net/resources/policy-on-and-liners-and-re-purposed-bags/) on non-packaged and user-unpackaged food that is discarded and separately collected - including where co-collected with plant waste – is that it must be presented:

a) in plastic or paper liners or re-purposed bags (inside the caddy/bin) independently certified compliant with BS EN 13432 or BS EN 14995s [interpret this as industrially compostable;
b) in a user-made caddy/bin lining made of a re-purposed, paper, non-bag / non-liner item, e.g. newspaper; or
c) loose inside the bin (also referred to as naked), as the least preferred but still acceptable option if the bin user or organisation responsible for such bins so chooses.

A study by the consultancy Sancroft International, commissioned by the BBIA (see https://bbia.org.uk/improving-the-costs-of-food-waste-collection-enhancing-economic-and-environmental-outcomes-by-choosing-the-right-caddy-liner-2/), was published in 2020 on Improving the costs of food waste collection: enhancing economic and environmental outcomes by choosing the right caddy liner. It concluded that 'The evidence shows that the most cost-effective option that delivers the biggest benefits for the nation is the use of compostable bags as a liner, as the most effective balance of reasonable costs, minimisation of [non-compostable] plastic contaminants in the biodegradable waste stream and maximisation of total food waste collected and processed. Based on that logic, the priority is first compostable bags, then paper bags, then lastly no bags and PE bags, since both have significant downsides whether in plastics contamination or poor yields and high GHG emissions.'

As EfW facilities have demand for biogenic carbon, as compostable liners have such content (usually referred to as 'bio-based' content), as machine removal of liners at AD plants is imperfect and as protecting soils from environmentally persistent plastics is ever more important, if numerous food-waste-fed AD plants were to receive, front-end remove and send compostable liners to EfW facilities (in the short to medium term while organic recycling solutions are being developed) we believe that using compostable liners for food waste collections that don't also target food waste in mixed types of packaging is a more beneficial approach than continuing to use polyethylene liners or an 'any liners/bags' approach. E.g. for household food waste collections.

33. If liners and food packaging are included, are they typically: a) not stripped (i.e. left to be treated by the AD process)? b) stripped and sent to a separate composting phase on-site? c) stripped and sent to a separate composting facility (off-site)? d) stripped and sent to incineration? e) stripped and sent to landfill? f) other (please describe)

Independently certified compostable packaging and liners can be (b) stripped and composted on-site*, (c) stripped and sent to a separate composting facility (off-site)* or (f) other, e.g. be fed into an ABPR-compliant dry-AD with a following composting phase. However, some biowaste stream types currently contain amounts of non-compostable plastic/packaging that deter or prevent operators from carrying out (b), (c) or (f).

* If the composting process is ABP regulation compliant, and assuming the packaging/liners are from sources where the associated food waste falls within ABP regulations. Suitable waste reception hall / pre-treatment set-ups need to be in place, especially if the AD plant is also receiving waste streams that have allowed inclusion of non-compostable liners/packaging.

In practice, householders often use non-compostable liners for their food waste where the local authority has contracted for householders' food waste to be treated at an AD plant. Such LAs tend to advise householders to buy polyethylene liners or buy/use any liner/bag type. The receiving AD plants d) strip and send the liners/bags to incineration or EfW facilities or e) send them to landfill. Distance from the AD plant to the nearest incinerator, EfW or landfill facility and the receiving facility's fees influence the AD plant operator's choice. EfW = UK median £103/t gate fee. Landfill = UK median £28/t gate fee (excl landfill tax) + £103.70/t for 'standard' rated waste's landfill tax.

Considering food retail-back-of-store waste streams, the majority of food packaging is non-compostable, and any bags/liners used are likely to be non-compostable. The receiving AD plants d) strip and send the packaging/liners/bags to incineration or EfW facilities or e) send them to landfill.

Food wastes from business/commercial food service sources, where collected for AD treatment if packaged are treated similarly, with any packaging, bags or liners are removed and sent to incineration EfW or landfill (d or e).

34.Please provide any evidence you have on the benefits and costs of detecting, monitoring or repairing methane leakage from AD sites.

There are obvious benefits to detecting and repairing methane leakage from AD sites. Environmentally, reducing methane leakage reduces GHG emissions and prevents air pollution. Economically, repairing methane leaks improves the efficiency of biogas production. AD sites generate revenue from biogas production, so any methane leaks represent lost economic value. Preventing methane leaks is important for ensuring regulatory and market confidence in AD which will ensure the continued success of the sector. However, there are costs associated with addressing methane leakage. It requires initial investment in methane detection and monitoring systems. Costs vary depending on the size of the AD facility and the complexity of the monitoring infrastructure. There are also labour and equipment costs associated with regular maintenance, monitoring, periodic inspections, repairs, and temporary operational disruptions necessary to detect methane leaks.

It should be noted that the EA has just launched its Methane action plan[17] and there is a view to update their Leak Detection And Repair (LDAR) guidance and Best Available Techniques (BAT) for AD reports. They are therefore likely to require installations to comply and possibly with stricter limits and improved testing. This may create an issue on the requirements to convert older plants but also covers landfill gas and sewage gas.

35.What challenges might the biomethane industry face if future government policy sets a limit on fugitive methane emissions from biomethane production?

REA recognise the damage that methane can create as a greenhouse gas. There is genuine concern about uncontrolled release and the need for fugitive methane emissions to be addressed where identified as an issue. Recent work has taken place trying to address fugitive

[17] Environment Agency Methane Action Plan 2024 to 2026 - GOV.UK (www.gov.uk)

emissions which includes the House of Lords committee on Methane, which REA provided evidence for and the very recent publication of the EA Methane Action plan. This is significant given the GHG rating of methane.

The greatest challenge associated with a limit on fugitive methane emissions is the costs associated with detection and repair. Many AD plants will have to upgrade existing infrastructure and adopt methane capture and control technologies. This would be particularly challenging for smaller operators or AD facilities with outdated technology. Increased operational costs (improved monitoring systems, regular leak detection surveys, and enhanced maintenance protocols) will also impact the profitability of biomethane production and could potentially lead to higher consumer prices for biomethane-derived products. These operational costs combined with a new regulatory burden and competition with competing energy sources could hinder the growth of the sector.

REA does not fundamentally disagree with a limit on fugitive methane emissions from AD, but we do emphasize that reducing methane emissions will require time, effort, and resources. The limits should be achievable and phased so that smaller AD facilities are able to stay in compliance. The most important thing is that the Government communicates their expectations with industry clearly and gives them adequate time to comply with new regulations.

36.What are the key sustainability considerations for any non-AD biomethane production technologies that could be in scope for the future framework? Please specify which technology your answer relates to.

Non-AD biomethane production won't need the same consideration of digestate management however dependant on the process there may be some by products that will need to be considered. The need to capture carbon will be a similar consideration as would the need to effectively store and or utilise. A similar consideration would need to be made on the feedstock and this would also need to be considered under the considerations of benefits of using waste material. The only other aspect may be the difference in energy consumption as this may be a sustainability criterion but significantly may attribute to increased OPEX. The type of waste streams and generally feedstock that is used in a gasification plant will differ from an AD plant as this will tend to be a dry feedstock rather than a wet one so these production methods would not be competing for the same feedstock.

Chapter 5: Planning and standards

37.Have you experienced or are you aware of any challenges with the planning process for AD plant developments? If yes, please provide details.

As a trade association we are only able to draw on the experiences of members. As planning is dealt with on a local level the experience can differ dependant on the experience and resources available in the particular local authority, however the experience of most applicants has been consistently delays. This can be attributed to COVID however we have heard that in some instances there are issues experienced due to lack of staff where delays were caused by a mixture of staff experience due to senior staff having left, lack of staff and staff retention causing

in one instance, a requirement for a neighbouring authority to take on the application after an already lengthy delay.

The experience of challenges with planning is felt across the renewable energy sector and can on occasions be as result of lack of experience for even senior staff in the technologies being submitted for planning. Within the REA and as echoed by some members the suggestion for a centralised planning team to provide additional resources, knowledge and support on a national level to help process applications more efficiently, competently, consistently and confidently. There could also be a clear route for renewable projects away from the normal planning of residential developments.

However, the biggest barrier, particularly for larger scale plants can be planning objections which seems to be consistent, not only to waste reacted sectors (odour, traffic etc) but for renewable energy projects in general as experienced for solar parks and pylons, when needed to reach wind farms. The process for local objections is important however there needs to be some strategic support to avoid the unnecessary costs for appealing decision that falls not only on the developer but also the council when often even against the planning officer's recommendation.

38.What type of AD-specific information would be useful to local planning authorities when reviewing planning applications for AD plant development?

Within the REA and as echoed by some members the suggestion for a centralised planning team to provide additional resources, knowledge and support on a national level to help process applications more efficiently, competently, consistently and confidently. They would already have access to key stakeholders such as the Environment Agency and HSE for a plant of a certain size but problems experienced with particularly the EA is similar to that identified for LA planning departments with staff experience, retention and delays for permitting. This can have not only a knock-on impact but also limit the assurance a LA will have to proceed with confidence.

Given that AD have been in operation for some time there is already much guidance and resource available such as Best Available Techniques, Quality Protocols and safety regulations. The scale of newer plants may provide an extra level of complexity or at least concern due to the resultant scale of preserved risk. But a specific and generic guidance for a planning team would be a useful resource which would cover key areas to ensure is in place, BAT, key risks and resources to refer and cross check.

39.What are the benefits and risks that would need to be considered in changing the permitting regime to apply the same regulatory standards to AD sites processing waste and non-waste feedstocks?

At present the complexities of collecting, transporting, treating waste and establishing end of waste status can be unnecessary. This is amplified when dealing with multiple government departments and regulators, particularly where there may be differences across nations with inconsistencies. Obviously, it is important to encourage waste material to be diverted from landfill and treated rather routed through EfW and we concur with the modelling and reports such as the Biomass strategy that have specified AD as the optimal route for food.

40.What are your views on the feasibility and usefulness of developing industry-wide guidance on design, maintenance and operation standards for AD plants?

For the reasons provided to questions 37 and 38, a document for the purposes of providing an understand to support officers in planning departments would be useful to assist with decision making. However, it is recognised that guidance is currently available through BAT, permits and regulators that will specify the requirements listed. This will include the recently published Methane Action plan form the EA[16]. Guidance is always useful provided it doesn't limit choice and innovation.

Certainly, accreditation schemes can be useful and currently available although again this is voluntary, and we are not suggesting this needed to be compulsory. Such schemes are run through REAL Biofertiliser Certification Scheme and ABDA but may also be done through competence training via CIWM. As with permitting in waste facilities there is a requirement to have competently trained personal on site with criteria such as holding a COTC or WAMITAB qualifications. However, some operators have developed their own training programmes to ensure staff are trained with sufficient competency.

An area which has been brought to our attention is via the HSE who are currently trying to develop an industry wide meeting to inform and discuss areas that can be improved for AD plants in light of incidents experienced over the past few years and following on from a recent round of targeted inspections. We can provide more details on this if required. This also follows recent developments through the ENA gas forum where competencies for the specific gas entry part of the AD plant was discussed with some concerns from GDNs about the required competency required for site operators which led to an update within the ABDA accreditation scheme but which should be restricted to just this scheme, especially with the potential for plant conversions.

41.What is the impact of grid capacity, now and in the future, on the development, operation and output of biomethane plants? Please outline where this differs between distribution and transmission level and between production technologies.

There have been concerns by biomethane producers that the ability to connect to the grid has too many barriers.

- It can be expensive which varies from the model used in France,
- Costs can vary significantly between networks, particularly on upfront costs.
- options for entry significantly restricted- can deter choosing the optimal plant location
- delays in getting the connection equipment as this is being managed by the GDNs and 3rd party contractors are not allowed.

There have also been some occasions when developers have seen projects abandoned due to the lack of grid capacity. This is exacerbated by the concerns by grid networks on whether the capacity will exist for the lifetime of the plant (~15Yrs). This is therefore already impacting on decisions for plant deployment and will only further impede ambitions if the grid network isn't provided with some assurance on longevity and government support.

There are a significant number of plants already on the system and there are concerns that the current capacity allowance for biomethane has already been used so new plants will struggle to connect without some intervention. This is combined by a shift in demand with a change to other more electric technologies for both domestic and industrial markets, particularly in new housing stock. However, these impacts are not similarly experienced through the transmission system.

And when they are connected there are further restrictions due to

- the overuse of propanation that can be required,
- the inconsistency of CV requirements regionally,
- Injection restrictions due to temporary /seasonal network constraints leading often to the need to flare which is detrimental to the plant operation/finances or Environment.
- The inflexibilities for CV quality cut off that means a lengthy restart and flaring.
- NTS Exit Meters turndown limit (going below this flow impacts the operation of odorant injection systems) can cause biomethane capacity issues for the GDN as, in essence, they have to maintain a minimum use of fossil gas

Most of these issues have already been identified in the Call for evidence and was discussed in meeting with DESNZ as a follow up to the Mid scheme review response.

42.Are there any steps the government and the industry could take so that biomethane producers could more easily access reliable grid injection capacity?

Our members include mostly producers but also some gas networks operators and REA sits on related forums. The issues experienced in some instances of inconsistent CV values (not only variable to the site but regionally) and what is considered by some members as unnecessary propanation can not only increase the operating costs but also can impact on the ability to inject and need to flare.

This is also the case for capacity, which has led to discussions for injection to the transmission system (NTS) rather than the delivery network (GDN) and solutions such as reverse compression. Industry has recognised the work that NTS have done in simplifying processes such as quality, metering and compression. Although there have been some investigation/projects completed with the DNS, such as with investigations for reverse compression and the despite the introduction of the UNC Mod 0808, industry are concerned this has yet to be implemented yet and a particular reluctance for support of reverse compression provision through third parties.

It's recognised that there needs to be a way forward for both parties to ensure that projects can not only access the grid but without the restrictions currently experienced. GDNs are investigating the options through projects including "Biomethane and hydrogen: maximising the role of green gas" exploring how biomethane can be managed and used in areas of the gas network which are converted to dedicated hydrogen.

In addition, the decision of hydrogen blending up to 20% has been made strategically so far pending safety discussions. Once this decision is made, which would be consistent with the approach on the continent, changes to the current GSMR regulations will need to be made and this may also include a decision to manage the control through the transmission system as a means to avoid double dosing. This would be a useful time to update the procedure for biomethane updates could be done at the same time with possible exemptions for the AD Industry. If agreed this could effectively reduce the FWAC with in the network which would mean that the Target CV will be less so no need to add Propane.

There is a need to work with GDNs to ensure that a consistent and timely approach is adopted. Any changes need the ability of the consumer to drive the timeline and there needs to be an escalation / audit mechanism for the GNO's to prevent blocking of projects on spurious grounds. The RIIO 3 mechanism might be an opportunity to review.

43.Which technologies, including reverse compression, could increase grid capacity access for biomethane plants and what are the associated costs and barriers? Please provide evidence for your suggestion, including details on costs where possible.

Reverse compression is a key technology that can help resolve the current issues and is something some of our members have been actively calling for and members such as CNG can provide more details on the specifics.

However, the additional one would be addressing the need to propanate which can be variable and costly for potentially little benefit given the dilution within the grid. If the mechanism for customer billing could be changed to address this issue, with a consistent approach across the UK, this would make a significant benefit to plant deployment and operational costs. There have been issues experienced with propane that has caused further problems for plant operators and there are concerns that imports of LNG may further impact this.

The other considerations would be the process of gas transmission pipeline under the Cadent SLO1 process. This has been well supported in the industry and successfully reduced the timeframes for projects from the monopoly provision required for compliance with the procurement legislation (from 3yrs down to ~12-15mths in some instances). It's also less technically challenging than reverse compression. SL01 self-lay process for high pressure and the ability for producers to self-lay at low pressure were fundamental in developing the industry we have today.

44.What steps need to be taken by the biomethane industry, gas networks or the government to reduce or remove the need for propane in preparing biomethane for injection to the gas grid while maintaining fair billing for gas customers?

The Thermal Energy Regulations provide consumer protections to maintain fair billing and are already in operation, therefore it may be possible to use the systems already in place rather than requiring biomethane to be enriched to the flow weighted average CV. If the Thermal Energy Regulations are not deemed to be adequate, then a review could be instigated by policy makers on possible amendments. It is true that different processes outside of the UK exist with some places such as in Ireland where no propanation is required.

Propane addition doesn't only have an environmental impact and a cost of materials, but it is also linked to a significant cause of downtime on existing operations. More evidence-based work to essentially change the flow weighted Average CV methodology which will be needed for Hydrogen blending. Installation of strategic smart meters and a new methodology should be a priority with the potential to eliminate the need for propane addition. Either that or we do large hub installs in the future to the NTS where propane isn't needed. Obviously the more complicated the process the harder it is to implement and blending as promoted particularly by SGN is a simple and low-cost option. There is also further ability to use AI to decide if blending for CV is possible without the need for instrumentation. Thyson also has software modifications that can provide further solutions.

45.What are you views on the best approach to enable optimal plant locations in the future framework? How might this differ across different production technologies?

In terms of location there is no optimal location that is favoured by particular production technologies and is more determined by land availability and the planning process. Feedstock

will be possible within a locality although the larger the plant the more diverse this can be and so has to be considered as determining factor. This is particularly the case where there may be plant collaboration with crop production such as for smaller and farm located AD, or with partnerships between a larger AD operator and agriculture. So, the constraint will be more in accessing the injection point and connection, especially as although compressed biomethane transport by road is feasible, it is less optimal than pipeline transmission, particularly with distances of more than 10 miles. There are no such restrictions for the NTS injection.

The GDNs will already have access to an area map for grid constraints that they will use to consult with an application request process however this may be in complete contrast to the beneficial location for plants. There are bottlenecks already acknowledged in certain parts of the country and particularly in the east of England where there can otherwise be most optimal for AD/plant locations. It is already recognised that It may be useful to collate a national map and maybe provide better access for applicants. A consistent approach will certainly help and work that has been completed through ENA and Gas Goes green has tried to bring about conformity with the application process.

Coordination and easing of processes could be done through the newly formed NESO with the aim to improve the opportunities for accessing the grid but also be used to investigate areas of the network which could be strategically improved to gain better access opportunities. This approach may also help identify where the transmission system may be a better option for injection. And additionally, it could further investigate how to instigate the development of a national billing strategy to resolve the CV constraints, through coordination of all the investigations already completed by GDNs and third parties.

This process could also capture those plants that have experienced issues with injection, (where this was the GDNs instigation rather than a fault of the operator) and investigate the work needed to improve access. Improvements may include a plan of how and where reverse compression can be implemented. This may need to be completed ahead of the submission for the RIIO 3. In the case of

Regarding the issues resulting from the NTS exit metering which measures flow from the NTS to the GDN the idea that biomethane should be restricted in favour of fossil gas seems to contradict the efforts to decarbonise and may limit a case for longevity of the gas grid. It has therefore been suggested by members that a Gas industry working group could be set up to investigate the impact.