Department for
Energy Security
& Net Zero

Future Policy Framework for Biomethane Production

A Call for Evidence

Closing date: 25 April 2024

February 2024

Any enquiries regarding this publication should be sent to us at:
greengassupport@energysecurity.gov.uk

Introduction

The UK has set an ambitious target to achieve net zero greenhouse gas emissions by 2050. Whilst a broad range of technologies and approaches will be required for the UK to reach net zero, biomethane's multifaceted benefits mean it can play an important role in this transition. In the Powering Up Britain: Energy Security Plan[1] government recognised the role that increasing domestic biomethane production can play to reduce carbon emissions, decrease reliance on fossil methane, and provide diversity in gas supply. The Biomass Strategy further emphasised biomethane's role in optimising the path to net zero cost-effectively by 2050 and increasing UK energy security.[2]

In the UK, biogas is primarily produced via Anaerobic Digestion (AD), a process whereby organic materials are broken down by microbes in the absence of oxygen. This biogas can be upgraded to biomethane and injected into the gas grid to directly replace fossil fuel methane. Biomethane is a flexible and adaptable fuel which can contribute to decarbonising hard-to-abate sectors including heavy transport and machinery, industrial processes, and agriculture. Due to its use of 'wet waste' such as unavoidable food waste, slurries, manures, and sewage feedstocks, AD provides a critical waste management tool and a solution to decarbonise the waste sector. In agriculture, AD could play a role in creating a circular economy by displacing fossil fertiliser with digestate, an organic fertiliser. Furthermore, it has the potential to deliver negative emissions, through carbon capture technology both at the point of production and point of combustion, which will be crucial to meet net zero.

Biomethane production for injection into the grid has, to date, been supported through the Renewable Heat Incentive (RHI) and, from 2021, the Green Gas Support Scheme (GGSS). The Mid Scheme Review Government Response for the GGSS[3] set out details on our intention to extend the scheme to 31st March 2028. The Renewable Transport Fuel Obligation (RTFO), GGSS and RHI, biomethane production are expected to support around 8 TWh of biomethane injections by 2030. However, the Biomass Strategy outlined that around 30 – 40 TWh of biomethane production in 2050 would help the UK achieve net zero cost-effectively, based on best utilising feedstocks such as animal slurries, food waste and maize, sewage sludge and the upgrade of landfill gas.

In the Energy Security Plan, government committed to consult on a future framework for biomethane to follow the GGSS. Given the important role biomethane can play in meeting net zero, we are now seeking to gather evidence to support the development of the future policy framework to overcome undue barriers for the market, increase investment and move the industry towards being self-sustaining. To maximise the potential of the market, the new framework will need to facilitate innovation, reduce costs, and accelerate growth in the sector.

This Call for Evidence is an important step to fully appraise the right policy interventions to incentivise the biomethane industry to scale-up and reach its potential. We welcome views from leaders in the field, including from anyone interested in sustainable heat, power, transport

[1] DESNZ (2023), Powering Up Britain: Energy Security Plan, https://www.gov.uk/government/publications/powering-up-britain/powering-up-britain-energy-security-plan
[2] DESNZ (2023), Biomass Strategy, https://www.gov.uk/government/publications/biomass-strategy
[3] DESNZ (2024), Green Gas Support Scheme: Mid-Scheme Review Government Response, https://assets.publishing.service.gov.uk/media/65b24b32f2718c0014fb1d61/ggss-mid-scheme-review-government-response.pdf

fuels, circular agriculture, and low carbon waste management. We are also keen to learn from other similar sectors and international comparators.

Contents

General information

Consultation details

Issued: 29 February 2024

Respond by: 25 April 2024

Enquiries to: greengassupport@energysecurity.gov.uk

Consultation reference: Future Policy Framework for Biomethane Production

Audiences: This consultation will be of particular interest to stakeholders in the biomethane industry. We expect some interest from farming groups, the waste sector, and Emissions Trading Scheme operators. We welcome views and ideas from any parties interested in sustainable heat, power, transport fuels, circular agriculture, and low carbon waste management.

How to respond

We encourage respondents to make use of the online e-Consultation platform, Citizen Space, to respond to this consultation wherever possible. This is the department's preferred method of receiving responses. However, responses submitted by email will be accepted. If responding by email, please use the template found on the GOV.UK consultation page.

Respond online at: https://energygovuk.citizenspace.com/low-carbon/future-policy-framework-for-biomethane-cfe

or

Email to: greengassupport@energysecurity.gov.uk

When responding, please state whether you are responding as an individual or representing the views of an organisation.

Please refer to Annex B: Question guidance before preparing your responses. Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the Freedom of Information Act 2000, the Data Protection Act 2018 and the Environmental Information Regulations 2004).

If you want the information that you provide to be treated as confidential please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable data protection laws. See our privacy policy.

We will summarise all responses and publish this summary on GOV.UK. The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

Quality assurance

This consultation has been carried out in accordance with the government's consultation principles.

If you have any complaints about the way this consultation has been conducted, please email: bru@energysecurity.gov.uk.

Executive Summary

This Call for Evidence summarises our initial thinking on a future biomethane policy framework to incentivise continued growth in biomethane production after the Green Gas Support Scheme (GGSS) closes. The Mid Scheme Review Government Response for the GGSS[4] set out details on our intention to extend the scheme to 31st March 2028. In this Call for Evidence, we outline our key strategic objectives and principles for the development of the framework, potential future incentive mechanisms and considerations of non-Anaerobic Digestion (AD) production methods, all underpinned by robust sustainability criteria. These could form the basis of any future support for the industry and will be developed by working closely with other government departments and industry.

Feedback and evidence received as part of this Call for Evidence will inform the policy development of the new policy framework ahead of a more detailed consultation.

Chapter 1 provides the rationale for continued government intervention and the priorities for the post-GGSS transition to reduce the risk of any hiatus in support between the GGSS and a future policy. It looks at the proposed core principles for designing a new policy framework, the technologies in scope and the barriers to investment. We expect the industry to move towards becoming financially self-sustaining and the framework will be developed with this in mind.

Chapter 2 outlines the strategic role of biomethane up to 2050, the multifaceted benefits of biomethane production in reaching net zero and energy security, and the potential of setting a biomethane volume target or ambition.

Chapter 3 outlines our current understanding of the costs and revenues associated with biomethane production from AD, including potential additional revenue streams. This chapter also includes the case for continued financial support for AD and other technologies and explores the potential incentive mechanisms to support them.

Chapter 4 highlights the current sustainability landscape of the production of biomethane via AD in the UK. This section also covers why it is critical that biomethane production contributes optimal carbon savings through robust sustainability criteria that minimise environmental impacts and accounts for the latest technologies and policies, such as carbon capture.

Chapter 5 considers plant standards, location and permitting of AD plants. There is a clear role for both industry and government to help determine the location of plants and this is an important consideration as we look to consider other technologies that could provide, for example, negative emissions through Carbon Capture, Utilisation and Storage (CCUS).

The deadline for responses to this Call for Evidence is **25 April 2024**. The department welcomes contributions from stakeholders with an interest in biomethane production as well as any parties interested in sustainable heat, power, transport fuels, circular agriculture, and low carbon waste management.

[4] DESNZ (2024), Green Gas Support Scheme: Mid-Scheme Review Government Response, https://assets.publishing.service.gov.uk/media/65b24b32f2718c0014fb1d61/ggss-mid-scheme-review-government-response.pdf

Chapter 1: Design and scope of a new framework

The rationale for continued intervention through a biomethane policy framework

There are currently over 700 Anaerobic Digestion (AD) biogas plants in the UK, with over 100 of these upgrading to biomethane for grid injection.[5] AD has two interlinked purposes that need careful consideration when determining future policy for biomethane. Firstly, AD is the preferred waste treatment process for organic waste: the 'upstream' benefits.

Secondly, the resultant biogas or biomethane from the AD process is used to decarbonise energy demand (other by-products of the process can bring additional benefits, which are discussed in Chapters 3 and 4): the 'downstream' benefits. Valuing this end-product is important to stimulate the necessary investment needed for AD infrastructure and, in this way, both the 'upstream' and 'downstream' benefits are closely linked (see Chapter 2 for more detail).

In 2022, 6.8 TWh of biomethane was domestically produced and then injected into the GB gas grid.[6] Most of this injection was supported financially by the Non-Domestic Renewable Heat Incentive (NDRHI) or the Renewable Transport Fuel Obligation (RTFO). These existing policies and the Green Gas Support Scheme (GGSS) are expected to support around 8 TWh of biomethane injections by 2030.[7] However, the Biomass Strategy outlined that around 30–40 TWh of biomethane production in 2050 would help the UK achieve net zero cost-effectively, based on best utilisation of feedstocks such as animal slurries, food waste and maize, sewage sludge and the upgrade of landfill gas. This is discussed in more detail in Chapter 2.

Other production methods are considered later in this chapter, and we request further information to help us to consider their potential role in the framework, based on their contribution to 'upstream' and 'downstream' carbon savings.

In March 2023, the Energy Security Plan committed to consulting on the introduction of a policy framework for biomethane to follow the GGSS.[8] The main objective of the framework is to facilitate a biomethane market where a sufficient volume of biomethane is produced to meet strategic aims, in a way that is environmentally sustainable, efficient, and commercially viable. We expect this to be contingent on relevant market frameworks reflecting the social value of biomethane or biogas, depending on the eventual end-use (which is discussed in further detail in this document):

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[5] ADBA (2023), Database of Active and Planned AD Plants in the UK, https://adbioresources.org/resources/ad-plant-database/

[6] Digest of UK Energy Statistics (DUKES): Chapter 6: statistics on energy from renewable sources, DUKES 6.4, https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

[7] Based on internal DESNZ modelling of biomethane injections from plants supported by the NDRHI and GGSS. Further injections may exist from plants not supported by these schemes.

[8] DESNZ (2023), Powering Up Britain: Energy Security Plan, https://www.gov.uk/government/publications/powering-up-britain/powering-up-britain-energy-security-plan

- **Sufficient volume:** sufficient to meet UK Carbon Budgets, enable optimal pathways to net zero and bolster security of supply.
- **Environmentally sustainable:** reduces carbon emissions after the whole life cycle of production and adheres to, and where possible advances, environmental standards, policy objectives and targets.
- **Efficient:** produced cost-effectively from a societal perspective, reflecting the cost of carbon, environmental and wider economic impacts. Production is optimally placed to maximise wider benefits to the energy system but also consider how it can play a role in the decarbonisation of hard-to-abate sectors.
- **Commercially viable:** the biomethane market is attractive to investors, and biomethane production becomes profitable and innovative without direct government subsidy.

To achieve this, the framework should aim to include measures that overcome undue barriers for market players, creating a more stable investment environment that moves the industry towards being self-sustaining in the future (see p.11 for more detail); and provide an adequate regulatory regime. This will be discussed in more detail in the following chapters.

What is the biomethane policy framework?

To work towards a self-sustaining market, we think a wider approach could be taken that can build a more supportive environment in which developers and their investors can operate. The framework could encompass four primary elements:

1. **The strategic role of biomethane**, which, building on the Biomass Strategy, we start to define in Chapter 2, including the potential for a production target or ambition.
2. **A set of guiding principles** which help to guide specific policy interventions and market development, e.g. barriers to overcome, which production methods should be within scope, and how to retain flexibility of end-use, which we discuss in this chapter.
3. **Specific policy interventions to accelerate market growth**, including those that help to reduce barriers to investment and harness opportunities for innovation, identify and bolster associated revenues and production costs, an effective and efficient planning and permitting regime, and a viable incentive mechanism. These issues are discussed in Chapters 3 and 5.
4. A robust **sustainability regime** which underpins the entire framework and which we start to define in Chapter 4.

This document aims to discuss these primary elements and lay out our initial thinking, as well as request evidence and insight from stakeholders to help further our understanding as we continue to develop the framework. The Mid Scheme Review Government Response for the GGSS set out details on our intention to extend the scheme to 31st March 2028.[9] We expect the future framework to be in place by then, avoiding a hiatus between policies. However, there

[9] DESNZ (2024), Green Gas Support Scheme: Mid-Scheme Review Government Response, https://assets.publishing.service.gov.uk/media/65b24b32f2718c0014fb1d61/ggss-mid-scheme-review-government-response.pdf

may be elements that can come into force sooner and we will look to clarify timelines in a later consultation.

Framework principles

To design an effective future biomethane policy framework (herein known as ‘the framework’), we have developed five key principles to guide policy development and set a benchmark for decision making:

Sustainability: in alignment with the priority use principles in the Biomass Strategy,[10] the framework should ensure that biomethane and biogas production achieves the right balance in use of feedstocks that produces optimal carbon savings appropriate to the end-use, contributing to the circular economy. All associated production processes from end-to-end should enhance environmental benefits, prevent, rectify or, at minimum, mitigate at source any environmental impacts, including pollution to water and air. The framework should ensure that AD production maximises its use as the optimal destination for waste. If feasible, the framework should incentivise optimal carbon savings through a robust and effective life cycle assessment.

Security: the framework should ensure that continued biomethane production contributes to a domestically produced energy mix, reducing the need for energy imports and therefore exposure to global pressures that contribute to rising costs for billpayers. It should help ensure a more predictable energy supply in the long-term that is less weather dependent, compared to solar and wind, for example. It should provide a stable and desirable destination for domestically produced biomass, particularly waste. It should ensure capacity in the gas and electricity grids that meet the necessary demand and supply, taking into account the strategic future of the grid. It should also consider any further public safety measures that could usefully be included.

Adaptability: the framework should consider how biomethane and biogas’ potential is best utilised across a range of end-uses, maximising carbon savings but also its potential contribution to decarbonising hard-to-abate sectors, such as agriculture. It should consider both AD and non-AD production methods, and their potential use for production of other fuels, including hydrogen. It should ensure by-products are utilised in the most efficient way and, where possible, help to decarbonise other sectors. Where feasible and desirable, it must look to maximise the use of existing infrastructure.

Commercial viability: the framework should ensure the UK maintains its position as a market leader in biomethane and biogas production, continuously improving its value as a contributor to the economy, including through innovation. It should encourage green taxonomy-compliant investment whilst minimising impact on bill payers, supporting the move to a self-sustaining market that is industry-led. It should help to improve plant economics by incentivising the utilisation of production revenue streams. It should improve routes to market by facilitating an efficient regulatory regime that properly accounts for carbon savings. If feasible, it should use a life cycle assessment to deliver any government support based on overall carbon abatement. This should include consideration of options for maximum carbon abatement but also savings that can be achieved in hard-to-abate sectors.

[10] DESNZ (2023), Biomass Strategy, p. 96, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1178897/biomass-strategy-2023.pdf

By ‘self-sustaining’ we mean an open market where investors have visibility and knowledge of market conditions to assess demand for biomethane or biogas, costs, performance, and rates of return. The market has a consistent regulatory and policy landscape, a stable supply chain with access to necessary skills and labour and receives broad social acceptance and understanding of the benefits of biomethane to consumers. This would create legitimacy, investment certainty and stability in a market that experiences growth and investment without direct government financial support.

Compatibility: the framework should achieve long-term compatibility with broader energy security and net zero policies, including the Biomass Strategy, waste and agricultural decarbonisation policy, the UK Emissions Trading Scheme (UK ETS), the future of the gas grid and hydrogen for heating. It should seek to facilitate and incentivise negative emissions, which are crucial to delivering net zero.

Q1a. Do you agree with the principles as a basis on which to develop the policy framework?

b. Are there any crucial factors missing from the principles?

Barriers to an improved investment environment

Key to building the framework will be identifying and overcoming significant barriers to market for developers. Previous interventions focussed on addressing the disparity between the costs of biomethane production compared to that of fossil fuel-derived gas. This has previously been the determining factor in the rationale for government support on the RHI and GGSS.[11] Further stakeholder engagement has highlighted other key barriers:

Government strategy or messaging

Stakeholders have said that the industry would benefit from improved join-up across government on biomethane and related policies, which would better incentivise investors.

- *We have set out in Chapter 2 and the Biomass Strategy our initial thoughts on the potential strategic role of biomethane and will set out further detail on the framework a future consultation.*

Uncertainty over demand for biomethane and future of the gas grid

We are aware that stakeholders feel the exact future demand for biomethane across all end-uses and the future role of the gas grid needs further clarity. There is also uncertainty in the supply of sustainable feedstocks, which is discussed in more detail throughout this document.

- *We have set out in broad terms our intent to mitigate this barrier in the ‘Adaptability’ and ‘Compatibility’ principles above. We will continue to develop these with teams across government alongside the feedback received through this Call for Evidence, particularly concerning how the framework will interact with future decisions on the gas grid.*

[11] BEIS (2021), Final Stage Impact Assessment: Green Gas Support Scheme/Green Gas Levy , p.11, https://assets.publishing.service.gov.uk/media/61422e36d3bf7f05aa5f92d8/green-gas-impact-assessment.pdf

Some environmental and societal impacts of biomethane and biogas production are not properly managed

There is perceived uncertainty regarding the sustainability of various feedstocks. We understand there is also a lack of clarity around the proper management of digestate and its use as an alternative to chemical fertiliser. There is also a need to ensure that its environmental impacts are mitigated, which can, in turn, impact an AD operator's ability to sell digestate as a fertiliser.

- *As part of the 'Sustainability' principle, we intend to develop a sustainability regime that builds on existing criteria (see Chapter 4) and the Biomass Strategy, including on the management of feedstock use and digestate. We also discuss planning and permitting as barriers in Chapter 5.*

Underdeveloped supply chain

Delays and a lack of resilience in the UK supply chain and accompanying skills base have been a limiting factor on the speed of deployment and the lack of capacity in the UK has the potential to hamper the future framework. This is exacerbated by the geographic disparity between feedstock location and injection points.

- *A key point of intervention in previous schemes incentivised use of waste and grid injection, meaning developers factor this in when determining plant locations.*[12] *This is discussed further in Chapter 5. We would also expect supply chains to respond to any further demand incentivised in future policy. We will consider in further detail as we develop the framework.*

Potential revenue streams are not utilised across the industry

We know that AD plants are able to create revenue streams from the CO_2 and digestate produced by the process, and through certification schemes and gate fees.

- *Working to utilise revenues from production is a crucial part of the 'commercial viability' principle. We intend to continue exploring these interactions as we develop the framework. These are discussed in more detail in Chapter 3.*

Grid capacity

Limitations on grid capacity in some localities have made it harder for plants to secure Network Entry Agreements with high enough injection capacities. Seasonal demand variations mean plants may be unable to inject at certain times, impacting plant revenues and increasing investment risk.

- *We intend to work across government on the strategic priorities for the future of the gas grid, including on grid capacity. We are also keen to understand further the possible role of reverse compression (see Chapter 5) and other approaches in helping to free available capacity for biomethane producers.*

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[12] In the 'Future Support for low carbon heat' Government response, we reiterated that grid injection was necessary to receive support and that a minimum of 50% of the energy output must have derived from waste feedstocks. This is a continuation of policy from the RHI. BEIS (2021), Future Support for Low Carbon Heat & The Green Gas Levy Government response to consultations, https://assets.publishing.service.gov.uk/media/60521e7ae90e07527ad40193/green-gas-levy-future-support-low-carbon-heat-govt-response.pdf

Propanation

Gas networks require the calorific value of biomethane to be increased before it can be injected into the grid, meaning producers must incur extra costs to add propane to it. This also reduces the carbon emissions savings of biomethane production. The calorific content is an important strategic issue for decarbonising the gas grid, and government has consulted on it, alongside other issues, in the Hydrogen Blending consultation.[13]

- *We intend to work across government on ways that more flexibility can be built into the gas system without compromising the fairness of billing and are keen to understand further the role of methane blending and other technologies in reducing propane use (see Chapter 5).*

Q2. Are there any other important current or future barriers to market growth not mentioned in this chapter 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.

Q3. In your view, what are the most important barriers to market growth that need to be addressed and why? Please provide supporting evidence.

Framework coverage

The RHI and GGSS are Great Britain-wide schemes to facilitate and encourage the renewable generation of heat and rely on specific powers from the Energy Act 2008 which extend to England, Scotland and Wales but not Northern Ireland. We are working with the Devolved Administrations to consider how a future framework could apply across the UK. This will be dependent on the types of polices being implemented to overcome barriers to market growth and achieve the framework principles.

Production methods under consideration

We expect that AD plants will deliver significant proportions of biomethane under the new framework and will continue to ensure effective waste management, however, we are considering expanding the scope of production methods for a future framework if commercial viability and potential can be proven.

This section outlines where we have evidence to suggest a production method may have a role to play in a new framework or where further evidence might be required to enable a fuller assessment. To inform this, the following assessment criteria have been considered:

- **Technical feasibility:** has the technology been proven to be technically feasible and how much further research and development is required?
- **Technical potential:** how much biomethane (and biogas where relevant) could potentially be produced by optimal feedstock utilisation up to 2050?

[13] DESNZ (2023), Hydrogen Blending Consultation, https://www.gov.uk/government/consultations/hydrogen-blending-into-gb-gas-distribution-networks

- **Greenhouse gas abatement potential:** can the technology deliver significant abatement when considering the whole life cycle of production?
- **Sustainability performance:** can biomethane be produced by this technology in a way that meets expected sustainability standards?
- **Commercial viability and cost-effectiveness:** how commercially viable is the technology and how does the cost of production and greenhouse gas abatement compare to other technologies (e.g. AD plants for biomethane into grid)?

AD plants for biomethane injection into grid

Data and modelling supporting the Biomass Strategy suggests there is significant technical potential from this technology out to 2050.[14] Support for AD plants has been limited up to 250,000 MWh/year per plant, to encourage geographical diversity in deployment. However, we will consider the case for supporting plants over 250,000 MWh/year, given the benefits these could bring in terms of economies of scale, subject to feedstock availability.

GGSS analysis has shown that supporting AD plants to produce biomethane creates a net benefit to society.[15] Alongside this we are currently conducting a life cycle assessment (LCA) study (see Chapter 3 for more detail), which will support our assessment of the carbon abatement potential and carbon cost-effectiveness of AD plants. The expansion of existing AD plants could potentially also deliver biomethane at a lower cost than building new plants under a new framework. We would welcome any additional evidence based on the proposed criteria, especially relating to the potential costs and benefits of developing larger-scale AD plants and the expansion of existing plants, and AD's potential to use Carbon Capture, Utilisation and Storage (CCUS) technology.

Combined Heat and Power (CHP) conversions and expansions

A large number of AD CHP plants produce biogas for electricity generation and receive support from the now closed Renewable Obligation (RO) or Feed-in Tariff (FiT) subsidy schemes. These subsidies will begin to run out from 2027 potentially making these plants suitable for upgrading their biogas production to biomethane (conversion) or adding new biomethane production capabilities to the existing CHP plant (expansion).

CHP conversions or expansions are not currently supported by the GGSS, although this was considered in the GGSS Mid-Scheme Review. The Government Response[16] outlined that there was insufficient evidence to change our overall analysis on the negative Social Net Present Values of AD CHP conversions during GGSS timelines if CHP plants continue running. There remains uncertainty as to whether sites are more likely to shut down or continue running when CHP sites' electrical subsidies end. For the expansion of non-GGSS AD sites, there are several non-monetary considerations such as significant restructuring of scheme regulations and operational complexities, which means that supporting these sites under the GGSS was not considered feasible. We committed to assessing the case to incentivise conversions (and expansions) as part of the future framework.

We believe that larger AD CHP plants would be more likely to do this, given costs may outweigh the benefits for smaller plants. We also see waste as being the predominant feedstock for AD CHP conversions or expansions and plants could potentially reuse their

[14] DESNZ (2023), Biomass Strategy
[15] BEIS (2021), Final Stage Impact Assessment: Green Gas Support Scheme/Green Gas Levy
[16] DESNZ (2024), Green Gas Support Scheme: Mid-Scheme Review Government Response

existing infrastructure and equipment to deliver biomethane at a lower cost than building a new plant. Assessing the technical potential and carbon abatement potential is complex and further evidence on the commercial viability and carbon abatement potential is required to complete a full value for money assessment. This would include consideration of any plants that fall outside the remit of receiving government subsidies.

Small-scale / on-farm AD

Small-scale AD plants process waste and produce biogas or biomethane for use in transport or to produce electricity and heat for onsite use; they typically do not inject into the grid. A type of small-scale AD could be on-farm, whereby farm-generated agricultural waste is processed and used for transport or to generate electricity and heat for on-site usage. Alternatively, in some cases it could be upgraded into biomethane for grid injection. According to the Department for Environment, Food and Rural Affairs' (Defra) farm practice survey in 2023, 9% of farmers used AD to process waste, crops or other feedstocks, and this is a growing technology, with usage having increased from 5% in 2018.[17]

The market is seeing more innovative and cost-effective technologies in this space, such as modular AD systems, making quicker deployment on farms more feasible. Processing manures and slurries on farms is a beneficial waste management tool and means that digestate can be returned directly to land as an organic fertiliser where there is crop and soil need which can have sustainability benefits (see Chapter 4 for more detail). Developing a circular economy is a key government objective where small-scale AD could play an important role.

Further evidence is required to fully assess the commercial viability of small-scale AD and how delivering optimal sustainability measures can strengthen the case for cost-effectiveness.

Advanced Gasification Technology

Advanced Gasification Technologies (AGTs) deploy a controlled process involving heat, steam, and oxygen to convert biomass or waste into synthesis gas (or syngas). Syngas is a mixture of gases, which can be used to generate power, heat, and fuels such as biomethane, hydrogen and ethanol.

The maturity level of the technology depends on the specific AGT, but in general, a complete system has not yet been demonstrated at commercial scale in the UK. Further evidence and development will be required to understand how this scale can be achieved in a cost-effective manner, which DESNZ is already supporting through a life cycle assessment study.

The Biomass Strategy details the potential for gasification to play an important role in producing biomethane by 2050, subject to demonstrable scale-up and cost-effectiveness. Gasification utilises different feedstocks to AD, and therefore provides additional technical potential for biomethane production that does not crowd out AD feedstocks. Based on illustrative scenarios included in the Biomass Strategy, municipal solid waste and waste wood feedstocks could theoretically be used to produce between 0-13 TWh of biomethane by 2050. However, this does not account for potential future competition that could arise should these feedstocks be utilised for other purposes e.g. hydrogen or sustainable aviation fuel production.

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[17] DEFRA (2023), Farm practices survey February 2023 - greenhouse gas mitigation – Anaerobic Digestion, https://www.gov.uk/government/statistics/farm-practices-survey-february-2023-greenhouse-gas-mitigation/anaerobic-digestion

Further evidence is required on the future commercial viability of this technology, in particular, evidence on the best end-product to produce via gasification (e.g. biomethane, hydrogen etc.), including the viability and potential attractiveness for plants to change the end-product over their lifetime, depending on the demand for different fuels.

Landfill gas capture and upgrading

Biodegradable waste deposited in landfill sites produces landfill gas (LfG) via naturally occurring anaerobic digestion. This gas is predominantly methane and carbon dioxide and accounts for over 3% of the UK's total greenhouse emissions[18]. This gas can be captured and upgraded to biomethane. Any site regulated under the Environmental Permitting (England and Wales) Regulations 2016 is required to capture and manage LfG.

Captured LfG has historically been used to generate electricity. Sites that generate electricity by combusting methane are currently supported by the RO which closed to new entrants in 2017 with contracts coming to an end from 2027.

In 2021, 58% (732Kt) of methane was captured by landfill sites[19], showing there is scope for this to be increased. The Environmental Services Association has set a methane capture target of 85% by 2030.[20] Although there are plans in place to minimise biodegradable waste being sent to landfill, LfG could continue to be produced from previously deposited materials for the next 30 years.

Further evidence is required to understand whether including LfG upgrading to biomethane would represent value for money under a future framework, relative to other technologies, and how this would be impacted by the anticipated reduction in waste being sent to landfill.

Other technologies

There are a range of other biomethane production technologies available, for example direct methane capture from slurry lagoons and e-methane. Direct methane capture from slurry lagoons can be sold into the grid or used on-site and delivers upstream emissions savings, alongside potential income streams for farmers. E-methane is produced in two stages; hydrogen is produced using electrolysis, which is then reacted with CO_2. If renewable electricity is used to produce green hydrogen, and the CO_2 is biogenic or captured from the atmosphere, the resulting e-methane has the potential to be carbon neutral. Although there are examples where e-methane is operational, we have yet to see this being deployed at a commercially viable scale and we are aware that the cost per unit produced is high.

Innovation

Any post-GGSS support is likely to focus on biomethane production with commercially available technologies. However, it may be beneficial for some areas of biomethane production technologies that are not yet commercially viable to benefit from government innovation support at an earlier stage of development. Example areas of innovation might include production yield, fugitive emissions, ammonia stripping, plastic contamination, and increasing

[18] DESNZ (2024), 2022 UK greenhouse gas emissions: final figures – data tables, Table 1.2, https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2022
[19] DESNZ (2023), Biomass Strategy, p. 80
[20] ESA (2021), Executive Summary: A net-zero greenhouse gas emissions strategy for the UK recycling and waste sector, p.20, https://www.esauk.org/application/files/5316/2496/7074/ESA-Net-Zero-Full-Report.pdf

the usefulness of digestate as a fertiliser. Funding already exists for research and development.

There may be other production methods that warrant consideration for the future framework, such as electro-methanogenesis reactors, which we know are in early trial stage funded by DESNZ under the Energy Entrepreneurs Fund,[21] and we would be keen to receive evidence on these and other technologies with reference to the assessment criteria above.

Q4. Are there any production methods that could have significant potential which are not included in this chapter?

Q5. Please provide evidence related to the outlined assessment criteria for any of the production technologies listed in this chapter (or for any additional technologies not included).

[21] DESNZ (2017), Recipients of Energy Entrepreneurs Funding, https://www.gov.uk/government/publications/recipients-of-energy-entrepreneurs-funding

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

A collectively agreed strategic narrative on the benefits of biomethane production and its potential contribution to meeting net zero and energy security is a vital part of a holistic policy framework for biomethane. Where there is demand for gas across the economy, biomethane has a role to play in decarbonising this fuel supply, alongside providing a crucial waste management service. It also diversifies national gas supply with a home-grown renewable gas, thereby bolstering energy security. Biomethane production can be deployed at scale to deliver carbon savings without requiring end-user behaviour change or infrastructure investment. Biomethane production methods also have high potential in the future to deliver negative emissions as a form of Bioenergy with Carbon Capture and Storage (BECCS). BECCS is an engineered Greenhouse Gas Removals (GGR) technology where CO_2 is captured from a biogenic source and permanently stored.

The multifaceted benefits of biomethane production

Biomethane from AD delivers 'upstream' emissions savings and wider environmental benefits through its role as a waste management technology. When sent to landfill, or otherwise stored and disposed, organic matter such as unavoidable food waste, municipal biowaste, sewage sludge, or agricultural waste (manures, slurries), releases potent greenhouse gas emissions such as methane and nitrous oxide. As recognised in the United Kingdom methane memorandum[22], processing wastes via AD reduces these methane emissions, contributing towards the UK's commitments in line with the Global Methane Pledge.[23] For these organic wastes, AD is the preferred destination for optimal treatment, and it is therefore important to have the requisite AD infrastructure in place.

Biomethane has a range of possible end-uses that contribute to 'downstream' decarbonisation of various sectors of the energy system. These downstream benefits have historically been the focus of support mechanisms which have attracted continued investment into AD. This includes decarbonising heat for buildings, industry, transport, and power generation, and biomethane can also be used as a feedstock for a variety of industrial processes, as well as hydrogen production. Its flexibility as a fuel provides valuable optionality across end-uses, which could be adapted based on a context that will inevitably change and evolve between now and 2050. On the other hand, this flexibility can also lead to a less well-defined role for biomethane, when compared to other renewable energy sources.

Capturing the biogenic CO_2 removed from biogas as part of the upgrading process to biomethane could result in even greater carbon savings. With the installation of CCUS technology, plants could capture the vented CO_2 and turn AD manufacturing into a negative emissions process, subject to constraints such as being of sufficient scale to make it viable, and onward transport and storage of the CO_2.

[22] United Kingdom methane memorandum (2022), https://www.gov.uk/government/publications/united-kingdom-methane-memorandum
[23] Global Methane Pledge https://www.globalmethanepledge.org/

As well as biomethane and biogenic CO_2, the AD process produces digestate. This organic material is what remains of the biomass after the digestion process and can, in some cases, be used to supplement or replace fossil-derived fertiliser, depending on its nutrient content and other factors. This makes AD a key part of the circular economy approach and aids the closing of nutrient cycles where possible. In this way, waste streams produced directly from agriculture (e.g. slurries and crop residues), food waste, sewage sludge, and sustainably grown energy crops can be processed to deliver renewable energy before being returned to the soil as a fertiliser. However, this can only be achieved by best practice nutrient management planning, low emission storage and application techniques, and the correct regulatory approach to mitigate environmental risks associated with this resource. These are primarily around nutrient impacts, available land bank and contaminants, which the biomethane policy framework should account for as part of a holistic approach. Further detail is set out in the 'Digestate' section of Chapter 4.

Biomethane production also contributes towards the development of renewable energy supply chains. Our analysis suggests that over two thirds of existing biomethane plants are located in rural areas, with 80% of all GB plants located in areas with a lower-than-average Gross Value Added.[24] Supporting this industry therefore benefits the economy by creating jobs, developing net zero skills in the workforce, and helping to diversify and grow the rural economy.

Finally, if feedstock is sourced domestically, biomethane also contributes to increasing energy security by virtue of being produced domestically, sustainably, and delivering steady production volumes, provided feedstock supply is stable.

The Biomass Strategy and biomethane's role for net zero

In August 2023, the government published its Biomass Strategy. This Strategy reiterates the government's firm commitment to biomass sustainability and considers how this resource could be prioritised strategically across the economy to help achieve our net zero target, and wider environmental and energy security commitments.

The Strategy recognised the benefits of biomethane, as summarised above, and set out the potential role that biomethane can play both in meeting net zero by 2050, and in energy security.

End-use

As biomethane can be used flexibly across many different end-uses – heat, power, industry, transport, agriculture, and hydrogen production – it has the potential to help decarbonise multiple sectors. As referenced above, this flexibility is valuable as it enables us to adapt to an evolving context that, by 2050, will not look precisely as predicted now. Demand for gas will decline in the transition to net zero, but where there is ongoing demand for gas across the energy system, biomethane represents a renewable alternative, which can be used in conjunction with, and as a replacement for, quantities of natural gas.

Biomethane's optimal end-use will therefore likely change over time but its flexibility as a fuel provides valuable optionality:

[24] BEIS (2021), Final Stage Impact Assessment: Green Gas Support Scheme/Green Gas Levy, p. 77

- As we transition to net zero, we will continue to rely on the gas grid for energy. Modelling up to 2035 (based on the Carbon Budget Delivery Plan) shows biomethane decarbonising users of the gas grid, such as heat, industrial processes, and power.
- Beyond 2035 to 2050, the role of biomethane for heating buildings will be contingent on future decisions on the role of the gas grid and heat decarbonisation. Biomethane's role in decarbonising heat in buildings will likely decrease as other renewable heat technologies play a much larger role. By 2050, in some pathways, biomethane could be used to deliver peaking power requirements, combined with carbon capture and storage (CCS) technology.
- Biomethane can also play a role in decarbonising transport in the transition to net zero and prior to other technologies such as electrification becoming widely available. This is reflected in the fact that biomethane is currently helping to decarbonise transport through the Renewable Transport Fuel Obligation (RTFO).

Feedstock utilisation

Biomass Strategy modelling of illustrative scenarios to meet net zero cost efficiently suggested that, by 2050, all animal slurries, food waste and sewage sludge should be used to produce biogas or biomethane via AD, alongside the upgrade of landfill gas to biomethane. The UK should maximise the emissions savings associated with optimally treating these wastes, much of which is unavoidable or difficult to reduce. Additionally, in some of the illustrative scenarios,[25] some lignocellulosic (plant-based biomass) feedstocks are prioritised for gasification-to-biomethane coupled with CCS.

Biomethane production volumes

Based on assumptions about the availability of these feedstocks, around 30-40 TWh of biomethane was produced in the Biomass Strategy illustrative scenarios for a net zero UK energy system in 2050. The analysis shows a core 30 TWh of AD and landfill gas biomethane production across each pathway, with additional production coming from gasification to biomethane BECCS in certain scenarios. The modelled 30 TWh figure assumes that in 2050 all AD biogas and landfill gas is upgraded to biomethane, where in practice it may be the case that some biogas use on-site for power and heat generation remains. It should be noted that this modelling does not account for all possible constraints on scaling up biomethane production in the right locations to utilise these feedstocks. In addition, as set out in the Biomass Strategy the potential future availability of sustainable biomass to the UK is subject to uncertainty, which we will need to continue to monitor, retaining flexibility to adapt as circumstances change. With any increase in biomethane production comes an increase in digestate, which must be managed appropriately to maximise benefits and mitigate risks; more detail is provided in the 'Digestate' section of Chapter 4.

Production methods

The Strategy envisages AD remaining the dominant production method. However, emerging technologies to upgrade landfill gas to biomethane, and the gasification of lignocellulosic biomass have the potential to be important contributors, subject to future technological development and cost-effectiveness considerations.

[25] DESNZ (2023), Biomass Strategy, Chapter 5, p.94

Carbon capture

The Biomass Strategy has illustrated how Bioenergy with Carbon Capture and Storage (BECCS) will be critical to delivering net zero as a source of the negative emissions that are required to offset hard-to-abate sectors. Biomethane has the potential for carbon capture at both the point of production, i.e., at AD plants, but also at the point of use i.e., if biomethane is burnt and electricity or heat is produced. New AD plants can be built with carbon capture in mind, and some existing plants are retrofitting this capability. In the near-term this is largely targeted at the CO_2 usage market, which is presently more developed and accessible for AD plants than the carbon storage market. In this way, future-proofing biomethane production processes with carbon capture capabilities could be both economically sustainable and produce carbon savings.

Production targets

The government currently does not specify a production target of annual biomethane by a specific date. Instead, expected deployment, and therefore production, is published for biomethane support schemes. For example, the GGSS is expected to support 3.3 TWh of annual biomethane production at its peak (by around 2033/34).[26]

We would like to gather evidence on whether a production target or ambition would be valuable, and if so, how that target should be defined. Potential approaches to some of the different elements of a production target are set out below:

- **Time horizon:** the ambition could be over the short, medium, or long-term. A 2050 ambition gives clarity of the anticipated contribution to ultimately reaching net zero, but also has inherently greater uncertainty when compared to, say, a 2035 ambition. Staged production targets (e.g. yearly, or at set staging posts up to 2050) could provide the benefits of both but could be more complex to set in an accurate manner, and risk implying an unrealistic degree of precision.

- **Scope:**
    - **Geographic** – the RHI and GGSS are Great Britain-wide schemes, with the Northern Ireland government setting NI-specific policy around biomethane production. However, feedstock availability as modelled within the Biomass Strategy has been assessed across the UK, and a target for biomethane production may sit best at UK level, though policies supporting the ambition could continue to be devolved or joint.
    - **Subsidised vs. unsubsidised** – to date, biomethane has been produced primarily through some form of financial incentive provided by government (e.g. through the RHI, GGSS or RTFO). However, as markets are supported to value biomethane's social benefits (i.e. as a low-carbon source of energy), there may be the potential for 'unsubsidised' biomethane production to become more prevalent. In contrast to the status quo approach where government publishes

[26] Based on internal DESNZ modelling of projected GGSS AD deployment and biomethane injections, consistent with the most recently published scheme budget caps. DESNZ (2023) , GGSS budget caps, production factors, and inflation forecasts for 2024-2025, https://www.gov.uk/government/publications/green-gas-support-scheme-budget-management/ggss-budget-caps-production-factors-and-inflation-forecasts-for-2024-2025

projections of directly supported biomethane production, a holistic volume ambition would likely need to encompass the biomethane industry as a whole.

  - **Production methods** – a volume ambition would need to make judgements about the future development of the production methods outlined in Chapter 1, and what level of biomethane production is plausible from each.

- **Volume**: setting a volume ambition must start with the best, most up-to-date, feedstock availability data. This must take full account of economic and logistical constraints that derive from matching feedstock and plant location, given the dispersed nature of feedstocks. Such an exercise should also holistically assess the environmental benefits and risks of any given ambition, for example by recognising the accompanying increase in digestate. As referenced above, the Biomass Strategy showed a core 30 TWh of biomethane from AD and the upgrade of landfill gas in 2050 across each modelled pathway. Technical potential figures do not necessarily translate directly to a volume ambition, as they do not account for the affordability or practicality of scaling-up plant deployment that is able to access and process all available feedstocks. Likewise, some proportion of these feedstocks may, in practice, by 2050 still be used by smaller-scale AD plants using biogas on site to generate power and heat.

Q6. 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.

Q7. What might be the impact on the UK biomethane market if government were to set a form of biomethane volume target? Please provide evidence.

Q8. What are the benefits and risks associated with the different approaches (to Time Horizon, Scope and Volume) listed under the production targets section?

Q9. 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 this chapter?

Chapter 3: Accelerating growth of the sector

Revenues and costs from producing biomethane

Key to assessing the commercial viability of biomethane or biogas production and the potential for an incentive mechanism post-GGSS is to have a thorough understanding of the costs and revenues involved. Building on the costs discussed in Chapter 1, we are interested in better understanding production economics, particularly for biomethane production.

Biomethane production costs

AD plants carry significant upfront capital expenditure (capex) and ongoing operating expenditure. Based on previous evidence from the GGSS impact assessment[27] and the latest Annual Tariff Review,[28] we estimate that a typical 6 MW plant would incur capex of £17m and £1.6m in opex per annum. Opex for an AD plant is partially determined by the type of feedstock it treats, with varying costs involved in securing feedstock, any required pre-treatment, and post-treatment management. Certain feedstocks may be inherently more costly for one or more of these parameters. We also discuss processes that incur further costs throughout this document, including in Chapter 5, where planning, permitting and propanation are considered.

Other than the sale of biomethane, there are four potential revenues streams for AD plants, which could have a significant impact on whether an incentive mechanism is needed and, if so, its scale. Digestate is discussed in Chapter 4. Certification, the Renewable Transport Fuel Obligation and carbon capture are discussed below.

Green gas certification

A potentially important revenue stream is a certification market for biomethane. There is currently one industry-led biomethane certification scheme in operation, the Green Gas Certification Scheme (GGCS) run by Renewable Energy Assurance Limited. Using sustainability criteria from the RHI, the scheme verifies grid-injected biomethane with certificates in a way that guards against double counting injections. The value of these certificates is driven by market demand, such as gas suppliers who wish to offer consumers 'green tariffs' or organisations wishing to meet or demonstrate their carbon saving commitments. There is also a potential interaction with the UK Emissions Trading Scheme, which is discussed later in this chapter.

> **Q10.** 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.

[27] BEIS (2021), Final Stage Impact Assessment: Green Gas Support Scheme/Green Gas Levy
[28] DESNZ (2023), Green Gas Support Scheme (GGSS): Annual Tariff Review 2023, https://www.gov.uk/government/publications/green-gas-support-scheme-ggss-annual-tariff-reviews-and-tariff-change-notices/green-gas-support-scheme-ggss-annual-tariff-review-2023

Renewable Transport Fuel Obligation (RTFO)

RHI AD plants are eligible to claim Renewable Transport Fuel Certificates (RTFCs), the certification scheme underpinning the RTFO run by the Department for Transport, for the biomethane produced. The current RHI and GGSS legislation requires that biomethane producers can either claim on the RHI/GGSS or the RTFO in a given quarter, not both. This interaction was welcomed by industry as a useful option for additional or alternative revenue and we will consider how to develop this in the new framework.

Q11. 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.

CO_2 – Carbon Capture, Utilisation and Storage (CCUS)/Bioenergy with Carbon Capture and Storage (BECCS)

The biogas to biomethane upgrading process generates a high-purity (>95%) stream of CO_2 as a by-product, which can be efficiently captured, potentially resulting in additional carbon savings and a significant economic opportunity for AD plants and other biomethane production methods. Carbon capture is already used in the biomethane production industry by a number of plants supplying CO_2 into other sectors. It also represents an opportunity for AD biomethane to become a negative emissions process, by permanently storing the biogenic CO_2. However, there are barriers associated with the dispersed and small-scale nature of biomethane plants, when compared with larger operations in industrial clusters closer to potential sequestration sites.

In future, the Greenhouse Gas Removals (GGR) Business Model[29] could provide a suitable route to supporting carbon capture and storage (CCS) retrofit in existing AD facilities as well as new-build plants, potentially accelerating commercial deployment. It will not, however, support costs associated with utilisation. If support becomes available for AD plants via the GGR Business Model, consideration will need to be given to the interaction with any future financial incentive for biomethane production to avoid negative outcomes, such as double subsidy.

Q12. Please provide any evidence on the current or expected costs (capex and opex) and revenues relating to carbon capture on AD plants.

Q13. 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.

CO_2 from the AD process can also meet the required standards for use in food production. To address any perceived negative perception, the Environment Agency (EA) published a regulatory position statement (RPS) in June 2022 setting out conditions for treating, storing and using CO_2 from AD to meet food and beverage or industrial grade standards. [30]

[29] DESNZ (2022), Greenhouse gas removals (GGR) business models, https://www.gov.uk/government/publications/greenhouse-gas-removals-ggr-business-model.
[30] EA (2022), Treating, storing, and using carbon dioxide from anaerobic digestion: RPS 255, https://www.gov.uk/government/publications/treating-storing-and-using-carbon-dioxide-from-anaerobic-digestion-rps-255

Stakeholders have also stressed that the traceability of the feedstocks is an important aspect of determining whether CO_2 meets the food-grade specifications, which may in practice present a barrier to certain AD-derived CO_2 being used in food and drink.

Q14. 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?

Gate fees

Gate fees are typically characterised as payments to AD plants for waste collections and therefore are classified as a potential revenue stream. However, in some cases plants may pay for waste.[31] Gate fees are driven by demand, relative to supply, in specific geographical markets, and can therefore vary significantly across regions and over time. Contract lengths and energy prices can also be a key determinant of fees. Market intelligence suggests that, more recently, long-term contracts have been harder to secure, impacting on investment decisions, though we expect this to become easier as Defra's Simpler Recycling policy[32] and the GGSS extension comes into force.

Simpler Recycling will require the collection of food waste from all households, businesses and relevant non-household municipal premises in England. This will considerably increase food waste feedstock availability, which could have implications for the fees received by biomethane plants.

Q15. How can gate fees play a role in underpinning new biomethane capacity and what barriers must be overcome?

Costs and revenues of alternative production methods for producing biomethane

We are seeking to understand the associated costs of non-AD biomethane production methods and the subsequent non-biomethane revenue streams that may result from them. The next section asks for evidence and data on these production methods to assess the case for inclusion in the policy framework.

The case for a future incentive mechanism

Previous tariff-based support on the NDRHI and GGSS was viewed as necessary to address the relatively high operational costs associated with biomethane and to help grow the industry. As stated in the framework principles in Chapter 1, we intend to develop a framework that moves the industry towards becoming self-sustaining and taking ultimate responsibility for an enduring market for biomethane.

As Chapter 1 states, this will involve a holistic framework that sets out options for reforms in a range of areas, which will help achieve strategic aims but also recalibrate the costs and revenues inherent in producing biomethane or biogas, helping to reduce the disparity in overall production costs between biomethane and fossil-fuel gas. But it is also incumbent on any

[31] WRAP (2023), Gate Feed report 2022-23, https://wrap.org.uk/resources/report/gate-fees-report-2022-23
[32] Defra (2023), Simpler Recycling, https://www.gov.uk/government/news/simpler-recycling-collections-and-tougher-regulation-to-reform-waste-system

future incentive mechanism, and the broader framework, to leverage market forces that provide better value for money. This should include driving down costs of production, either through innovation or scale of production. Similarly, the uptake of new production methods may provide a lower-cost pathway to net zero if they can viably produce biomethane on a commercial basis in the future. Because of these factors, we expect any future incentive mechanism that forms part of the framework will move away from tariffs and instead use a market-based mechanism that better prepares the industry to bear responsibility for its long-term growth.

AD

Based on evidence underpinning the final GGSS Impact Assessment[33] and our most recent Annual Tariff Review,[34] preliminary scenario analysis of different costs and revenue streams has been undertaken to understand whether continuing support is needed in the future for AD plants. This analysis tested whether AD plants could potentially be commercially viable without support under many different combinations of assumptions and scenarios for each cost and revenue stream. Different hurdle rate thresholds were also considered. [35]

This analysis suggested that AD plants would be commercially viable without financial support under some of the scenarios tested. Most scenarios require gas prices to be ‘high’, but where there are lower gas prices, they can be partially offset by increased revenues elsewhere, such as higher Green Gas Certificate prices, though this by itself would not be enough to provide commercial viability in most of the tested scenarios. Similar conclusions were drawn across all hurdle rates tested (between 8 – 14%), as shown in Figure 1. Additional revenue sources not included in this analysis that further value greenhouse gas abatement and sequestration could significantly increase the number of scenarios where AD plants are commercially viable.

This preliminary analysis indicates that a combination of costs and revenue factors must be achieved to ensure AD biomethane is commercially viable and self-sustaining, the prices of which are primarily driven by market forces. These conditions create uncertainty and indicate that further government action through a framework to replace the GGSS is likely to be needed to meet a potential biomethane volume target or ambition.

[33] BEIS (2021), Final Stage Impact Assessment: Green Gas Support Scheme/Green Gas Levy

[34] DESNZ (2023), Green Gas Support Scheme (GGSS): Annual Tariff Review 2023

[35] Hurdle rates are the minimum required expected rate of return on investment in order for a project to go ahead. Testing different hurdle rates accounts for potential differences in investment risk appetite

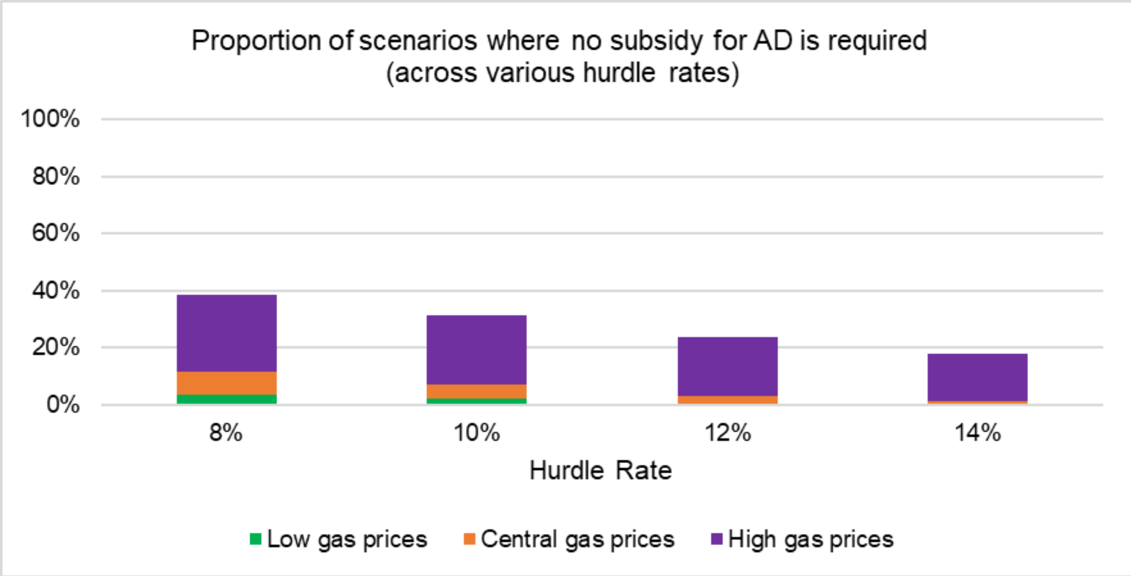

Figure 1: Proportion of scenarios tested where no subsidy for AD is required, split by hurdle rate and gas price scenario. For all hurdle rates, where a plant's hurdle rate is reached, high gas prices are required in the majority of scenarios without a subsidy (or other revenues to reflect carbon abated).

Gasification

As stated above, the BEIS Review and Benchmarking of Advanced Gasification Technologies (AGTs) assessed that the levelised cost of methane production by AGTs is significantly higher than the cost of production from natural gas, landfill gas and anaerobic digestion, when either wood or waste feedstocks are used.[36] Gasification should be able to access similar revenues to AD plants. Whilst gasification does not produce digestate, there is a potential revenue stream from selling by-product metals. Overall, this suggests that gasification is unlikely to be as or more commercially viable without support than AD, especially as it has not yet been deployed at scale in the UK.

Landfill gas

Biodegradable waste deposited in landfill sites produces gas via naturally occurring anaerobic digestion, which can then be upgraded to biomethane (see Chapter 1 for further information). The key costs involved with producing biomethane from LfG include the biogas treatment and upgrading costs, the cost of transporting the biomethane to the grid injection point (if injecting into the grid) and grid connection costs, if required. Despite the lower potential production scale compared to AD and gasification,[37] evidence suggests that producing biomethane via landfill gas could be cheaper than those two technologies but still higher than the cost of fossil-based natural gas.[38] Conversely, while there are no feedstock issues to be resolved per se, the upgrading process is more involved than for AD biomethane due to impurities in the raw gas and a material quantity of both nitrogen and oxygen, which need to be separated. This means that biomethane production from landfill might only be economically viable for the largest plants

[36] BEIS (2021), Advanced gasification technologies: review and benchmarking, https://www.gov.uk/government/publications/advanced-gasification-technologies-review-and-benchmarking
[37] As seen across the relative contribution of landfill gas across illustrative pathway in: DESNZ (2023), Biomass Strategy
[38] BEIS (2021), Advanced gasification technologies: review and benchmarking – Task 3 Report, https://assets.publishing.service.gov.uk/media/615aaa68d3bf7f56080b19d8/agt-benchmarking-task-3-report.pdf

with a sufficient gas production curve. The organic component of landfill, and therefore biogas production potential, will also decrease over time.

LfG has historically received support via the Renewables Obligation to produce electricity. The lower cost of producing biomethane relative to other technologies suggests that it could potentially offer greater competition on biomethane production costs. Further evidence and analysis are required to understand the relative carbon-cost effectiveness of supporting the upgrade of LfG to biomethane, and the level of support that would be required to enable commercial viability, if any. Also, we need to better understand the additional potential revenue streams from LfG-to-biomethane, such as certificates.

Other production methods

In Chapter 1 we discuss the case for including other production methods not listed in this section. The case for broadening the new framework to include other production methods based on similar analysis would also need to be considered. Given AD is the most established method of biomethane production, we expect that the need for continued support, or in some cases initiating support, is greater for less mature methods. We will work with industry and other stakeholders to determine the feasibility for inclusion of the other productions methods listed above, and what type of support, if any, would be most appropriate.

Availability and quality of evidence differs across specific future costs and revenues. We will look to improve on this where possible and welcome the provision of any evidence in this space. Further analysis will be conducted alongside the development of potential options for a future framework, to understand how to support cost-effective biomethane production whilst ensuring value-for-money.

Q16. Please provide further evidence on the potential costs and revenues for all production methods discussed in Chapter 1, where you have this information available.

Life cycle assessment (LCA)

Previous support for biomethane or biogas production was based on energy output. However, when developing the framework, further consideration will need to be given to how support can be offered based upon carbon savings, in keeping with the framework principles. As stated in the Biomass Strategy, we are commissioning research to create a methodology for conducting an LCA for biomethane production, initially for AD and gasification. We are keen to understand how an LCA could optimise carbon savings across the production process and associated supply chain. Therefore, subject to the outcome of the research, LCAs and measures of carbon saved could form the basis of a future incentive mechanism instead of energy output.

The UK Emissions Trading Scheme and biomethane: current interactions

The UK Emissions Trading Scheme (UK ETS) is a key part of the UK's approach to addressing climate change, setting a limit on emissions from the sectors covered and ensuring an appropriate price is applied to them. Carbon pricing is a cost-effective tool that will help fulfil our climate change objectives and reduce domestic emissions.

The UK ETS is a cap-and-trade system which caps the total level of greenhouse gas emissions, creating a carbon market with a carbon price signal to incentivise decarbonisation. Participants in the scheme are required to obtain and surrender UK ETS allowances (UKAs) to cover their annual greenhouse gas emissions.

The UK ETS covers the CO_2 emissions from any combustion of fuels on a site where combustion units have a total rated thermal input exceeding 20 megawatts. Operators using solid or gaseous biomass, or bioliquids for non-energy purposes, can apply an emission factor of zero for the fraction of the total fuel or material that is biomass; as a gaseous biomass fuel, this exemption applies to biomethane.

The majority of biomethane produced in the UK is injected into the gas grid where it is mixed with fossil fuel methane. Biomethane emissions from the combustion of this mixture are not, under the UK ETS rules, differentiated from fossil fuel emissions, and are charged a carbon price equivalent to that of pure fossil fuel methane. This means that operators are, in effect, required to cover the CO_2 emissions from the biomethane in this gas mix through the purchase and surrender of UKAs.

The potential case for change

To support the market growth envisaged in Chapter 2 we expect that some form of biomethane incentive mechanism will be required. In line with our principles for designing the biomethane policy framework, we are keen to explore the long-term viability of market-based revenue streams. We are exploring whether the UK ETS could be used to incentivise biomethane production. We are therefore seeking evidence on how the UK ETS could be part of a future policy framework for biomethane, and how this may affect both the biomethane and UK ETS markets.

We are looking into how the UK ETS treats emissions from combustion of biomethane from the gas grid and are focusing on two key considerations:

1. How the UK ETS accounts for the carbon-intensity and emissions of biomethane within the gas network grid (e.g. by potentially amending emissions factors); or
2. The potential for the UK ETS to enable operators to identify and account for the quantities of biomethane they source via the gas grid (e.g. the EU ETS approach which enables an installation to use biomethane purchase records to reduce their EU ETS allowances).

We are keen to understand the potential impacts that these considerations could have on UK ETS markets. We are particularly interested in understanding how relationships between UKAs and different approaches to accounting for biomethane in the gas grid may develop. We are also interested in the incentives that these relationships might offer to both UK ETS operators and the biomethane production market and the effects that these relationships may have on UK ETS markets.

We are seeking to understand the extent to which UK ETS interactions with biomethane in the gas grid may lead to additional revenue for biomethane producers, as a way to help address the revenue stream barrier identified above. We are interested in how UK ETS interaction with biomethane in the gas grid could complement other potential support models such as a Contracts for Difference scheme or Supplier Obligation.

Responses to these questions will be shared with the UK ETS Authority, which includes officials from the UK Government as well as those of the Devolved Administrations (Scotland, Wales and Northern Ireland), for further consideration.

Q17. 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)?

Q18. How could the UK ETS account for biomethane in the gas grid to make biomethane production more financially sustainable?

Q19. How might UK ETS recognition of biomethane in the gas grid affect UK ETS markets?

Incentive mechanisms

To be considered as part of the future framework, a financial incentive mechanism would need to meet strategic aims set out in Chapters 1 and 2, whilst also taking significant steps to move the industry towards being self-sustaining and free of financial government support. We are seeking to understand which market-based mechanism is best placed to meet these aims and enable biomethane to play an important role in delivering net zero and bolstering energy security.

The mechanisms under consideration are:

Contracts for Difference (CfD)

In a CfD, producers receive a fixed ‘strike price’, which is set during a competitive auction process that encourages bids as close as possible to a minimum viable price. When the market price (known as ‘reference price’) is below the strike price, the administrator will pay the producer the difference between the strike price and the reference price, whereas when the reference price goes above the strike price, the producer pays the difference to the administrator.

A CfD model in areas such as renewable electricity generation tends to incentivise production at large-scale, which is better able to leverage economies of scale. Evaluation of the GB CfD scheme for electricity generation suggested that it has successfully supported investment and cost reductions in offshore wind.[39] CfDs for biomethane production could produce similar results and therefore meet the tests of the commercial viability and security principles, but potentially at the expense of smaller-scale production. Other CfDs have used ‘auction pots’ to incentivise competition between technologies, which could also be considered if the framework expands in-scope production methods beyond AD.

CfD-facilitated large-scale production that signals the intent to significantly decarbonise the grid could have a positive impact on investor perception, addressing a key barrier to growth, but greater clarity is needed on how a CfD would provide a clear long-term strategy, though a clear target or ambition, as described in Chapter 2, may help. Scheme design for a CfD would also need to consider how it can utilise geographically dispersed feedstocks in line with strategic

[39] BEIS (2022), Evaluation of the Contracts for Difference Scheme, https://www.gov.uk/government/publications/evaluation-of-the-contracts-for-difference-scheme

aims and the sustainability principle. Use of a life cycle assessment may be able to help mitigate this issue, depending on its design.

Supplier Obligation (SO)

An SO sets an obligation level on energy suppliers to provide a proportion of renewable energy to their customers, either by setting a minimum percentage level of supply to the market or by setting a ceiling of ‘carbon intensity’ on the energy that is produced. For biomethane, either option could be underpinned by a tradable certification scheme that would prove compliance. Unlike a CfD, an SO would stimulate demand from the energy supplier side of the market.

SO schemes in other areas have focused on specific end-uses, for example the RTFO. The framework intends to have a flexibility of end-use in line with our strategic aims, so scheme design for any biomethane SO will need to take this into account, including future decisions on the gas grid. An SO might complement a framework that includes a production target of the kind outlined in Chapter 2, which would in turn be a positive step for providing a long-term signal for investment and, in part, for complying with the commercial viability principle. Conversely, SO certificate prices are market-led so there may be less revenue certainty compared to a CfD, though long-term Gas Purchase Agreements could be used to mitigate this. Scheme design would need to ensure that the intent to use a variety of feedstocks is met, which could in turn go some way to meeting the sustainability principle. This could be facilitated by use of a life cycle assessment, of which there is precedent on other SO-style schemes, including the RTFO.

Grants and loans

Defra offers grants, such as the Farming Investment Fund,[40] to help facilitate the decarbonisation and increased sustainability of agriculture. New options could be considered under Defra funds where there is a clear case to help farmers make upfront capital investments to transition to more sustainable practices and increase productivity.

Whilst grants and loans do not leverage market forces to drive down costs in the same way as an SO or CfD, they could be valuable for targeting hard-to-abate sectors, or feedstocks that may be neglected in a competitive market, which may also address the need to utilise dispersed feedstocks. Therefore, careful consideration would need to be taken to determine if grants or loans, as a standalone mechanism, could meet strategic and commercial aims around leveraging market forces.

Hybrid option

Given the intention that the framework should be adaptable according to strategic needs that may change over time, it may be appropriate to provide a flexible offer: the ‘Hybrid’ option. This could take the form of a ‘single pot’, where applicants submit a business case for a specific decarbonisation project to gain access to funding. Eligibility criteria would need to be determined but would reflect the framework’s principles and aims, as well as providing value for money. Alternatively, the framework could be implemented through an ‘action plan’: a suite of offers to address specific aims across the stated sectors in need of decarbonisation and/or bolster the uptake of a range of technologies. Either would work alongside regulatory and guidance improvements to overcome market barriers.

[40] Farming Investment Fund, https://www.gov.uk/guidance/farming-investment-fund

Given this is a relatively novel option for biomethane, a full assessment of this option against the strategic aims and objectives in Chapters 1 and 2 cannot be made without further developing how it would work in practice. That said, this option could be specifically tailored to resolve some of the tensions and trade-offs inherent in maximising biomethane's strategic role for net zero and energy security inherent in other options, as well as meeting many of the design principles and addressing barriers to growth. This, however, may come at the expense of clarity and long-term certainty for the industry. Furthermore, consideration would also need to be given to how to create a consistent sustainability framework for such a varied option that would meet the sustainability principle and be compatible with other relevant policies.

Q20. Which mechanisms are most likely to ensure we meet our strategic aims outlined in Chapter 2, and why?

Q21. Which mechanisms are most likely to comply with all the principles listed in Chapter 1, and why?

Q22. Which mechanisms are most likely to assist with overcoming the barriers to market growth listed above, and why?

Chapter 4: Sustainability

While we are clear that biomethane has an important role to play in reaching net zero cost-effectively across all likely decarbonisation pathways, we must ensure that our ambitions for the sector are underpinned by a core focus on sustainability, as reflected in our design principles (see Chapter 1).

This aligns with one of the key proposals from the government's Biomass Strategy to consult on developing a cross-sectoral biomass sustainability framework.[41] The framework will look to include common minimum requirements, such as criteria for waste, a cap on crop usage, efficiency and greenhouse gas (GHG) thresholds, but allow flexibility for sectors to set higher requirements and ambitions where achievable. The Biomass Strategy set out further detail on the anticipated elements of the cross-sectoral sustainability framework, which will be subject to consultation in 2024. These include actions relating to developing a common GHG emissions calculation methodology for biomass supply chains with comparable units and strengthening aspects of the land criteria based on latest evidence. As set out in the Strategy, the government's ambition is to remain at the forefront of sustainability across the bioeconomy, strengthening our already robust criteria, where required, to ensure consistency and continue delivering genuine GHG savings and in future, deliver negative emissions.

To ensure we can meaningfully contribute to the development of this cross-sectoral framework and consider areas for strengthening biomethane specific sustainability requirements, we have assessed the current sustainability landscape for biomethane or biogas production and identified opportunities for improvement. This chapter sets out the key areas where we have identified opportunities to improve or amend biomethane sustainability standards, primarily related to anaerobic digestion, and the evidence we need to inform that work.

Territorial extent of sustainability requirements

It should be noted that there are some differences in how the various aspects of biogas and biomethane sustainability are regulated across the United Kingdom; the future framework will need to take this into account and ensure alignment where possible for any amendments.

Feedstock priority use

A variety of feedstocks can be used to generate biogas and biomethane via AD. To assess the sustainability of the AD industry, it is important to consider how the choice of feedstocks used in AD can impact how sustainable the overall process is. We are considering the best approach to managing feedstocks in the future biomethane framework and are looking to gather evidence on the priority use of feedstocks in biomethane production. In this section, we have summarised the current feedstocks for which we hold data, our proposed feedstock sustainability assessment criteria, as well as relevant considerations and data limitations. We are seeking views on our proposed criteria and data to fill evidence gaps.

Criteria to assess feedstocks

The criteria set out below draw on the biomass priority use principles in the Biomass Strategy (i.e. sustainability, net zero, air quality, and circular economy). Future feedstock analysis will be

[41] DESNZ (2023), Biomass strategy

based on these criteria at a minimum, although we will keep them under review to strengthen or supplement as more information becomes available. They are:

Criteria	Relevance
Costs	Ensure the production of biomethane is feasible from a financial standpoint – includes gate fees, transport costs, production costs
Greenhouse Gas (GHG) Emissions	Reducing GHG emissions is at the centre of these policies in order to contribute to achieving net zero – includes upstream, bio generation and downstream
Air Quality Impacts	Important in considering the effects on local residents and biodiversity in line with key Biomass Strategy principles – includes particulate matter, ammonia, nitrogen oxide, sulphur dioxide, methane and non-methane volatile organic compounds (VOC)
Land Use	Opportunity cost of using the land for other purposes such as food production.
Water Quantity Requirement	Should minimise water use where possible.
Water Quality Impacts	Important due to its effects of the local community and biodiversity

Beyond these minimum criteria, we are also considering assessing feedstocks based on more specific criteria, such as biodiversity, soil contamination, and recycling rate impacts, depending on available data. We welcome views on these criteria and alternatives that we should take into consideration.

Q23a. Do you agree with the criteria set out in this chapter for assessing feedstocks?

b. Are there any additional criteria that we should consider for assessing feedstocks?

Current feedstock data

Below are feedstocks that we currently hold relevant data for, as well as a brief assessment of each, based on the sustainability criteria set out above:

- **Food waste:** offers upstream carbon savings from diverting waste from landfill, and at relatively low cost.
- **Cattle and pig slurries:** provide upstream carbon savings from diverting the waste from storage, reducing methane emissions.

- **Sewage sludge:** lacking evidence on upstream carbon savings, AD is a preferred waste-treatment method for sewage sludge.
- **Crop feedstocks:** we are aware that using crop feedstocks has benefits but also lacks upstream carbon savings as land and water use is required to produce this type of feedstock, but usually simpler to process and can have higher biogas yields than certain wastes.

We are aware that there are other feedstocks with the technical potential for use in AD and other biomethane production technologies. However, we currently have limited data for feedstocks beyond those listed above.

Q24. With reference to the feedstock sustainability assessment criteria set out in this chapter (or any other suggested criteria), please provide any data on AD feedstocks that you think we should consider in future policy.

Q25. With reference to the feedstock sustainability assessment criteria set out in this chapter (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).

Feedstock considerations

There are several considerations to account for when thinking about the best feedstocks to use in AD. While some of these are set out below, please note that this list is not exhaustive:

- **Feedstock availability:** this is the key dependency and could be a limitation within a future policy as preferred feedstocks may not be accessible for all AD plants across the country.
- **Feedstock type and usage:** given the biological nature of the AD process, it may not be possible for feedstocks to be used in a way that perfectly aligns with a prescriptive policy approach based on sustainability and might be incompatible with maximising biogas yields.
- **Geographical location:** if the AD plant is not located close to the feedstock source, transportation logistics may be challenging due to volume and weight of feedstocks.
- **Wider environmental considerations around energy crops:** we are aware of the benefits of using energy crops in AD such as the ability to decarbonise farming practices if used correctly. However, growing energy crops can take land out of food production, damage soils, and reduce opportunities for other uses which may have higher biodiversity or carbon sequestration value.

Policy options

It is important to ensure that the future framework encourages the uptake of sustainable feedstocks, and we have been considering ways to do this. Based on the current data we have, and policy considerations set out above, we have set out three potential approaches for feedstock prioritisation:

- **Adopt a waste feedstock threshold model.** We could require that a specific proportion of feedstocks must come from waste sources, with the conditions of any government support tied to meeting that threshold; for example, the GGSS requires that 50% of biogas yield comes from waste feedstocks. This could also include requirements around the proportions of domestic and imported feedstocks used. This approach would be relatively simple to implement and be familiar to the industry. However, feedback from the GGSS Mid-Scheme Review suggested that some participants find such thresholds unnecessary if limits are placed on overall biomethane greenhouse gas emissions.

- **Adopt a prescriptive approach to feedstocks under a new scheme.** We could set more specific thresholds on a per-feedstock basis, with conditions of any government support tied to meeting those thresholds. This could be an effective option to theoretically ensure that sustainable feedstock choices are always being made. However, there are likely to be various real-world challenges with this kind of approach, such as, but not limited to, lack of feedstock availability.

- **Encourage the use of sustainable feedstocks through target setting.** This could include implementing more stringent greenhouse gas emission targets and broader land use criteria, possibly going further than those set out in any future cross-sector biomass sustainability framework, with conditions of any government support based around greater carbon savings. This would actively encourage the use of feedstocks with a higher sustainability rating, depending on the targets used, but without restricting the individual mix of feedstocks used by AD plants. This would have the advantage of allowing AD plants to make feedstock decisions based on local circumstances. However, without firmer restrictions, it could lead to less sustainable feedstock choices being made by the market.

Regardless of the eventual approach to prioritising feedstocks, we are clear that all current and future biomethane producers should ensure that the food waste hierarchy is being followed when procuring feedstocks.[42]

Q26. What are your views on the approaches set out in this chapter for prioritising feedstocks? Are there any alternative approaches that we should consider for future policy?

Digestate

The AD process also produces digestate, an organic matter that can be used as a fertiliser due to its nutrient rich content. In this way, digestate has the potential to provide an additional revenue stream for AD operators, which could contribute to a more self-sustaining market, as well as providing farmers with a better way of recycling nutrients to their land. It can also be used as feedstock for gasification. We are, however, aware of longstanding issues that are currently preventing digestate becoming a viable revenue stream, including several environmental risks associated with its improper management:

[42] DEFRA (2024), Food and drink waste hierarchy: deal with surplus and waste, https://www.gov.uk/government/publications/food-and-drink-waste-hierarchy-deal-with-surplus-and-waste/food-and-drink-waste-hierarchy-deal-with-surplus-and-waste

- Environmental impacts include the ammonia released when the digestate is managed improperly during storage or while spreading to land; potential methane emissions during storage; the over-application of specific nutrients to the land bank and the impact that digestate can have on water courses including habitats sites, the catchments of which are already subject to nutrient neutrality; and potential plastic contamination from waste feedstocks. Digestate cannot always be simply used to displace other fertiliser products as their usefulness depends on crop and farm needs.
- The agricultural sector has concerns around its quality including the risk of plastic contamination. This is critical because the utility of the digestate post processing determines whether it will be used appropriately and can effectively displace other sources of fertiliser. BSI PAS 110 is intended to standardise the quality of digestate on the market;[43] however, some stakeholders have indicated that these standards are too low. This limits the market, and, in some cases, plants pay to have it taken away.
- The current Quality Protocol for waste digestate makes it costly to ensure it is fit for purpose. While necessary to ensure sufficient quality levels for digestate, the protocol's stringent standards may lead to increased costs for testing, treatment, and compliance. For example, regulated logistics requirements add costs, especially if it must be stored and treated for long periods before it can be safely spread to land.

It is important that the framework includes sufficient measures to mitigate these environmental impacts, given that an increase in digestate is an inevitable consequence of producing more biomethane or biogas via AD. The framework must also ensure that the benefits of digestate as a nutrient-rich fertiliser can be realised, emphasising its potential role as a valuable co-product rather than a waste to be dealt with. This includes digestate's proper treatment, transport, use, and disposal without impacting the environment or human health.

Digestate valorisation

The potential revenues from digestate are varied, ranging from being paid for the digestate by farmers to paying to dispose of it, and agreements to exchange it for feedstock. Therefore, we generally assume that sales of digestate currently hold little or negative value for AD plants but that this could change in the future should digestate become more widely used as a fertiliser. The framework will need to consider how to manage digestate in the future, including how its saleability may be improved. Encouraging the production and utilisation of quality digestate is an important step towards sustainability, and we are interested in seeking views on potential incentives to achieve this. Additionally, Defra intends to reform fertilisers regulations and put in place a conformity assessment framework for fertilisers. The framework will smooth the route to market for new and innovative products. This will provide farmers with a wider choice of more sustainable fertilisers. It will valorise fertilisers made from organic materials, opening the market to products that reuse nutrients. Defra's consultation on the new framework is planned for Spring 2024.

Q27. 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.

[43] BSI PAS 110: Producing Quality Anaerobic Digestate, https://wrap.org.uk/resources/guide/bsi-pas-110-producing-quality-anaerobic-digestate

Digestate and ammonia

The increase in AD over the last few decades has partly contributed to an increase in ammonia emissions, largely down to the processing and storage of digestate and its application to land.[44] Slurries and manures, which are commonly used as feedstocks for AD, are recognised as the main sources of natural ammonia emissions.

Ammonia emissions from digestate can lead to a variety of environmental issues. Ammonia is a gas that reacts with other air pollutants to form fine particulate matter, which affects respiratory health. Ammonia also causes acid deposition and eutrophication, which alter soil pH, nutrient availability, and soil health. This can reduce plant diversity and damage sensitive habitats, leading to biodiversity loss and affecting ecosystem function, including carbon sequestration in some habitats.

Beyond the environmental issues outlined above, as ammonia is lost from digestate the digestate becomes less nutrient-rich, and therefore, may be less efficient at fertilising soils.

Despite these concerns, there are a variety of ammonia abatement methods and technologies that can be employed as mitigations, some of which are already required under existing regulations (e.g. covering stored digestate). Abatement technologies we are aware of include ammonia stripping-scrubbing, nitrification-denitrification, acidification, gas-tight covers, and low-emissions spreading techniques.

A lot of work has already been done to identify the costs and ammonia abatement potential involved in these technologies. This includes the recent 'Identifying Impacts from Food and Farm Digestates' study which was produced by WRAP for BEIS/DESNZ. [45] The report concluded that digestate covers, which are already commercially viable, represent the most cost-effective form of ammonia abatement currently, but suggested that further information is needed about the costs and effectiveness of other ammonia abatement technologies.

As part of a future biomethane framework, we want to understand the barriers to uptake and explore opportunities for encouraging the wider use of these technologies across the AD industry. By having more consistent controls around digestate handling and processing, we can ensure that the environmental impacts of digestate are mitigated and potentially improve its viability as an additional revenue stream for AD operators.

Q28. 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?

Digestate and nutrient balancing

Beyond ammonia mitigation, there is a broader question of ensuring that digestate is being applied in the right quantities in areas that need organic nutrients to support crop growth and soil health. The focus generally rests on the three primary nutrients – nitrogen, phosphorus, and potassium – because of their relative abundance in plants. As crops grow and are harvested, the existing nutrients are gradually removed from the soil and over time will require additional nutrients to maintain or increase crop yield. In a circular nutrient economy, the focus

[44] NAEI, Pollutant Information: Ammonia, https://naei.beis.gov.uk/overview/pollutants?pollutant_id=21
[45] WRAP (2023), IDENTIFYING IMPACTS FROM FOOD AND FARM DIGESTATES FINAL REPORT, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1145312/identifying-impacts-from-food-and-farm-digestates.pdf

is on closing the loop, ensuring that nutrients are used efficiently, recycled, and reintegrated into the agricultural system. We understand that there are concerns about nutrient loading in areas where soils are already beyond capacity of nitrogen and phosphorus. These lead to adverse impacts on water quality and soil health and need to be properly managed as part of a future biomethane framework.

For example, the framework could encourage the movement of feedstocks and/or digestate from overloaded areas to those with a nutrient deficit, by transporting digestate and using it as a fertiliser elsewhere; this could support action to reduce nutrient pollution in the catchments of habitats sites adversely affected and subject to nutrient neutrality advice, as progress is made towards restoring these sites to a favourable environmental condition. However, this would need to be balanced against the wider environmental impacts associated with transporting large quantities of feedstocks or digestate around the country. Additionally, innovative technologies that extract and concentrate vital nutrients from digestates may have potential to be supported under the framework to increase the opportunities for a more circular economy for nutrients. This could allow for the creation of more consistent soil enrichment products that could be transported and applied in nutrient deficient areas. Furthermore, we understand digestate demand from farmers will vary throughout the year, so digestate storage infrastructure would need to be a consideration.

As the future biomethane framework will likely lead to the production of more digestate, we must ensure that we are properly considering the issue of nutrient balancing and the impacts on the available landbank. Further work is needed to determine the likely volumes of additional digestate and sustainable pathways for its utilisation or disposal.

Q29. 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.

Q30. 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.

Digestate and plastic contamination

Plastics in waste feedstocks present substantial challenges in the AD process due to their resilience and resistance to breakdown. Plastics in digestate render it unsuitable for use as a fertiliser or soil conditioner.

The presence of plastics in food-waste-derived digestate can compromise its quality for land use as the plastics not only detract from the nutrient value of the digestate but also pose risks to soil health and crop growth, potentially introducing micro-plastics into the food chain as well as the wider environment. An understanding of measures to effectively address this issue is required and we are interested in seeking views from the industry on preferred methods of removing caddy liners and other food packaging from food waste. Evidence collected here will also inform ongoing evidence gathering within Defra on this issue.

Q31. Can all AD food waste plant operators accept and process food waste with caddy liners or other food packaging included?

Q32. If liners and food packaging are included with food waste, what material types **a)** are AD plants able to process? **b)** are preferred? **c)** are least preferred and why?

Q33. 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)

Methane emissions

Methane has 80 times the warming power of carbon dioxide over the first 20 years after it reaches the atmosphere and is reportedly responsible for roughly 30% of global warming since pre-industrial times.[46] While CO_2 has a longer lasting effect on warming, methane can affect warming in the near-term. As methane takes about a decade to break down, reducing methane emissions in the near-term can contribute towards preventing global temperature increases.

The UK is fully supportive of rapid national and global action to reduce short-lived climate pollutants, including methane, as part of our commitment to limit global warming to 1.5 degrees. We continue to progress the global and collective commitment made under the Global Methane Pledge at COP26 (to reduce global methane emissions by 30% by 2030 compared to 2020 levels).[47]

Biomethane from AD directly contributes towards tackling methane emissions through its role as a waste management technology. Processing organic wastes via AD leads to greater emissions reductions than sending them to landfill, or otherwise allowing them to decompose and emit methane into the atmosphere. However, we have identified the potential risk of fugitive methane emissions from the biomethane production process, particularly from AD, as an area that should be addressed as part of the future biomethane framework. Excessive emissions can negate the carbon savings of biomethane and lower overall biomethane yields, reducing potential income for producers.

We recently commissioned a study on methane leakage, which was carried out by the National Physical Laboratory (NPL). This project was focused on field testing by employing measurements in real production environments at a small sample number of different AD sites, which is the most reliable approach to validate fugitive methane emission levels. The methodology used for measurements was developed by NPL, building on evidence from several sources on best available technologies, including Ricardo's 2016 Energy & Environment report.[48] The measurement campaign includes both a short-term and long-term

[46] EDF (2023), Methane: A crucial opportunity in the climate fight, https://www.edf.org/climate/methane-crucial-opportunity-climate-fight
[47] Global Methane Pledge https://www.globalmethanepledge.org/
[48] Ricardo Energy & Environment (2017), Methodology to Assess Methane Leakage from AD Plants, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786756/Methodology_to_Assess_Methane_Leakage_from_AD_Plants_final_report_part1.pdf

monitoring phase. The results of the first phase (short-term monitoring) will be published in due course.

Beyond this, in the short-term, we aim to gain a quantitative understanding of the impact of fugitive methane on the overall GHG balance of an AD site. We will also explore mitigation measures and best practice around plant design and operation for both point and diffuse emission sources with an aim to assess the effectiveness of those measures on leakage prevention. In the longer-term, we will build on the research carried out by NPL to capture a larger sample of UK AD sites with a wider representation of different feedstocks, upgrading technologies and other site characteristics, while also undertaking a techno-economic assessment of methane mitigation measures. Through this Call for Evidence, we also hope to gather evidence on the costs and benefits of implementing leak detection and repair (LDAR) programmes at AD sites, which involves establishing a plan for detecting and mitigating the release of volatile organic compounds, such as methane.

Work is already under way within government to address the risk of methane leakage from AD sites. The Environment Agency (EA) has developed and intends to publish a methane action plan which sets out their approach to tackling methane emissions across the sectors they regulate, including waste feedstock AD plants such as those under the GGSS. We would encourage the biomethane industry to engage with the EA as this work develops to ensure that industry and government take the right steps to effectively reduce methane emissions as much as possible. There is also work under way to address methane emissions from the gas distribution network, including any new innovative methods of detection. We will continue to monitor this work, should any lessons be drawn from it for biomethane production.

Q34. Please provide any evidence you have on the benefits and costs of detecting, monitoring, or repairing methane leakage from AD sites.

Q35. What challenges might the biomethane industry face if future government policy sets a limit on fugitive methane emissions from biomethane production?

Non-AD biomethane production methods and sustainability

As discussed in Chapter 1, we are considering the case for including a variety of non-AD biomethane production methods in the policy framework, including their sustainability performance. At this stage, we have a limited understanding of the sustainability considerations for such technologies. We intend to use this Call for Evidence to collect evidence and data on these production methods to assess the case for inclusion in the policy framework.

We would particularly welcome views on any specific sustainability considerations related to non-AD production methods that we need to consider as we develop the future framework. This could include, but should not be limited to, carbon emissions and impacts on air, water and soil quality, and biodiversity.

Q36. 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.

Chapter 5: Planning and standards

Planning for AD plants

Before construction, AD plants require planning permission. The government believes that local authorities are best placed to make local planning decisions. By law, planning applications are determined in accordance with the development plan, unless material considerations indicate otherwise. Each application is judged on its own individual merit and the weight given to these considerations is a matter for the local planning authority as the decision taker in the first instance. Local planning authorities are required to undertake a formal period of public consultation of no fewer than 21 days, prior to deciding a planning application. Effective consultation allows local planning authorities to identify and consider all relevant planning issues associated with a proposed development. Consultees, particularly those living near to the site in question, may offer particular views or detailed information relevant to the consideration of the application. Where relevant planning considerations are raised by local residents, these must be taken into account by the local authority before they determine an application. As part of the planning process, the environmental assessment processes, Strategic Environmental Assessment (SEA) (which operates at the plan level) and Environmental Impact Assessment (EIA) (which operates at the project level), help decision-makers understand the likely significant effects of plans, programmes or projects, so that these effects can be taken into account when making decisions on the acceptability of development.

The planning reforms set out in the Levelling Up and Regeneration Act aim to deliver improvements across the planning system as a whole to create a faster, more efficient system.[49] These include reforms to environmental assessment via the new system of Environmental Outcomes Reports, which will replace the current SEAs and EIAs. Planning for AD plants should benefit from these improvements. In addition to the proposals set out in the Act, we have also implemented a range of wider measures to create further improvements in the planning system, such as increasing planning fees to support well-resourced, efficient, and effective planning departments, as well as establishing the Planning Skills and Delivery Fund offering capacity support to local authorities.

One of the key issues raised by stakeholders relating to delays in deployment is challenges in the planning process. As part of this Call for Evidence, we are seeking to understand the reasons for this in more detail, and in particular, if there are any unique barriers AD plants face in the planning system. We will use the evidence we receive through this exercise to explore potential solutions to address these challenges, working with the Department for Levelling Up, Housing and Communities (DLUHC) and their devolved counterparts.

Q37. Have you experienced, or are you aware of any challenges with the planning process for AD plant developments? If yes, please provide details.

Q38. What type of AD-specific information would be useful to local planning authorities when reviewing planning applications for AD plant development?

[49] Levelling-up and Regeneration Act 2023, https://www.legislation.gov.uk/ukpga/2023/55/contents/enacted

Permitting for AD plants

Environmental permitting in the UK is managed by the Environment Agency in England, Natural Resources Wales, the Scottish Environment Protection Agency, and the Northern Ireland Environment Agency.

Some AD plants require an environmental permit to operate, however regulatory standards vary according to the feedstock used and apply only to AD sites processing waste feedstocks.

This means that there is a regulatory gap around non-waste AD which could restrict the ability of a future policy framework to ensure the same levels of protection for the environment are in place, regardless of the feedstock used. This also limits opportunities to maximise the capacity of existing AD infrastructure through co-digestion of waste and non-waste feedstocks.

Q39. 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?

We would also be interested to hear views on how AD developers can be better supported when preparing complex permitting applications, to minimise the risk of delays. Please include this in your response to Question 2 on additional barriers to market growth.

AD plant standards

It is important to ensure that future biomethane policy promotes the development of AD plants that are built, maintained, and operated to high standards. This is directly linked to the sustainability design principle for the future biomethane framework, as poorly operated plants can lead to negative impacts on the environment and the health and safety of those near to the plant.

Currently, all AD plants in the UK must comply with regulations concerning environmental protection, animal by-products, duty of care, health and safety and waste handling. AD is classified as a chemical process, with associated risks that must be managed in line with relevant regulations. However, across government bodies, the AD process is often regulated in a way that does not focus on the overall building or production of biomethane.

The key regulatory gap identified is a lack of overarching plant and equipment standards for AD plants, as well as poor visibility to regulators of the overall process for producing biomethane. We understand that many of the standards for the specific pieces of equipment used in AD are based on the oil and fossil fuel gas industry, which can lead to inefficiencies in plant design, as well as a greater risk of methane leakage or the release of other substances (see Chapter 4 for more detail on methane leakage). This could potentially be addressed through a review of the Best Available Techniques (BATs) associated with environmental permitting for preventing or minimising emissions and impacts on the environment.

We are interested in hearing views on whether a future framework should include broader guidance on overarching AD plant building, maintenance, and operating standards. We would expect industry to work with us in developing any guidance around plant standards, given the expertise that has been developed in the sector over several decades.

Q40. What are your views on the feasibility and usefulness of developing industry-wide guidance on design, maintenance and operation standards for AD plants?

Grid capacity

The gas network is managed to maintain a consistent, reliable supply to customers. Operators can only provide guaranteed injection volumes where they can be accepted without pushing key pressure and flow parameters outside target ranges. In some places, this means that capacity is not available at the injection rates required by a commercial scale AD plant. Demand is also seasonal and fluctuates throughout the day. This can mean, even with high peak season injection volumes, plants have to reduce rates temporarily or seasonally.

The biomethane industry and gas network operators are exploring and testing solutions for this issue. These include:

- reverse compression, which involves installing equipment to release capacity by extracting gas from constrained parts of the network and injecting it into higher pressure areas,
- increasing connections between different parts of the grid to improve management of pressure, and
- improving or altering grid flow management and tracking.

Q41. 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.

Q42. Are there any steps the government and the industry could take so that biomethane producers could more easily access reliable grid injection capacity?

Q43. 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.

Propanation

Biomethane injected into a Local Distribution Zone (LDZ – owned by the gas distribution network operators) must satisfy key conditions to ensure that customers receive a product of acceptable uniformity and are billed fairly.

Biomethane has a lower Calorific Value (CV) than fossil fuel methane. The injection of lower CV gas can result in unfair billing outcomes because it can lower the energy content of gas in the part of the grid close to an injection point. This can mean that customers receive lower-energy gas than they're billed for as billing is set at the average energy content of gas over the whole LDZ.

Rules covering gas injection requirements are set to prevent this and most biomethane plants increase the CV of their gas by adding propane to it to meet them. However, adding propane to biomethane reduces carbon savings and increases the capex and opex costs for producers who must buy propane, as well as purchase and maintain additional storage and injection equipment. A small number of plants do not propanate. Instead, they either blend biomethane and fossil methane before injecting it to create a gas mix that meets CV requirements, or they inject in locations where network gas flow is sufficiently high that biomethane injection does not affect network CV enough to impact billing fairness.

We are aware that a biomethane plant injecting into the National Transmission System (NTS) would not need to propanate. However, the location of the NTS and the cost of connecting to it will not always make this feasible.

The biomethane industry and gas networks are exploring solutions that may see a reduction in the use of propane. This could include the use of methane blending and using modelling to bill customers accurately when a more varied range of CV gases are injected into networks. We will work across government on reviewing the relevant regulations and how any changes might support injection of biomethane into the gas grid, either directly and without increasing its CV or after blending with methane.

Q44. 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?

Locational considerations

Currently, the ‘ideal’ location for biomethane production should balance accessibility to feedstocks with proximity to its end-use, while also taking into consideration environmental impact. Given that current support for biomethane focuses on grid injection, developers need to balance access to feedstock with access to the grid. This reflects the **bottom-up, market-led** approach currently taken on current government support for biomethane production. Both the Environment Agency and local planning authorities will also review applications for new plants, considering impacts on the local environment and community.

An alternative approach would be for a **top-down, government-led approach** to identify suitable locations for biomethane production based on several criteria, for example not only feedstock and end use but also CCUS offtake and more targeted environmental impact. Once the suitable locations are identified, industry would develop the plants accordingly, possibly through a competitive process or on a first-come, first-served basis. This approach has not been tested in the biomethane market.

Consideration may also be given to maintaining a broadly market-led approach, on the basis that the market could effectively implement a future framework. However, we will continue to consider any additional criteria to complement the principles as we develop the framework, including allowing flexibility for decisions on the future of the gas grid, for example, as well as providing greater investment certainty.

Q45. 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?

Annex A: Full list of questions

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?

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.

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

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

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).

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.

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.

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

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?

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.

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.

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

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.

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?

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

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

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)?

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

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

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

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

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

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?

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.

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).

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?

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.

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?

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.

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.

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

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?

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)

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

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

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.

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.

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

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?

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

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.

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

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.

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?

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?

Annex B: Question guidance

General Response Guidance

- To ensure responses can help formulate robust policy options for future consultation, please use CitizenSpace to respond to this Call for Evidence and provide evidence where possible to support any views presented.
- We recommend that respondents browse the entire document before drafting responses to specific questions.
- Respondents are not required to answer all questions. For questions you do not wish to respond to, please state "No response".
- Please refer to your responses for other questions where useful or to avoid repetition, identifying the relevant question number.
- Please provide references/sources where possible where external evidence is referred to in your response.
- Where relevant, data provided should be provided and presented in a clear manner to support your response. The following section provides more detail on how data should be provided.

Data submission guidance

- The full data privacy notice relating to this Call for Evidence can be found here.
- Data can be provided within your response to specific questions or as separate documents (e.g. Excel spreadsheets for larger datasets). Data and documents should be clearly named and signposted where relevant in your question responses. Please label tables and charts where possible, referencing these labels in your written responses.
- For cost and revenue figures, please provide where possible:
  - All figures in pound sterling (GBP). If a currency conversion has been used, please provide details.
  - A time series if appropriate, preferably on a calendar year basis. Please state if any other period is used (i.e., months, financial years).
  - All figures in 2022 (real) prices. Please state if another price year is used or if inflation is not accounted for in any historic/future values provided. Further guidance on how nominal and real prices are calculated can be found in HMT's Green Book.[50]

[50] HMT (2022), The Green Book, Section 5.3, https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government/the-green-book-2020

    - A breakdown of individual components wherever possible.
- For any other data, please provide where possible:
    - The units associated (MWh, %, tonnes etc).
    - Watts or Watt-hours units (e.g. MW and MWh) are preferable for energy capacity and generation/demand metrics.
    - A time series if appropriate, preferably on a calendar year basis. Please state if any other period is used (i.e., months, financial years).
    - A breakdown of individual components wherever possible.
- If the above is not possible, please submit relevant and useful data regardless and attach any extra information which will provide useful context for understanding and analysing the data.
- References/sources for data should also be provided where applicable.

Next steps

Responses provided to this Call for Evidence will be analysed and used to develop detailed policy proposals, which will be consulted on by all relevant authorities as appropriate in due course.

This consultation is available from: www.gov.uk/government/calls-for-evidence/future-policy-framework-for-biomethane-production-call-for-evidence

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.