



Department for
Energy Security
& Net Zero

Power Bioenergy with Carbon Capture and Storage

Government response to consultation on the
power Bioenergy with Carbon Capture and
Storage business model

March 2023



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

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Email: beis.bru@beis.gov.uk

Disclaimer

The policy positions represented in this consultation response remain subject to further development by the government and do not represent final positions. We intend to develop positions further with relevant regulatory bodies, the devolved administrations, industry. Policy positions are subject to Parliamentary approval of any necessary legislative amendments and to ensure consistency with subsidy control principles. The proposals, as set out in this consultation response, do not therefore constitute an offer by government and do not create a basis for any form of expectation or reliance.

Executive Summary

Introduction

Power bioenergy with carbon capture and storage (power BECCS) is the process of generating electricity using sustainable biomass feedstocks, then capturing and permanently storing the CO₂ generated in the process. The process removes CO₂ from the atmosphere, generating 'negative emissions' which are also called 'Greenhouse Gas Removals' (GGRs). Power BECCS technologies are part of a broader suite of engineered GGR technologies.

Government set out ambitious plans for GGR technologies in the Net Zero Strategy. Power BECCS can play a significant role delivering those GGR ambitions and net zero. We set out a commitment to develop a power BECCS business model in the Biomass Policy Statement.

This consultation response sets out the Dual CfD, the business model that is being designed to support investment in power BECCS. It follows precedents set in the Contracts for Difference (CfD) scheme and in other Carbon Capture, Usage and Storage (CCUS) business models. A key priority of the model is to give investor confidence while ensuring affordability and value for money.

Summary of Responses

Respondents

The consultation ran from 11 August to 7 October 2022. We received a total of 1024 responses, including responses from 37 organisations and a significant number of identical responses from a co-ordinated email campaign. Most responses included a response to some or all of the submitted questions, though some respondents provided more general feedback.

General and Campaign Responses

The responses which provided more general feedback requested an exemption to levy funding on energy intensive industries, and on the priority use of biomass. We set out that we are still considering the funding for power BECCS and, if appropriate, will look to introduce the exemption suggested once we have further detail. We set out that the forthcoming Biomass Strategy will further consider the availability of sustainable biomass and its priority use.

In response to the feedback we received, we set out the importance of the sustainability of biomass, and that we are developing sustainability criteria for power BECCS, building on the existing criteria and the forthcoming Biomass Strategy.

Section 1

Section 1 of the consultation looked to set out the strategic case for power BECCS. We sought feedback on the market failures and other barriers to the deployment of power BECCS at the scale required to meet our Carbon Budgets and net zero.

Respondents shared their views on barriers to investment and highlighted that developing government policy in other areas might have implications for investment in power BECCS.

We set out that the key aim of the power BECCS business model is to incentivise the production of negative emissions with a co-benefit of low-carbon electricity. We recognise the importance of sustainable biomass to its delivery and the importance of other factors identified. We will work across government to ensure that our policy is aligned with other areas of developing policy.

Section 2

Within Section 2, the consultation set out a range of potential business model framework options. It made early proposals about our preferred business model framework, a combined Contract for Difference for electricity (CfDe) and Contract for Difference for carbon (CfDc) ('CfDe + CfDc'), which we now refer to as a 'Dual CfD'.

In the section '**Overall Model**', we have confirmed that the Dual CfD is our preferred model as it offers a clear distribution of costs and risk allocation. We acknowledge feedback that the principles behind the CfDe and CfDc will have to be clearly set out.

Some respondents expressed that they preferred a CfDe + Negative Emissions Payment (NEP) or standalone carbon payment over a Dual CfD. However, others expressed that design choices within a Dual CfD framework could mitigate the concerns which led to these preferences. We have not yet determined the best approach to a CfDc Reference Price, or whether another framework may be necessary in the initial period of the contract.

Other respondents also raised concerns that projects which never demonstrated carbon capture could be paid under the Dual CfD. We have set out that we intend to include contractual mechanisms which prevent this, following CCUS precedents.

In the section '**Payment Mechanism**' we set out indicative structures of the CfDe Difference Payment and the CfDc Difference Payment.

Respondents mostly supported setting the CfDe Strike Price on the basis of the 'costs of unabated biomass', though some set out how this might be impacted by factors including: T&S unavailability, cost changes after contract signature and costs of operating in the electricity market.

Respondents also supported an approach of setting the CfDc Strike Price in relation to the additional costs of carbon capture, noting that it would combine well with the 'costs of unabated biomass' approach to the CfDe. We acknowledge the feedback that the two strike prices will

need to be designed to enable recovery of the projects costs when combined with wholesale revenues. We are still considering the distribution of costs between the two strike prices.

In Question 20 respondents expressed support for a possible integration of negative emissions into the UK Emissions Trading Scheme (UK ETS). The Net Zero Growth Plan sets out that we will work with the UK ETS Authority to consider options for integrating GGRs in the UK ETS. This is subject to the outcomes of last year's UK ETS consultation, a robust MRV regime being in place, and the management of wider impacts - including market stability and the permanence of the emissions stored by the GGRs.

In the section '**Baseload Running**' we received feedback about the interaction between running profiles and the electricity market, as well as feedback indicating that power BECCS technology is more suited to a baseload profile. We are still considering the trade-off between these factors.

In the '**Term Length**' section we set out that our minded to position was that, following DPA precedent, projects should be able to choose and justify a term length between 10 and 15 years. We are open to further evidence on this position.

In '**T&S Charges**', we set out that the support for T&S Charges will be calculated and paid separately, outside of the two strike prices. This approach was broadly supported by respondents and allows for simpler strike prices, reduced risk and additional flexibility. The support will be calculated based on actual usage and the charging rates set out in annual Charging Statements issued by the T&S Operator.

In the section '**Unabated Running and Support During Periods of T&S Unavailability**' we received feedback setting out a preference that projects should continue to run during periods of T&S unavailability. Some advocated for continued CfDe support, while others believed projects should be exposed to market signals. We are still considering our approach to unabated running, including its impacts on the power system and how to manage risks to investors. We set out that we consider the precedent set out in other CCUS business models to be a good starting point for CfDc relief during periods of T&S unavailability.

In response to questions about '**Biomass Price Risk**', the majority of respondents suggested their preferred option would be 'do-nothing'. Though some responses were supportive of the proposal to include price risk protections, others raised concerns about possible effects of these. We are still considering whether to include any mitigations to this risk in the Dual CfD, with the aim of maximising value for money for consumers and/or taxpayers.

Broader Business Model Elements

In this section we set out an overview of some of the features of the Dual CfD which were not directly addressed in the consultation. We set out some early thinking on '**Milestones and Conditions Precedent**', flagging that we considered many of the mechanisms used in the CfD and other CCUS models to be appropriate precedents. We are still considering these precedents in the context of power BECCS. We also set out that we were considering

precedents from these contracts in relation to '**Termination and Consequences of Termination**' and '**Other Provisions**'.

Section 3

Section 3 explored sustainability and negative emissions related considerations for the design of the business model. It details the policy development taking place to develop Greenhouse Gas Emissions Criteria specific to power BECCS. Those wider sustainability criteria are to be reviewed and strengthened where possible, and the recommendations will be set out in the forthcoming Biomass Strategy. Projects brought forward under the power BECCS business model, and the feedstocks used, will be required to adhere to strict sustainability criteria, as is required under current biomass support schemes.

Next Steps

We will continue to progress business model development and engagement with interested parties, working across government to ensure alignment with other developing policies. We are keen to continue engaging with industry, NGOs and other interested parties and will establish a series of regular engagement sessions to do this. We plan to use these engagement sessions to gather further evidence and develop the design of the business model.

Introduction

Power bioenergy with carbon capture and storage (power BECCS) is the process of generating electricity using sustainable biomass feedstocks and capturing and permanently storing the CO₂ generated in the process. As biomass grows, it sequesters CO₂ from the atmosphere and so when the CO₂ generated in this process is captured and permanently stored, this removes CO₂ from the 'active' carbon cycle and creates a net removal of atmospheric CO₂. Through this physical removal of greenhouse gases from the atmosphere, power BECCS is able to deliver negative emissions, which are also referred to as Greenhouse Gas Removals (GGRs).

Power BECCS, as one type of BECCS technology, is one of a suite of engineered GGR¹ technologies that government believes can play a significant role in meeting the level of engineered GGRs required by the Net Zero Strategy.

To meet our net zero targets and ensure future energy security, government has set out ambitious plans to bring forward the deployment of key low-carbon technologies through the Net Zero Strategy² and the British Energy Security Strategy. Power BECCS is just one part of this portfolio. The Net Zero Strategy set out an ambition to deploy at least 5 MtCO₂ of engineered GGRs per year by 2030. The strategy recognised that large-scale deployment of engineered GGRs will play a vital role in achieving the UK's net zero target by balancing residual emissions from hard-to-abate sectors that are unlikely to achieve full decarbonisation. It established government's intention to develop markets and incentives for engineered GGR technologies to support the growth of this emerging industry.

This recognition of the importance of GGRs to meet net zero both internationally and domestically has been supported by both the Intergovernmental Panel on Climate Change³ (IPCC) and the Climate Change Committee (CCC)⁴. The Climate Change Committee (CCC) in their Sixth Carbon Budget Report⁵, set out that BECCS technologies can play a significant role in supporting net zero targets through the delivery of negative carbon emissions. These will be necessary to offset residual emissions from hard-to-abate sectors which do not have readily available options to decarbonise and are projected to remain a source of emissions in 2050.

The Biomass Policy Statement⁶ set out that government was working on a business model for power BECCS to incentivise negative emissions and power generation. The decision to develop a bespoke business model for power BECCS is reflective of the advanced technological readiness of this specific technology and the significant co-benefits of both power

¹ Engineered GGRs are a class of technologies which remove CO₂ from the atmosphere.

² Net Zero Strategy, available at: <https://www.gov.uk/government/publications/net-zero-strategy>

³ IPCC (2022): Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: <https://www.ipcc.ch/report/ar6/wg3/>

⁴ Climate Change Committee (2020): The Sixth Carbon Budget, The UK's path to Net Zero

⁵ The Sixth Carbon Budget, available at: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>

⁶ Biomass Policy Statement, available at: <https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero>

generation and negative emissions. The forthcoming Biomass Strategy will set out further sustainability considerations for power BECCS.

The Net Zero Strategy had included a commitment to consult on business models to attract private investment and enable GGR projects to deploy at scale from the mid-2020s. We met this commitment by consulting on both a power BECCS business model and a broader GGR business model in 2022. It remains our objective to develop a business model which enables power BECCS to play this valuable role in reaching our Net Zero ambitions and to provide security in the generation mix.

In line with the other CCUS models under development by government, a key priority for the power BECCS business model is to provide projects with sufficient support to give investor confidence, whilst ensuring that these projects are affordable and represent value for money for consumers and/or taxpayers alike. The sustainability of biomass as a feedstock, and the negative emission potential of the use of biomass in the power BECCS process are fundamentally important areas of focus. They have been explored in recent work with the Chief Scientific Adviser for the Department for Energy Security and Net Zero. The outcome of this work will be published soon.

We are publishing the power BECCS government response alongside our plans for *Powering Up Britain*, which set out how we are taking bold action to achieve our energy security and net zero objectives.

Summary of Responses

This section will summarise the consultation responses and provides a government response setting out the next steps for developing the power BECCS business model.

Respondents

The consultation ran from 11 August to 7 October 2022.

We received a total of 1024 responses to the consultation, 20 responses were received through the Citizen Space platform and 17 direct responses via email. The remaining responses came from a coordinated email campaign. Of these responses, the majority included identical paragraphs of text, though 85 respondents either made amendments to the phrasing, or made additional comments.

Both email and Citizen Space responses came from a variety of organisations, including from biomass power projects, other power operators, project developers, non-governmental organisations (NGOs), local authorities, academia and trade associations. We also received responses from individuals. The format of responses varied between respondents who used the Citizen Space platform and those who emailed; Citizen Space required that respondents provided answers to specific questions and had an option to categorise answers as “yes”, “no” and “don’t know”, whereas email respondents were not required to respond to specific questions or label their answers. As a result, some questions have received fewer responses than others.

General Responses

Some respondents did not submit responses to individual questions. The key themes from these responses are summarised here.

Two responses highlighted the importance of electricity prices to energy intensive industries, including steel, and the potential impacts of support costs for power BECCS. One stakeholder suggested that funding directly from government would be more appropriate than funding from a supplier levy, to avoid distorting the electricity market and impacting on energy intensive industries. Both set out that if the government were to use funding from a supplier levy, they would urge the government to include an exemption for energy intensive industries.

Another response highlighted the importance of biofuels to decarbonising transport and set out concerns about the availability of biomass.

Government Response

We currently operate an exemption for certain Energy Intensive Industries for a proportion of the costs of funding the Renewables Obligation, Contracts for Difference and Feed In Tariffs. The exemption currently provides a bill discount of up to 85% of the indirect costs of these schemes. We are still considering the source of funding for the power BECCS business model, and, if appropriate, will look to introduce an exemption as we develop further detail on the source of funding for power BECCS.

We recognise that biomass is a finite resource. It is important that its use is prioritised within the economy where it offers the greatest opportunity to achieve GHG emissions reductions in 'hard-to-abate' sectors with fewer options for decarbonisation through alternative low-carbon technologies. The Biomass Strategy, which will be published in Q2 2023, will set out the results of a review into the potential availability of a variety of sustainable biomass from domestic and international sources and present a priority use framework that defines the best use of biomass across the economy in support of our net zero target.

Campaign Responses

We received 987 responses as part of a co-ordinated campaign to respond to the consultation. Many of the responses submitted used pre-filled text provided by the campaign organisers, but some amended the text to include different or additional views. The responses in the campaign raised general concerns about the use of biomass in principle and support for power BECCS in response to questions 1, 4 and 5 of the consultation.

The campaign broadly shared concerns over the land use requirements to provide feedstocks for power BECCS, and general sustainability concerns of utilising forest-based feedstocks, including impacts on biodiversity and social impacts. A further concern was set out about emissions of Nitrogen Dioxide and PM2.5 Particulate Matter.

The respondents also set out concerns about the technological readiness and large-scale deployment of carbon capture and storage technologies, with a focus on a risk that projects were unable to deliver reliable carbon capture, and on the thermal efficiency of projects. They raised concerns that projects could receive significant subsidy through a CfDe even if they were not capturing CO₂ under the minded-to overarching framework (CfDe + CfDc) (these concerns are also set out in Question 1).

There were also views expressed that subsidies required for power BECCS should be redirected to home insulation, heat pumps, expansion of wind, solar, tidal and wave power.

Government Response

As outlined by the Climate Change Committee (CCC) in their Sixth Carbon Budget Report⁷, BECCS technologies can play a significant role in supporting net zero targets through the delivery of negative carbon emissions. These will be necessary to offset residual emissions from hard-to-abate sectors which do not have readily available options to decarbonise and are projected to remain a source of emissions in 2050.

The sustainability of biomass as a feedstock, and the negative emission potential of this use of biomass in the power BECCS process are fundamentally important areas of focus that have been explored in recent work with the Chief Scientific Adviser for the Department for Energy Security and Net Zero. The outcome of this work will be published soon.

Projects brought forward under the power BECCS business model and the feedstocks used will be required to adhere to strict sustainability criteria, as is required under current biomass support schemes. The sustainability criteria include Greenhouse Gas Emissions Criteria and Land Criteria. Section 3 of this document details the policy development taking place to develop Greenhouse Gas Emissions Criteria specific to power BECCS. Those wider sustainability criteria are to be reviewed and strengthened where possible, and the recommendations will be set out in the forthcoming Biomass Strategy, which will be published in Q2 2023. Power BECCS operators must also comply with all relevant air quality regulations.

⁷ The Sixth Carbon Budget, available at: <https://www.theccc.org.uk/publication/sixth-carbon-budget/>

Government has set out ambitious plans to bring forward the deployment of key low-carbon technologies through the Net Zero and the British Energy Security Strategies and power BECCS is just one part of this portfolio. The Net Zero Strategy⁸ recognised that large-scale deployment of engineered GGRs will play a vital role in achieving the UK's net zero target. This recognition of the importance of GGRs in meeting net zero both internationally and domestically has been supported by both the Intergovernmental Panel on Climate Change⁹ (IPCC) and the Climate Change Committee (CCC)¹⁰.

Power BECCS is one of a suite of engineered GGR technologies the Government believes can play a significant role in meeting the level of engineered GGR required by the Net Zero Strategy. Furthermore, the technology has the potential in the near term to make an important contribution to the government's ambition of deploying at least 5 MtCO₂ of engineered GGRs per year by 2030 to support the delivery of our carbon budgets and Nationally Determined Contribution. Aside from power BECCS, the government is aiming to attract investment in a broad portfolio of GGR technologies to support the growth of a diverse and competitive negative emissions market. In July 2022 government published a consultation¹¹ on a proposed GGR business model to support this ambition. This consultation closed in September 2022 and government intends to respond this year.

Neither bioenergy nor CCUS are new technologies. CCUS has been working safely and effectively since 1972 to capture CO₂ from a wide range of industries and sectors. BECCS in industrial applications has been demonstrated at two plants under development in Norway, combining CCUS with biomass use in cement manufacture, and with energy from waste, so far demonstrating successful capture at a few thousand tonnes of CO₂, and aim to save 0.8 MtCO₂ per year by 2024. As set out in the Broader Business Model Elements section and in response to Question 5 below, there are a number of contractual mechanisms in the DPA and other CCUS models which aim to manage the performance of carbon capture, and we intend to develop the model to include similar performance management mechanisms.

⁸ Net Zero Strategy, available at: <https://www.gov.uk/government/publications/net-zero-strategy>

⁹ IPCC (2022): Summary for Policymakers. In: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: <https://www.ipcc.ch/report/ar6/wg3/>

¹⁰ Climate Change Committee (2020): The Sixth Carbon Budget, The UK's path to Net Zero

¹¹ Business Models for Engineered Greenhouse Gas Removals: A consultation on accelerating investment in engineered carbon removals, available at: <https://www.gov.uk/government/consultations/greenhouse-gas-removals-ggr-business-models>

Section 1: Rationale for Developing a Power BECCS Business Model

Section 1 focused on the strategic case for power BECCS by asking for questions about the market barriers and risks to deploying power BECCS that had been identified.

Market Barriers

Question 1: Have we identified the most important challenges in considering the development of power BECCS projects?

Summary of Responses

Thirteen respondents answered 'no' to this question, 9 answered 'yes' and 18 didn't know or didn't provide an answer.

The responses generally expressed that the consultation had identified some, but not all of the most important challenges faced when considering the development of power BECCS projects, which has given further evidence to consider when developing this policy.

The responses set out views on additional barriers for consideration, which included the availability and sustainability of biomass and the volatility of the biomass market. Being able to source biomass that abides by specific, strict sustainability criteria is crucial to BECCS plants operating and the delivery of both electricity and negative emissions. A further challenge was raised about the planning and environmental permit process, specifically highlighting the timelines linked to FOAK projects and the planning and permitting processes that projects have to abide by, for example the Development Consent Order (DCO) or town and country planning processes.

There was a question posed about the overall aim of the business model; asking whether it prioritises carbon removal or electricity generation primarily.

Respondents also set out their concerns about the eligibility criteria to the power BECCS Project Submission Process – which closed for applications on 19 October 2022 and is out of scope of this consultation.

Some respondents raised their views about the way that international carbon accounting treats emissions in the forest and energy sectors, advocating for a different approach to the treatment of biomass power.

Respondents also set out that the power BECCS model would need to account for any changes to how the wholesale electricity market operates as a result of the work government is undertaking in the Review of Electricity Market Arrangements (REMA). Another barrier identified was a lack of a definition of GGRs as a sustainable activity in tools, such as the UK Green Taxonomy.

Government Response

The business model is being designed to incentivise the production of negative emissions as defined in the consultation¹² with a co-benefit of low carbon power generation, which contributes towards the security of supply of electricity from low carbon sources on the electricity system.

We recognise that availability of sustainable biomass is essential to the delivery of power BECCS. The Government is actively progressing work on the Biomass Strategy, including work on the assessment of the priority use of biomass across the economy, which will be published in Q2 2023.

With regards to the planning and environmental permitting risks highlighted, projects must adhere to all relevant planning and consenting requirements (for example DCO, Town and Country or other), and environmental permitting processes and requirements in the development of all energy infrastructure, including CCUS technologies. The Environment Agency has published guidance on 'Post-combustion carbon dioxide capture: best available techniques (BAT)'¹³ which is currently under review.

We recognise how fundamental these processes are to the development of a CCUS industry. We will provide support wherever possible to the relevant authorities, to ensure that all parties have the correct information to make informed decisions. It is the responsibility of any applicable projects to ensure their compliance with these processes under reasonable timeframes.

The power BECCS Project Submission process was launched in August 2022. It had the intent of bringing forward projects that met the eligibility criteria and passed the deliverability assessment onto Track-1. Several responses touched on the eligibility criteria for this process but is out of scope of this consultation response. We have also responded to these views as part of the Project Submissions process¹⁴. We reserve the right to revise the eligibility criteria for different deployment tracks. We remain committed to the ambition of deploying at least 5 MtCO₂ of engineered GGRs per year by 2030. Therefore, we are considering options to deploy power BECCS and other GGRs by 2030.

The UK reports and accounts for biomass use in accordance with internationally agreed rules that follow guidance from the Intergovernmental Panel on Climate Change (IPCC). These rules avoid double counting of emissions in the forest and energy sector. Where carbon stock changes occur in forests as a consequence of forest management activities (for whatever

¹² "When undertaken sustainably, BECCS can deliver negative emissions because carbon sequestered in biogenic material is captured and stored after combustion, resulting in a net decrease in atmospheric CO₂ overall." <https://www.gov.uk/government/consultations/business-model-for-power-bioenergy-with-carbon-capture-and-storage-power-beccs>

¹³ <https://www.gov.uk/guidance/post-combustion-carbon-dioxide-capture-best-available-techniques-bat>

¹⁴ Clarification question 006, 007, and 008 available at: <https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-power-bioenergy-with-ccs-beccs/clarification-questions-with-responses-21-september-2022>

purpose), they are accounted for in the Land Use Land Use Change and Forestry (LULUCF) sector of the country in which this takes place.

The UN's IPCC is the authoritative body on the scientific and technical understanding of climate change and options for adaptation and mitigation. It has 195 member countries, including the UK. Its assessments draw on thousands of peer-reviewed scientific papers and are produced by hundreds of experts from around the world who volunteer their time. The UK has the second highest number of experts selected as authors (after the USA) in the current assessment report (just over 9% of the total). IPCC reports undergo a rigorous expert and government review process to ensure accuracy, balance and good communication. The UK Government is active in the scoping, review and approval of IPCC reports.

We will work across government to assess potential impacts of developing government policy, including REMA, on the power BECCS business model. We will ensure that the model is compatible with developing policy.

Question 2: Are there any other market barriers in addition to those identified?

Summary of Responses

This question was answered by 39 respondents, with 23 agreeing there were additional market barriers that needed to be identified. The rest set out that there were no additional market barriers which needed to be identified or did not respond. This question gave a further opportunity for respondents to highlight any other views on market barriers specific to power BECCS projects that were not highlighted previously.

One respondent offered that a barrier to consider could be considerations around the planning and permitting process relating to visual impact of CCUS and that there are currently no CCUS facilities in operation. Another respondent raised a concern about how the composition of flue gases resulting from combustion using biomass, would interact with post combustion capture technology.

Some respondents held the view that one barrier to investment could arise from policy choices in relation to the proposed business model. Some of this feedback was around how recent market dynamics have interacted with the Baseload Market Reference Price. Some warned of recent volatility of biomass fuel costs. Others warned against considering biomass and wholesale price risk as barriers because they are well understood risks which are currently managed by industry.

In addition, to help the delivery of negative emissions, respondents suggested that power BECCS plants should be encouraged to run with a high load factor to ensure continuous sequestration of CO₂.

Some respondents have voiced a desire for further clarity on how negative emissions will be defined for use in the model, and the interaction with other tools, including the UK Green Taxonomy. Respondents highlighted their views that power BECCS policy, the Biomass Strategy and UK Green Taxonomy will need to synchronise and collectively recognise the sustainability criteria to allow for more sustainable investment in the GGR sector.

Government Response

As set out in the response to Question 1, there are relevant planning processes and regulations in place that must be followed.

The CfDe Reference Price is discussed in more detail in the feedback and government response to Question 8 in the Payment Mechanism section below. Biomass fuel price risk is discussed in more detail in the Biomass Price Risk section below.

The post combustion capture technology used to capture CO₂ from power biomass plants will be selected and aligned to ensure it can meet the demands of the flue gas produced. To achieve this the technology provided will have to show a track record with biomass carbon capture, and where possible piloting of biomass flue gases will be undertaken to confirm that the solvents used are compatible. Any selected carbon capture technology will have to comply with UK environmental requirements which, as mentioned in Question 1, are currently under review.

More detail about the next steps for the UK Green Taxonomy is set out in the UK Government's update to the Green Finance Strategy.

Question 3: Are there any other power BECCS-specific risks that need to be considered? If so, what are your proposals for mitigating them?

Summary of Responses

This question invited views on anything else not previously considered and therefore the summary will highlight views not previously discussed in the above two questions.

One respondent held the view that large thermal power plants should not run as baseload in a future power system that may increasingly value agility and flexibility. The same respondent also asked whether there is enough evidence to demonstrate the net negativity of power BECCS over the full life cycle of these facilities.

One respondent stated that clarity is needed on the initial and future balance of UK domestic and imported feedstocks that are anticipated to fuel a FOAK power BECCS project.

Another respondent set out their view that there is a requirement for appropriate regulatory and policy frameworks to ensure the high-quality production of negative emissions and electricity.

Some respondents set out that they would prefer a technology neutral focus on GGR technologies, wider than the scope of the proposed power BECCS model, for example including afforestation or ocean-based CO₂ sequestration. They set out that this is important because, in their view there are domestic deployment risks for investment in power BECCS technologies. However, the same stakeholders set out that it was important that the government takes urgent action to meet our net zero targets by incentivising permanent removal of CO₂ from the atmosphere. Similarly, a respondent provided challenge that in their view, CCUS should not just mean permanent geological sequestration. They suggested that GGRs could be achieved through other technological solutions at a smaller scale than government is currently considering supporting.

Government Response

To achieve the policy intent of delivering negative emissions and low carbon electricity generation, the business model will not specify which types of biomass feedstocks will be eligible for support. Instead, there will be clear supply chain emissions thresholds and sustainability requirements that feedstocks will need to meet, regardless of whether these are produced domestically or imported. These thresholds are explored more in Section 3 below. In addition, the Biomass Strategy will set out further information on the potential future availability of a variety of sustainable biomass feedstocks from domestic and international sources.

We will build on the existing biomass sustainability criteria and processes for regulating the sustainability of supply chains. In turn, this will support the development of Monitoring, Reporting and Verification (MRV) processes that will ensure that power BECCS results in negative emissions. Similarly, as set out in the GGR business model consultation¹⁵, we recognise the importance of MRV to instil public and investor confidence that greenhouse gas removals are genuine and verifiable. We consulted on factors to define legitimacy of removals, such as ensuring that more carbon is removed from the atmosphere than is generated in a GGR process (often referred to as 'net negativity'); the need to distinguish between avoided and removed emissions; and ensuring that removed carbon is stored for an effective period (often referred to as 'permanence' or 'durability').

The consultation set out that the GGR business model will aim to attract investment in a diverse portfolio of GGR technologies, supporting the growth of a deep and competitive negative emissions market in the UK. It invited views on the potential role of the GGR business model in supporting BECCS projects that are not eligible for the Power BECCS or Industrial Carbon Capture business models. We intend to publish a response to the GGR business model consultation later this year.

¹⁵ Business Models for Engineered Greenhouse Gas Removals: A consultation on accelerating investment in engineered carbon removals, available at: <https://www.gov.uk/government/consultations/greenhouse-gas-removals-ggr-business-models>

Section 2: The Business Model Proposal and Options Considered

Section 2 of the consultation set out that it is government's intention to introduce a contract-based business model for power BECCS, subject to affordability and value for money. This model would address the main investment barriers by providing revenue support for both power generation and negative emissions within a recognised contract framework that manages the cross-chain risk posed by interactions with the T&S Network.

The sections below set out more detail about how we are responding and using the feedback received to inform next steps in designing the business model, whilst also outlining the likely structure of the power BECCS business model. At the end of appropriate questions, we have detailed the progress we have made in developing our model utilising the consultation responses related to that specific area.

Where relevant, we have commented below on potential similarities and differences between the power BECCS model and either the CfD in its fourth allocation round (AR4) or, the Dispatchable Power Agreement (DPA) and other Carbon Capture, Usage and Storage (CCUS) business models. While it is intended that this document can be reviewed on a stand-alone basis, the reader may find it useful to refer to the detailed provisions of the AR4 CfD and the DPA.

We refer to the AR4 CfD as it is the most recent iteration of the CfD at the time of drafting. As the model develops we will refer, where appropriate, to further iterations of the CfD and the other models.

To ensure the feedback and responses to each topic are kept together, we have grouped the consultation questions by theme in this section. This has resulted in the question numbers in this section not being presented sequentially. The following list is provided to help locate responses to specific questions. Question numbers have also been retained to allow cross-referencing.

Overall model

Question 4: Do you agree with the overarching objectives of our policy framework for power BECCS?

Question 5: Do you agree with the minded-to-position of a combined CfD for electricity generation (£/MWh) and a CfD for Carbon (£/tCO₂) under a CfD contract framework? If not, please provide rationale for why not?

Payment Mechanism

Question 7: Are there alternative methods to setting this that should be considered?

Question 8: Are there any risks or concerns around setting the CfDe Strike Price that have not been mentioned here?

Question 10: Do you agree with the outlined approach to setting the CfDc Strike Price? If not, are there any alternative methods to setting this that should be considered?

Question 11: Are there any risks or concerns around setting the carbon strike price that have not been mentioned here?

Question 20: What do you believe is the most appropriate market framework for supporting FOAK power BECCS projects over the next decade, and how might this framework evolve over time? In your answer, please consider the market options outlined in Section 3 of the GGR consultation, indicating which option or combination of options would be preferable to achieve the objectives for power BECCS.

Baseload Running

Question 6: Should the power BECCS project be incentivised to run as baseload or flexibly? Please provide rationale for your answer.

Term Length

Question 13: Do you agree with a proposed contract length of 10-15 years? If not, why not?

T&S Charges

Question 12: Should the T&S charges be a separate payment?

Question 16: What are your views on the proposed options?

Question 17: Where should the T&S charges be sourced from?

Unabated Running and Support During Periods of T&S Unavailability

Question 18: Should the plant run unabated during periods of T&S unavailability, such as temporary outages?

Question 19: Do you have any evidence or thoughts on ways to manage CCUS costs in the event of T&S network unavailability?

Biomass Price Risk

Question 9: The CPI indexed Strike Price option requires the project to bear the risk of biomass costs and is the option in current contracts. Is this an appropriate allocation of risk? Please provide rationale and evidence for your answer.

Question 14: What are your views on the suggested options?

Question 15: Are there any alternative methods to mitigate the biomass price risk that we have not discussed?

Overall Model

As detailed within the consultation, we identified several possible frameworks and set out five assessment criteria to assess them. These criteria were: affordability, maximising benefits of power BECCS, minimising the costs of power BECCS, ensure the model is investible, and to enable power BECCS to deploy on the desired timelines.

Question 4: Do you agree with the overarching objectives of our policy framework for power BECCS?

Summary of Responses

This question had 29 responses. There were 15 responses which answered 'no' or suggested they were unsupportive of the objectives and 12 which answered 'yes' or showed they were supportive of the objectives.

Ten respondents agreed with the proposed policy objectives for power BECCS, though some suggested additional factors which needed to be considered while making decisions about power BECCS policy. Some also set out that the objectives are inter-related, and cautioned against emphasising one above the others. In particular, multiple respondents set out that the affordability and minimising cost objectives should be considered in the light of bringing forward a nascent industry, and that the lowest cost solution may not be the one which delivers the most value over time.

Respondents suggested there should be additional objectives which consider:

- Supporting the policy within the upcoming Biomass Strategy;
- A position on technology neutrality, and in particular an emphasis on a model which can be adaptable to small, medium, and large projects, as well as new-build and retrofit projects;
- Enabling the transition from support for biomass power generation to the power BECCS model;
- Developing supply chains for power BECCS; and the
- Development of negative emissions market framework(s).

One stakeholder asked for clarity about the phrasing of the description within the "Timelines" objective, asking whether government plans would allow for the deployment of multiple power BECCS facilities.

Many of the responses disagreed with the proposed objectives. In particular, most of the responses which disagreed did so on the grounds of not supporting power BECCS, citing similar concerns to those outlined in the Campaign Responses section above. One response set out concerns about the eligibility criteria to the power BECCS Project Submission Process

which is out of scope of this consultation. Another response suggested that power BECCS should be supported through a more technology neutral approach.

Government Response

We welcome the feedback that we have received on the policy objectives we set out for the overarching framework of the power BECCS model. We agree that the objectives are inter-related and that the best outcome for the business model will involve balancing competing objectives with each other.

Some of the additional objectives raised are areas that government is actively considering. The Biomass Strategy will set out principles that we are seeking to align with throughout the process of developing the power BECCS business model. Alignment between the Biomass Strategy and the business model is fundamental to the delivery of power BECCS and the associated negative emissions. We also acknowledge the role that the power BECCS business model has in interacting with current and future negative emissions markets and government will take a holistic approach to developing market frameworks across technologies.

As set out in response to Question 1, the power BECCS Project Submission eligibility criteria are out of scope. Details of the eligibility criteria were set out in the power BECCS Project Submission guidance¹⁶. The responses also proposed that we consider the business model framework through the lens of neutrality towards project size, neutrality towards retrofit and newbuild projects, and to develop power BECCS supply chains. It is our view that these additional objectives and considerations would not be significantly affected by the choice of overarching business model structure, but we recognise they could be important considerations for developing the next level of detail.

Question 5: Do you agree with the minded-to position of a combined CfD for electricity generation (£/MWh) and a CfD for Carbon (£/tCO₂) under a CfD contract framework? If not, please provide rationale for why not?

Summary of Responses

There were 24 responses to this question, in addition to the significant response as part of an organised campaign. The campaign responses, a further set of co-ordinated responses from environmental groups and a small number of other responses voiced their lack of support for power BECCS, and therefore for the proposed Dual CfD model. The remaining responses highlighted additional key factors to be considered when settling on a model.

Many of the respondents supported the approach of a CfDe for electricity alongside a CfDc for carbon captured, which we call a Dual CfD, particularly emphasising the well understood

¹⁶ Power BECCS Project Submission guidance, available at: <https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-power-bioenergy-with-ccs-beccs>

nature of the CfD scheme. They also expressed support for the possible consistency with one of the potential frameworks for the GGR model¹⁷. However, of these respondents, the majority also indicated they were concerned that there was not currently a well-developed negative emissions market to form the basis for a CfDc Reference Price, and that uncertainties around this created a risk for developers.

As a result of this uncertainty around future negative emissions markets, several of the responses highlighted a preference for a CfDe + Negative Emissions Payment (NEP) over the Dual CfD model, though many also recognised that a Dual CfD could work well with an initial CfDc Reference Price of 0 until an appropriate market is established. When suggesting the approach of setting an initial CfDc Reference Price of 0, respondents emphasised that government would have to set out very clearly how any process for moving away from an initial CfDc Reference Price of 0 towards a market based CfDc Reference Price would work. They stressed that government needed to ensure that the process did not create risks for Generators. Two key risks that were highlighted in relation to such a transition were the risk of there not being sufficient demand or volume of credits in a market to allow the Generator to achieve the CfDc Reference Price in its sale of negative emissions.

One respondent suggested that a CfDc Reference Price mechanism could be set based on an achieved sale price, particularly for Voluntary Carbon Market (VCMs) sales. The response suggested that Generators should retain a share of market revenues in addition to the CfDc Strike Price in order to incentivise them to seek out a high market price in the VCMs.

Many respondents highlighted the importance of aligning carbon payments with the approach for the GGR model, and the importance of early clarity to investors.

Of those who did not support the Dual CfD model, one concern which came up in multiple responses was that offering a CfDe would enable a project that does not ever or always operate its capture plant to receive significant subsidy. Respondents raised concerns about previous CCUS projects which have performed poorly, suggesting that the CfDe would continue to provide subsidy if the same occurred for a power BECCS project. This concern was often tied to a view that biomass electricity generation is not low-carbon electricity generation. One respondent set out their view that operating unabated biomass generation would be inconsistent with the Biomass Policy Statement, which set out an intention that future large-scale biomass-based electricity generation would not be supported without the addition of CCUS.

Some respondents also set out a concern that electricity consumers should not be exposed to prices as high as the cost of unabated power generation, one of the possible bases on which the CfDe Strike Price might be set. These responses noted that there are cheaper forms of low-carbon electricity than power BECCS.

¹⁷ Business Models for Engineered Greenhouse Gas Removals: A consultation on accelerating investment in engineered carbon removals, available at: <https://www.gov.uk/government/consultations/greenhouse-gas-removals-ggr-business-models>

One respondent set out that it would be important to understand how funding will be distributed across the CfDc and CfDe. Others set out that the effectiveness of the CfDe would depend on future market arrangements and that the CfDe should not default to exactly copying the terms of the existing renewable CfD. A small number of responses highlighted a preference for the model to be a stand-alone carbon payment, with electricity generation exposed to market forces to incentivise more flexible generation behaviour. Their view was that this was a technology neutral approach to power BECCS, which should align with other GGR technologies.

Government Response

Following consideration of the feedback that we received in the consultation we will continue to develop the Dual CfD model as the business model for power BECCS. We set out more detail about the structure of the model in the Dual CfD section below.

We set out in the consultation that we consider that the CfDc could be designed to include flexibility to integrate negative emissions sales from an appropriate carbon market. The Dual CfD can provide revenue stability while mitigating risks of overcompensation if market revenues from carbon and electricity are high. We recognise that there is currently a great degree of uncertainty related to nascent negative emissions markets, and that as the model develops it will have to mitigate risk arising out of this uncertainty. Our approach to negative emissions markets, the CfDc, and the CfDc Reference Price will continue to be developed as part of our wider action on GGRs, including the GGR business model and consideration of the ETS as a future market for GGRs.

Several responses raised concerns about the possibility that projects may never demonstrate carbon capture, or may fail to maintain a high capture rate throughout the term of the contract.

- The existing renewable CfD scheme, and the other CCUS business models all include a series of requirements known as “Operational Condition Precedent” (OCPs), which have to be demonstrated before payments commence under these schemes.
- For the CCUS business models, this includes commissioning tests which verify that the project is capable of achieving a high standard of CO₂ capture. For example, the DPA requires projects to demonstrate a capture rate of at least 80% to commence payments, and then to demonstrate a capture rate of at least 85% by the Longstop Date (one year after the end of the Target Commissioning Window) or the contract will be terminated.
- The CCUS business models also include “Minimum Capture Rate” provisions, which can lead to termination if a project fails to resolve a consistently low capture rate.
- The CCUS business models also include a “Termination for Prolonged T&S Unavailability”, which allows the contract to be terminated if, due to no fault of the capture project, the relevant T&S Network is not available for a significant period of time, and no alternative route to storage can be found. Where prolonged periods of T&S unavailability are not the fault of the capture project, the CCUS models offer compensation in this circumstance.

As set out in the Conditions Precedents and Termination and Consequences of Termination sections below, we intend to include similar requirements in the power BECCS business model and will set out more details in due course. As a result of these contractual mechanisms, a project will not receive payments if it never demonstrates a high standard of CO₂ capture and may face termination if it fails to maintain a high standard of capture rates.

Biomass is considered a renewable, low carbon energy source, because its inherent energy comes from the sun. It removes CO₂ from the atmosphere as it grows, and can be used to directly displace oil, coal and natural gas. This view is supported by the Committee for Climate Change. As set out in response to Question 18, we are continuing to develop our position on unabated running.

We agree that it is important for detail about the distribution of costs between the two payment mechanisms to be set out and will work closely across government to further develop these principles and set them out in due course. Power BECCS projects can offer significant negative emissions alongside a co-benefit of firm, low carbon power generation. This is a unique opportunity to contribute significantly to reaching our Net Zero ambitions, whilst also bolstering security of supply and reducing reliance on natural gas.

We are considering the precedent under the existing renewable CfD scheme alongside the CCUS business models and the strategic priorities of power BECCS projects to develop the Dual CfD model. We will diverge from the existing CfD model where we consider it best to meet our objectives for power BECCS.

We have considered the feedback in the consultation suggesting a range of views about whether power BECCS projects should be exposed to market conditions and incentivised to run more flexibly; or as set out below in response to Question 6, that running at a more stable, baseload profile has the potential to deliver significant negative emissions. We are continuing to consider our approach to electricity market signals and flexibility. We are considering the costs and benefits of different approaches alongside any contractual mechanisms which can reduce electricity system costs while maximising negative emissions potential.

Having reviewed the evidence and views submitted and considered further the desired outputs and market dynamics at play, we consider that a Dual CfD model remains the most suitable power BECCS business model and is more appropriate than a stand-alone carbon payment. As set out in the consultation, a standalone carbon payment framework would not allow for cost recovery from sales of electricity. This would prevent any revenue payback where electricity prices are above a CfDe Strike Price. As power BECCS plants would be carrying the wholesale electricity price risk, a standalone carbon payment model may require a higher carbon payment and could therefore increase the overall level of support. A standalone carbon payment could also create a perverse incentive for the plant to run inefficiently in order to maximise this carbon payment. The Dual CfD model allows for a clearer distribution of costs and allocation of risk than a stand-alone carbon payment, making it the most suitable model.

Dual CfD Model

In the consultation we set out our minded to position that, based on the successful Contracts for Difference (CfD) scheme, the power BECCS business model will be a 'CfDe +CfDc', which we refer to as a Dual CfD. The suggested Dual CfD model was described as a combination of a CfD for low-carbon electricity and a CfD for carbon captured.

Having considered the responses received and evidence available, we have confirmed that we will continue to develop the Dual CfD model. The model will include a payment mechanism of three parts, a difference payment for the low-carbon electricity generated (referred to as a CfDe); a difference payment for carbon captured (referred to as a CfDc); and, to support the use of the T&S Network, a T&S Charges Payment. The two difference payments are broadly based on the difference payment in the CfD scheme.

The Dual CfD model is likely to include other features from the existing CfD scheme, with amendments where appropriate, potentially including the Operational Conditions Precedent, Target Commissioning Window and Longstop Date. We will set out further details of these in due course.

Payment Mechanism

The payment mechanism is split into three parts: a difference payment for the low-carbon electricity generated (referred to as a CfDe), a difference payment for carbon captured (referred to as a CfDc) and a T&S Charges Payment.

The two difference payment mechanisms will each be made up of a strike price and a reference price, meaning there will be two strike prices and two reference prices for the Dual CfD model. We recognise that, once developed, it will be important to set out the principles behind the distribution of costs between these two strike prices.

The two strike prices will need to be designed to consider all the costs that a project is exposed to, along with possible ancillary revenues outside of the electricity and carbon markets. The two strike prices will need to be set to ensure that no costs are double counted. We recognise that some costs during the construction of the project may not be clearly allocated between electricity generation and carbon capture, and these costs will need to be treated to ensure that they are incorporated into the model correctly.

We will continue to develop the principles behind the two strike prices, and set out more detail in due course.

Question 7: Are there alternative methods to setting this that should be considered?

Context

This question was asked in the context of potential principles which could be used to set the CfDe Strike Price. The section set out three possible approaches: “wholesale price projections”, “cost of unabated biomass generation” or “comparator technology cost”; and asked whether there were additional methods which could be used to establish a CfDe Strike Price.

Summary of Responses

Nine respondents gave substantive responses to this question, and 2 further respondents set out that they did not have alternative approaches to suggest. Of those that responded, the majority expressed support, and some a preference, for setting the CfDe Strike Price based on the costs of unabated biomass. Some suggested that such an approach would be consistent with the existing CfD scheme. Others suggested that setting the CfDe Strike Price on that basis would mean that low-carbon generation could continue during periods where no capture was possible.

Some responses set out potential risks arising from the comparator technology costs or wholesale market price approaches which were set out in the consultation, though noting that more information was required about the approaches. Particular concerns included that with a comparator technology approach a project may be less likely to run during unabated periods, and with a wholesale market price approach likely to lead to under-subsidisation or not fully count the value of biomass generation during any periods where no capture was possible. However, one response suggested that the CfDe Strike Price and the CfDc Strike Price would need to be designed to complement each other – such that if the CfDe Strike Price is not enough to incentivise the dispatch of power on its own, the addition of the CfDc Strike Price should ensure the project runs.

Two respondents used this question to reiterate that they do not support a CfDe, suggesting that a stand-alone carbon payment, such as a CfDc or NEP, could reflect the whole value chain instead. One respondent suggested that a CfDe Strike Price could be set at 0 with a corresponding higher CfDc Strike Price to recover costs and remove power price exposure.

Government Response

We welcome the responses we have received to the potential principles which could be used to set the CfDe Strike Price, and will consider the feedback we have received. We agree that the principles behind the CfDe and CfDc Strike Prices will need to be complementary and recognise that it is important for government to set out detail about the distribution of costs between the two payment mechanisms. We will work closely across government to further develop these principles and set them out in due course.

As set out in response to Question 4, we consider that a Dual CfD model is more suited to power BECCS than a stand-alone CfDc or NEP model as it allows a more appropriate apportionment of cost and risk between industry and government.

Question 8: Are there any risks or concerns around setting the CfDe Strike Price that have not been mentioned here?

Summary of Responses

The responses received to this question highlighted two key factors which need to be considered when setting the principles behind the CfDe Strike Price. These factors were the risk of cost increases between contract signature and the project coming online (for example due to cost increases while securing EPC contracts or when contracting for fuel), and the costs of operating in the electricity markets (for example the risks and costs of selling power in the forward markets, such as the cost of securing collateral).

Some responses also set out some further considerations about the broader CfDe mechanism and in particular its treatment of periods where the T&S Network was unavailable or constrained and how it might incorporate sustainability criteria. Some respondents highlighted that during periods of T&S unavailability, a power BECCS Generator can increase its power output and that there would need to be a mechanism to ensure that feedstock costs and electricity output during this period are properly accounted for. The responses also highlighted that during any periods where the T&S Network is constrained, there may be a loss of efficiency if the plant is turned down to match T&S availability and that the mechanism should account for this.

One response suggested that risks around forward sales could be reduced if the basis of the CfDe Reference Price was changed to quarter-ahead power sales. Another stakeholder suggested that the CfDe could have different “installed capacity estimates” for abated and unabated capacity, to account for periods of T&S unavailability.

Some respondents asked for more detail about the formula for calculating difference payments, including whether a Renewable Qualifying Multiplier, such as that in the existing CfD scheme, might be applied. One response also reiterated the importance of clearly setting out the principles behind the distribution of costs between the CfDe and CfDc Strike Prices to ensure that all cost elements are accounted for in the mechanism.

Another respondent stressed their view that the CfDe Strike Price should only factor in the social benefit of security of supply provided by a power BECCS plant, with the social benefits of negative emissions valued separately in the CfDc Strike Price.

Government Response

We welcome the evidence we have received on additional challenges which need to be considered when developing our approach to the CfDe. We are considering the evidence, and look forward to further engaging with interested parties about the challenges raised as part of a series of regular engagement sessions. More detail is set out about these engagement sessions in the Next Steps section below.

As set out in the Campaign Responses section, projects brought forward under the power BECCS business model will be required to adhere to strict sustainability criteria. The Biomass Strategy, which will be published in Q2 2023, intends to present recommendations on how the existing biomass sustainability criteria could be enhanced. We are still considering how these sustainability criteria will apply in the model, including considering the Renewable Qualifying Multiplier and how it should apply to the CfDe. We will set out further detail about the sustainability criteria, and any mechanisms within the model for implementing it, in due course.

We recognise that payment calculation elements, such as the CfDe Reference Price and Renewable Qualifying Multiplier, and the full payment calculations for the power BECCS model are of significant interest to respondents and we are considering their design. We will continue to develop the principles behind these and engage with industry and across government to finalise them.

The Dual CfD is being designed to support investment in power BECCS projects. The CfDc is an important part of the model as it provides generators with a payment for carbon captured and helps to incentivise the generation of negative emissions. The generation of negative emissions is a societal good which will aid in the UK's push to achieve net zero by 2050 and will help balance residual emissions from hard-to-abate sectors. We recognise the importance of setting out the principles behind the distribution of costs between the two strike prices, and will continue to develop these principles.

Question 10: Do you agree with the outlined approach to setting the CfDc Strike Price? If not, are there any alternative methods to setting this that should be considered?

Summary of Responses

There were 13 responses to this question, of which, the majority of respondents expressed support for the approach outlined in the consultation, though some suggested that more details needed to be set out.

In particular, some responses emphasised that return on investment and the fixed and variable costs of capture needed to be covered by the CfDc Strike Price. Some respondents emphasised that the CfDc will need to work in conjunction with the CfDe and that together they

would need to cover the cost base of the project, requesting that the principles of the CfDe and CfDc strike prices be clearly set out and considered.

Several responses noted that there is a degree of cost uncertainty and set out their view that the approach to the CfDe Strike Price needs to remain flexible until agreed in negotiations with projects. One respondent set out their view that T&S Charges should be separate from the CfDc Strike Price.

Two respondents used the question to reiterate their concerns about the Dual CfD approach, raising their view that the CfDe Strike Price should be set an appropriate level which does not “subsidise the CfDc”. They set out their view that both strike prices should be limited to the cost of equivalent alternatives.

Government Response

We welcome the feedback we have received on the possible principles underpinning the CfDc Strike Price. We agree that in order to support investment, a reasonable return will need to be recovered from the projects revenues from the electricity market, any negative emissions markets, the CfDe and the CfDc.

Support for negative emissions is a developing policy area across government and we will continue to seek feedback and coordinate across relevant business models to develop further details. We are considering the principles behind both the CfDe and CfDc and these will be set out in more detail once developed. This will include setting out more detail about how the model will allow for the recovery of a project’s capital costs and a reasonable return on investment.

T&S Charges are discussed in more detail in the T&S Charges section below.

Question 11: Are there any risks or concerns around setting the carbon strike price that have not been mentioned here?

Summary of Responses

There were 13 responses to this question. Some respondents highlighted the uncertainty around future negative emissions markets, and subsequent uncertainty about whether a project will be able to effectively sell their negative emissions at the CfDc Reference Price. Several of these respondents suggested that setting the CfDc Reference Price at 0 until there is a sufficiently developed and accessible market for negative emissions would mitigate this risk. One response suggested a cap and floor mechanism for a project’s Internal Rate of Return (IRR).

As in the responses to Question 12, respondents set out views around the balance of subsidy between the CfDc and CfDe, the risk of cost increases after contract signature, the lack of

existing cost data for power BECCS projects and a desire for more detail on how payments will be calculated.

The responses also raised concerns about how a CfDc for negative emissions might impact negative emissions markets, and that the power BECCS model should align with the GGR model also in development.

Government response

We welcome the feedback we have received on further challenges related to the CfDc. As set out in response to Question 5, we recognise that there is currently a great degree of uncertainty related to how nascent negative emissions markets would fit into a CfDc. We are working across government to develop our approach to the Dual CfD and understand how the power BECCS business model will interact with such markets.

Question 20: What do you believe is the most appropriate market framework for supporting FOAK power BECCS projects over the next decade, and how might this framework evolve over time? In your answer, please consider the market options outlined in Section 3 of the GGR consultation, indicating which option or combination of options would be preferable to achieve the objectives for power BECCS.

Context

This question was asked in a section which mentioned several possible market frameworks, for example integrating engineered GGRs into a market, such as the UK Emissions Trading Scheme (UK ETS), a separate market for negative emissions or a GGR obligation scheme. The question referred to further detail set out in Section 3 of the GGR business model consultation¹⁸.

Summary of Responses

We received 20 responses to this question. The majority of respondents expressed views that, if integrated, the UK ETS would be a suitable market framework for GGRs. However, two respondents did not consider CfDc support appropriate, setting out their view that polluters should bear the whole cost of the negative emissions. Two other respondents did not believe that any support should be given for power BECCS.

Several respondents set out that UK ETS would be an appropriate market in the long term, but suggested that the most readily available markets at the moment were VCMs, and that participation in these should be allowed in order to drive down support costs. Some of these

¹⁸ Business Models for Engineered Greenhouse Gas Removals, Section 3: Building a market for negative emissions, available at: <https://www.gov.uk/government/consultations/greenhouse-gas-removals-ggr-business-models>

responses suggested that revenues from the VCMs should be shared between projects and government via a gainshare mechanism to help reduce the overall level of support.

Some respondents also suggested that projects should be given flexibility to choose between selling into VCMs and any compliance markets such as UK ETS which are established, to allow them to seek the most value from their negative emissions. These respondents stressed this would need to be managed in a way to ensure there is no double counting of emissions.

Other respondents suggested that the business model could be an opportunity for government to provide early clarity on what it considers to be robust standards and help develop VCMs.

Some respondents reiterated their view that the CfDc Reference Price should initially be set at 0 due to the early stage of existing negative emissions markets. They set out that in their view, investors cannot yet guarantee that they will be able to sell negative emissions with sufficient volume and price certainty to rely on a CfDc Reference Price mechanism. Some respondents noted that they believed it was unlikely that such certainty would arise over the life of the initial contracts and in their view the CfDc Reference Price should be set at 0 throughout the contract term.

Multiple respondents set out views about the forms a compliance market for negative emissions could take, and suggested a phased approach to establishing such a market.

Some responses also highlighted that in their view it was important that there is a common framework for all GGR technologies. These respondents were in favour of technology neutral approaches to support for different GGR technologies, and suggested a fixed price for GGRs.

Government Response

We welcome the feedback that we have received in response to this question. The power BECCS business model and broader GGR business model have an important role to play in helping to bring forward projects which will engage in future negative emissions markets. As set out in response to Question 5, we recognise the uncertainty expressed about how a CfDc Reference Price mechanism would interact with the current and possible future negative emissions markets. We also recognise that it is important that the CfDc Reference Price reflects a price that projects can be achieve at sufficient volumes. We will continue to work across government to develop our approach to negative emissions markets for the power BECCS model.

The 'Developing the UK ETS' consultation, published in March 2022, contained a call for evidence exploring the role of the UK ETS as a potential long-term market for GGR technologies including power BECCS. This explored the potential benefits of the inclusion of GGRs in the UK ETS; the key considerations for policy design; the range of associated market participation criteria; and the different ways of integrating and phasing GGRs into the market over time.

In the Net Zero Growth Plan, we stated that we recognised the integrity offered by the UK ETS could unlock investment at scale in the UK's GGR sector by providing an integrated market

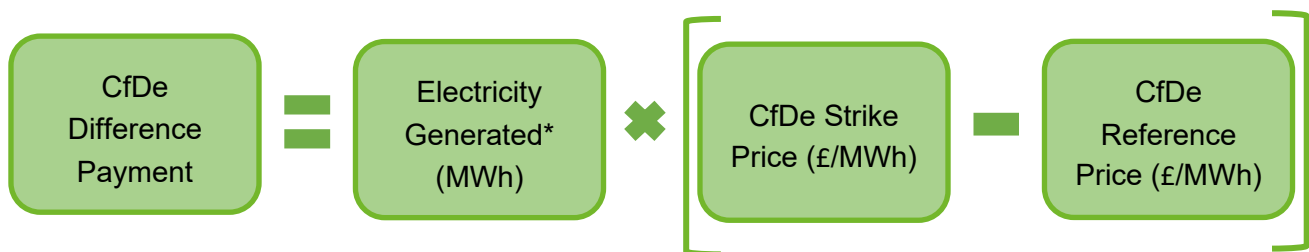
where businesses can make economically efficient choices on how to decarbonise or remove their emissions. We will work with the UK ETS Authority to consider options for integrating GGRs in the UK ETS, subject to the outcomes of last year’s UK ETS consultation, a robust MRV regime being in place, and the management of wider impacts - including market stability and the permanence of the emissions stored by the GGRs. Further detail will be provided in the Government Response to the ETS consultation.

We recognise that VCMs represent a source of market revenues to projects prior to the inclusion of negative emissions within the UK ETS, but that risks around volume and price are still present in the VCMs. We will continue to explore how these revenues may be factored into the power BECCS model, and how the model might interact with both VCMs and the UK ETS if GGRs are included.

CfDe Difference Payment

The CfDe Difference Payment will resemble the difference payment in the existing renewable CfD scheme. It will consist of a CfDe Strike Price, a CfDe Reference Price and a term representing the power output of the plant. We anticipate that a term representing the power output of the plant will be capped for each settlement unit and will continue to develop this approach.

In summary, the CfDe Difference Payment should function by considering:



As with the existing CfD scheme, when electricity is generated during periods where the CfDe Strike Price is greater than the CfDe Reference Price, the Generator will receive a payment from the Counterparty. If the CfDe Strike Price is lower than the CfDe Reference Price, the Generator will have to make a payment to the Counterparty.

Electricity Generated: The “Electricity Generated” will be the metered electrical output of the facility, with a floor of 0 and capped for each settlement unit. It is anticipated that it will be adjusted to account for the Transmission Loss Multiplier and likely the Renewable Qualifying Multiplier (RQM). We are exploring whether the Advanced Conversion Technologies Multiplier should apply and whether for Combined Heat and Power (CHP) projects, the CHP Qualifying Multiplier should apply. Further detail will be set out in due course about how these multipliers will be treated, and how the formula will be represented in the business model contract.

CfDe Strike Price: The CfDe Strike Price represents a fixed revenue per megawatt hour (MWh) of electricity that is output by a power BECCS project. As set out above, we are still developing the principles behind which costs and revenues are intended to be considered in

the CfDe Strike Price and which costs and revenues are intended to be considered in the CfDc Strike Price.

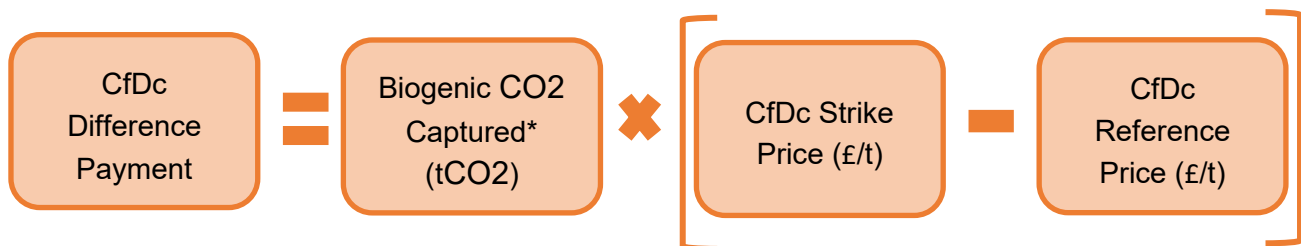
CfDe Reference Price: We are considering the precedent from the renewable CfD scheme alongside stakeholder feedback and key power BECCS considerations. We will set out the CfDe Reference Price in due course.

Calculation and payment periods: The CfDe Difference Payment will be calculated for each Settlement Unit, and paid once per Billing Period. We are still considering what the most appropriate length of time for the Settlement Units and Billing Period should be to ensure alignment with the T&S Charges Payment and CfDc Difference Payment.

CfDc Difference Payment

The CfDc Difference Payment will broadly follow the same format as the CfDe Difference Payment. It will consist of a CfDc Strike Price, a CfDc Reference Price and a term to represent the biogenic CO₂ captured and sent to storage. The Biogenic CO₂ Captured term may be capped at an agreed value for each Settlement Unit.

In summary, the CfDc Difference Payment should function by considering:



As with the existing CfD scheme, when biogenic CO₂ is captured and permanently stored during periods where the CfDc Strike Price is greater than the CfDc Reference Price, the Generator will receive a payment from the Counterparty. If the CfDc Strike Price is lower than the CfDc Reference Price, the Generator will have to make a payment to the Counterparty.

Biogenic CO₂ Captured: The CfDc will reward biogenic CO₂ output into the T&S Network. We recognise that further detail will need to be developed on the methodologies, such as MRV, needed to support this approach.

We are still considering the best approach to forming the basis of the CfDc Difference Payment, including whether to pay the CfDc (i) on net-negative or (ii) on gross-biogenic CO₂ basis.

If we were to pay on (i) a net-negative basis, this would mean paying based on a figure for the total units of net-negative CO₂ stored in each Settlement Unit by considering the total amount of biogenic CO₂ stored after supply chain emissions have been deducted. If we were to pay on (ii) a gross-biogenic basis, this would mean paying on the total amount of biogenic CO₂ stored. We are considering whether we should apply some form of Carbon Qualifying Multiplier based

on the sustainability and supply chain emissions of each consignment of fuel. This could be based on the precedent of the Renewable Qualifying Multiplier from the existing CfD scheme. Further detail will be set out in due course about which approach is preferred, the necessary MRV processes to implement it and how such a multiplier would be treated. We will also set out more detail about how the formula will be represented in the business model contract.

CfDc Strike Price: The CfDc Strike Price represents a fixed revenue per unit of biogenic CO₂ permanently stored, on either a net or gross basis. As set out above, we are still developing the principles behind the two strike prices.

CfDc Reference Price: We have not yet determined the best approach to a CfDc Reference Price, or whether another framework may be necessary in the initial period of the contract. We will set out more detail on the appropriate market frameworks for carbon sales within power BECCS in due course.

Calculation and payment periods: The CfDc Difference Payment will be calculated for each Settlement Unit, and paid once per Billing Period. We are still considering what the most appropriate length of time for the Settlement Units and Billing Period should be to ensure alignment with the T&S Charges Payment and CfDe Difference Payment.

Baseload Running

The consultation, and feedback from respondents, highlighted a number of aspects to consider regarding the optimum dispatch profile for power BECCS projects. We are continuing to develop a position on the dispatch profile. Within this we are considering how to ensure the model meets the objective of incentivising the provision of negative emissions and low-carbon electricity for security of supply. A key factor in this decision will be assessing the costs and benefits of a baseload profile, and in particular considering how to maximise negative emissions whilst recognising the needs of the power system. We will consider how to ensure the model represents the best value for money for the consumer and wider society, including the benefits of offsetting emissions from hard-to-abate sectors to help reach net zero.

Question 6: Should the power BECCS project be incentivised to run baseload or flexibly? Please provide rationale for your answer.

Summary of Responses

There were 24 responses to this question. One theme within the responses focused on the potential impact of baseload running on the power system. Respondents expressed a view that any power BECCS project should participate in the market in the way that minimises the cost of a decarbonised electricity system. These responses set out a view that the business model framework should ensure that the generator remains an active participant in the wider electricity market. They set out that the model should ensure generation is dispatched according to system margin and price signals, to enable safe and efficient operation of the electricity system.

Some respondents highlighted that a baseload running profile would incentivise the most predictable and largest volume of negative emissions.

A few participants highlighted that from a technical perspective, a power BECCS project is designed to run at baseload rather than on a dispatchable basis, and that running in this way could deliver affordability given the need for security of supply. The responses also raised concerns about the practicalities around the storage of and perishability of feedstocks. Another consideration raised was that power BECCS projects would likely have slower start-up times and ramp rates compared to other generation types. The same respondents expressed that in their view this is not compatible with a flexible electricity system.

Further responses set out views that power BECCS projects should be enabled to bid into flexibility services markets. They set out that these could be effective mechanisms to ensure that power BECCS plants do not run during periods where the benefit to the electricity system of turning down the plants outweighs the value placed on negative emissions through the support mechanism.

There were concerns raised regarding the technology readiness of the carbon capture and storage equipment. These focused on what would happen both financially and from an emissions perspective during a period where either the carbon capture or the T&S Network was unavailable.

Government Response

This question highlights the importance of the two priorities, the production of negative emissions and low-carbon electricity generation. The power BECCS business model is seeking to achieve a production of negative emissions, with low-carbon electricity generation as a co-product for security of supply.

One factor to consider is that the technology is designed for baseload running from a financial and technical perspective. Another factor is that higher load factors allow for the maximum volume of negative emissions to be produced.

A dispatchable profile may suit the needs of the power system more optimally. However, this approach would lead to a smaller quantity of negative emissions (compared to a baseload profile). At lower load factors, power BECCS would contribute less negative emissions to offset hard-to-abate sectors, and less towards government's ambition of deploying at least 5 MtCO₂ of engineered GGRs per year by 2030. We are considering how the business model should reflect this balance.

Another factor to consider when looking at flexibility, is that projects can receive revenues by bidding into flexibility services which could offset the cost of power BECCS, whilst maximising the benefit of negative emissions.

As set out in response to Question 5, we intend to include mechanisms in the business model which will manage the performance of carbon capture. The contractual mechanisms suggested would mean that a project would not receive payments if it never demonstrated a high standard of CO₂ capture and may face termination if it fails to maintain a high standard of capture rates.

We are continuing to develop our thinking on the load factor, noting the links to other elements of the business model that remain in development. Any decision will be subject to a number of considerations including subsidy control.

Term Length

Question 13: Do you agree with a proposed contract length of 10-15 years? If not, why not?

Responses

This question had 21 responses. Twelve of the respondents were supportive of the suggested contract length and 9 were unsupportive. Fourteen respondents did not provide a response or responded that they didn't know.

Summary of Responses

Several respondents who answered 'yes' did not provide further information. Respondents who were in support of this contract length suggested that having a consistent, and sufficiently long, term length across the different business models would give investors' confidence that a robust negative emissions market would be developed within the contract life. They set out their view that if the term length was shorter, it could result in the strike prices being higher.

Respondents who did not support the suggested term length set out a preference for a term length which was linked to performance, and that in their view there needs to be provisions in the contract for revision of terms over the contract life. Respondents that suggested performance indicators said that linking the contract to performance would motivate good practice and improve CO2 removal. One suggested method involved validating any 'promised removals' every 2 years to ensure the financial reward was being linked to carbon removal in real times.

Some respondents also flagged their view that the technology is still evolving and therefore having a contract of 10-15 years could leave government locked into long term contracts with generators while other new technologies are still being developed. They suggested adding a review process for contracts, where if they do not keep up to date with new technologies, the contract could be voided.

Some respondents also flagged concerns about the reliance on feedstock from overseas, and their view that this could present a risk to security of supply in a way that can't be predicted.

Government Response

We welcome the feedback in the responses we received. Our minded-to position is that the Dual CfD model should have a contract term of 10-15 years, with each project having flexibility to choose an appropriate term length that is between 10 and 15 years, following the precedent in the DPA.

The rationale for this position is that it provides a sufficient length of contract to attract investment and ensure that the strike prices are not unnecessarily high. The flexibility of a term

length between 10 and 15 years will allow projects to decide and justify on a case-by-case basis what length is the most appropriate for each individual project.

We recognise that ensuring good performance is essential to the contract, but do not consider the term length the best mechanism to do this. As set out in both the Broader Business Model Elements section and the response to Question 5, we intend to develop provisions within the contract to manage performance. These will include mechanisms to ensure that a good standard of capture is achieved and maintained.

We are continuing to evaluate and develop our position on term length to ensure the best value for money. Our position on term length requires further analysis and may be subject to negotiation. We are open to further evidence about different term lengths. Throughout the term of the contract, we anticipate that performance will be managed through various contractual mechanisms, including potential penalties for poor performance.

T&S Charges

In the consultation we asked questions related to T&S Charges and suggested some options for how these charges could be approached in the power BECCS business model. The approaches we set out in the consultation included one approach where support for the cost of T&S Charges could be factored into one, or both, of the strike prices. Another approach was that the T&S Charges could be calculated and supported separately.

T&S Charges are one of the key cost items which a power BECCS Generator will have to pay, and so must be incorporated into the payment mechanism of the Dual CfD model. As we set out as one option in the consultation¹⁹, business model support for the T&S Charges will be calculated separately based on the rates in the annual Charges Statement and actual usage. The T&S Charges will not form part of the cost basis for either the CfDc Strike Price or the CfDe Strike Price. More information about the rationale for this and the feedback we received related to support for T&S Charges is set out in response to questions 12, 16 and 17 below.

The CCS Network Code²⁰ sets out that the T&S Charges will be comprised of three separate charges, a Flow Charge, a Capacity Charge and a Network Charge. The charges for each project will be calculated and invoiced monthly by the T&S Operator using the rates set out in an annual Charges Statement, and the power BECCS business model will pay support for these charges as a passthrough in a separate payment. We will do further work to set out how these will be paid in the business model.

¹⁹ 'T&S Charges', page 31, available at: <https://www.gov.uk/government/consultations/business-model-for-power-bioenergy-with-carbon-capture-and-storage-power-beccs>

²⁰ CCS Network Code, (Annex) Updated Indicative Heads of Terms, December 2022, Section H: Charges, Invoicing and Payment, available at: <https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models>

Question 12: Should the T&S charges be a separate payment?

Summary of Responses

The majority of respondents set out that they would prefer for T&S Charges to be calculated separately, outside of the CfDc and CfDe Strike Prices. Some respondents set out that this would have benefits such as making the strike prices simpler, reduce risk baked into the strike prices, offer increased transparency over T&S Charges, and could be more flexible for projects which do not directly connect to a T&S Network.

Some respondents stressed that aligning with other CCUS business models was important, and one stressed that it was important that the policy set for the power BECCS business model not to delay or confuse the finalisation of the other CCUS business models.

Some respondents also set out that for iterations of the power BECCS business model after FOAK projects, it might be appropriate to consider incorporating the T&S Charges into the CfDc Strike Price.

Government Response

As set out above, support for the T&S Charges under the power BECCS business model will be calculated separately based on the annual T&S Charges Statement and actual usage, and T&S Charges will not form part of the cost basis for either the CfDc Strike Price or the CfDe Strike Price.

This will have the effect of ensuring the subsidy reflects the actual T&S Charges set in the annual Charges Statement and removes a potential risk that the subsidy over or undercompensates for T&S Charges. It simplifies the agreement of the strike prices and allows for additional flexibility to account for possible modifications to the CCS Network Code. The approach mirrors that in the other CCUS business models.

Question 16: What are your views on the proposed options?

Summary of Responses

As with the response to Question 12, the feedback we received in response to this question highlighted a preference for a separate calculation of T&S Charges. There was some support for the suggestion that this could be calculated using the annual Charges Statement and metered usage of the T&S Network, though some respondents set out that further analysis and detail needed to be laid out.

Some responses set out a preference for T&S Charges to be made in a separate payment altogether.

Government Response

As set out in above, and in response to Question 12, support for the T&S Charges under the power BECCS business model will be calculated separately based on the annual Charges Statement and actual usage, with reconciliation against invoices from the T&S Operator. We are open to further feedback about the approach as the CCS Network Codes are developed.

Question 17: Where should the T&S charges be sourced from?

Summary of Responses

Respondents generally set out a preference for T&S Charges to be funded from the same source of funding as the CfDc Difference Payment. Some respondents set out their view that support for the T&S Charges should not be funded from consumer levies, which are the preferred funding for the CfDe. This was because the negative emissions facilitated by the use of the T&S Network have a wider societal benefit than to just the electricity system.

Some respondents felt that emitters, or the T&S Operator, should bear the costs of the T&S Network.

Government Response

We are still considering how best to consider costs, including the costs of the T&S Charges, between the carbon and electricity sides of the model.

Unabated Running and Support During Periods of T&S Unavailability

In the Biomass Policy Statement²¹ we set out that we intend for future large-scale biomass-based electricity generation to not be supported without the addition of CCUS. In the consultation we asked for views about whether projects should run during periods of T&S unavailability, such as temporary outages, to recognise the value of low-carbon power to the electricity system. Throughout the consultation document we also considered whether different policy positions could have an effect on the incentive to run unabated if this was considered desirable.

²¹ Biomass policy statement, page 22, available at: <https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero>

We recognise that we will need to consider the benefits and risks of incentivising projects to run during periods where they are not able to capture CO₂, such as during periods of T&S unavailability. We are assessing whether our approach should differ in situations where the Generator is at fault for being unable to capture CO₂, either through causing T&S unavailability or through issues with the capture equipment.

We are continuing to develop our position on unabated running, in particular looking at the costs and benefits of unabated running to the power system, and how to appropriately manage risks to investors arising out of periods where the T&S Network is unavailable, including various potential periods of planned and unplanned outages.

Question 18: Should the plant run unabated during periods of T&S unavailability, such as temporary outages?

Summary of Responses

There were 18 responses to this question. The responses expressed a mixture of views, but the majority of respondents considered that plants should continue to run during periods of T&S unavailability, such as temporary outages. The responses predominantly said this was because unabated biomass offers a source of low-carbon generation and that power BECCS plants would be helpful for security of supply on the electricity system. Of those that supported unabated running, some advocated for the continuation of the CfDe throughout unabated periods. Other responses expressed that the plants should be exposed to market signals and only run when required by the market.

Three respondents did not support unabated running, citing their view that unabated biomass was not carbon neutral.

Several responses also touched on the importance of making use of any available alternative storage solutions, and some set out that the CfDc should not be paid during unabated periods. Other responses stated that further detail about the character and length of potential periods of T&S unavailability needed to be understood to finalise a position.

Government Response

We welcome the feedback we have received in response to this question. As set out above, we are continuing to develop our position on unabated running. We are considering the impacts of unabated running on the power system, and how to appropriately manage risks to investors arising out of periods where the T&S Network is unavailable, including various potential periods of planned and unplanned outages.

Question 19: Do you have any evidence or thoughts on ways to manage CCUS costs in the event of T&S network unavailability?

Summary of Responses

There were 11 responses to this question. The majority of the responses set out that following the ICC or broader CCUS programme precedents would be a good starting point for determining power BECCS policy, though some set out that careful consideration needed to be given to any risk of the loss of additional revenues.

One response also set out a view that the project should not receive payments when no carbon is captured.

Government Response

As set out in the consultation, we consider the precedent set out in other CCUS business models to be a good starting point for CfDc relief during periods of T&S unavailability. We consider that support during such periods is appropriate due to the loss of revenues for CO₂ which cannot be captured and stored during periods of T&S unavailability. We are continuing to consider how these precedents can be adapted to fit the power BECCS business model.

Biomass Price Risk

Within the consultation we asked three questions related to biomass feedstock prices. Question 9 was asked in the context of a section which discussed the potential principles which could be used to set the CfDe Strike Price, where one of the options was to set the CfDe based on the “cost of unabated biomass generation”. This question was intended to address potential mitigations to the risk that, over time, the cost of biomass might increase beyond the cost that was considered when forming the basis of the CfDe Strike Price. This is a risk which was identified to us in previous stakeholder feedback.

Questions 14 and 15 were included in a section addressing biomass feedstock costs, particularly looking at the risk that long-term increases in biomass feedstock costs could create a risk for investment and consumers. The section within the consultation set out some possible approaches to the treatment of biomass feedstock price risk: a ‘do-nothing’ option which mirrored the approach to biomass costs in the existing CfD scheme where no additional protection was offered; an option to index part of the CfDe to an indicator of biomass fuel costs; or a cost-reopener for fuel costs or a gainshare mechanism.

The responses to questions 9, 14 and 15 are summarised below, after which there is a single government response covering the three questions.

Question 9: The CPI indexed Strike Price option requires the project to bear the risk of biomass costs and is the option in current contracts. Is this an appropriate allocation of risk? Please provide rationale and evidence for your answer.

Summary of Responses

We received 17 responses to this question. Nine respondents highlighted that their preferred approach would be for the power BECCS model to follow the precedent in existing biomass contract where projects bear the risk of any changes to feedstock costs. Some respondents highlighted that they wanted to see consistency across all CCUS business models. They set out concerns that providing a protection for feedstock price risks could distort the biomass market and affect other feedstock users who do not have support mechanisms for the price risk.

Respondents also highlighted their concerns that some of the support mechanisms identified in the consultation would reduce the incentive for operators to seek fuel which offered the best value for money. They set out that a protection could also create a situation where power BECCS operators could be prepared to pay more for their feedstocks than other users of biomass. This is because some of the additional cost would be covered by such a protection, creating further distortion on the market.

However, some respondents suggested that there are uncertainties around future biomass costs and that it may be appropriate for government to share the risk of biomass costs with FOAK project developers initially until the market is developed. It was indicated by some respondents that given the role BECCS is expected to play in helping to achieve targets, it would not be appropriate for the generator to bear the full risk of changes to biomass feedstock costs.

Question 14: What are your views on the suggested options?

Question 15: Are there any alternative methods to mitigate the biomass price risk that we have not discussed?

Summary of Responses

There were 14 respondents that responded to one, or both, of these questions. Some respondents also referred to their responses to Question 9. Within the 14 responses received for Question 14, there was support for each of the options proposed in the consultation (indexation, pain/gainshare, re-openers and also 'do-nothing'). The majority of respondents, taking into account the feedback received in response to Question 9, suggested their preferred option would be 'do-nothing'.

Some of the responses suggested that biomass suppliers could be more prepared to raise their price if they were aware that the model included a mitigation for price increases. They also set out additional views that the do-nothing option would help to reduce the chance of distortion on the market. They set out a concern that other biomass users, who would be exposed to the same volatility, may be less able to participate in the biomass market if their competitors were given increased support by a mitigation to this risk.

Respondents who expressed views that there should be a price mechanism highlighted that recently there has been an increase in biomass costs which, in their view, is likely a result of Russia's invasion of Ukraine. Some respondents also suggested that although the fuel is typically bought on long-term contracts, it is likely that a power BECCS project would still have residual exposure to the volatility. Some responses set out views that the inclusion of a mechanism to mitigate the impact of rising costs could incentivise investment in power BECCS projects as developers and investors would have confidence in the returns from investments.

In Question 14, we requested views on the possible options set out regarding feedstock price risk. Respondents suggested that due to there not being sufficient liquidity in the biomass market and there not being a reliable index for biomass feedstock costs, it may not be appropriate to have a direct link to the biomass index in the CfD. Respondents suggested that 're-openers' could recognise material changes in costs and structure of biomass supply contracts after the project reaches investment decision.

It was detailed by multiple respondents that the specific design and the appropriate mechanism would be largely driven by the risk allocation sought by government and the project developer.

Question 15 sought the views for alternative methods of approaching the biomass feedstock price risk. Respondents suggested some alternative methods, including fuel-switching-flexibility, and highlighted further risks which hadn't been identified related to foreign exchange rates and shipping costs. Respondents suggested that following the publication of the Biomass Strategy government should re-consult on this topic to determine a priority use framework for different biomass fuels.

Government Response

We welcome the feedback provided for questions 9, 14 and 15 which are all related to potential mitigations for the risk of the cost of biomass increasing over time. We are still considering whether to include any mitigations to this risk and any updates on this position will be communicated in future updates.

Broader Business Model Elements

This section provides an overview of some of the features of the power BECCS business model which have not directly been addressed in the consultation questions, to give an indication of how early thinking is developing on the Dual CfD.

Milestones and Conditions Precedent

Commencement and Expiry

Counterparty: We are still considering and have yet to set out who the Counterparty to the Dual CfD will be.

Commencement: We anticipate following the precedent in the CfD scheme and CCUS business models. The Dual CfD will commence on the earlier to occur of the “Start Date” and the last day of a specified Target Commissioning Window (TCW). The end of the TCW will be adjusted day-for-day for any delays that occur due to “Force Majeure” (discussed below) or T&S Commissioning Delays.

This would mean that if the Generator fails to commission the project during the TCW, the term of the Dual CfD will commence and the 10-15 year period will begin to reduce. However, payments will not commence until the Start Date occurs – this is to incentivise the relevant Generator to commission the project as soon as reasonably practicable within the TCW.

We have yet to determine the length of the TCW for the power BECCS business model. The DPA and CfD scheme both have a 12-month TCW, and we are considering this precedent in the context of power BECCS projects.

Expiry Date: Where the Generator achieves the Start Date before the end of the relevant Longstop Date (see below), the Dual CfD will expire on the date which falls 10-15 years (as chosen by the project) after the date referred to above in ‘Commencement’, unless it is terminated earlier in accordance with its terms. As set out in the Term Length section above, our minded-to position on term length requires further analysis and may be subject to change. Please see below for a discussion on early termination.

Conditions Precedent

Initial Conditions Precedent: It is envisaged there will be two sets of conditions precedent, the "Initial Conditions Precedent" and the "Operational Conditions Precedent", similar to the AR4 CfD and DPA. The "Initial Conditions Precedent" are designed to ensure that the Generator meets certain legal/regulatory requirements and conditions relating to the Dual CfD immediately following the date of the agreement. This is likely to include the Generator's entry into certain key project documents, such as a connection agreement with the T&S Network.

Milestone Requirement: The Generator will be required to demonstrate within a certain period of time that it is committed to the Project by evidencing: (i) actual spend of at least a minimum percentage (to be determined) of "Total Project Commissioning Costs"; or (ii) fulfilment of specified "Project Commitments", both similar to the AR4 CfD and DPA requirements. This is to deter speculative or underdeveloped projects from applying for a Dual CfD (over and above any primary checks prior to this point), and to ensure that budget remains committed only to projects that demonstrate sufficient progress. The Counterparty will be responsible for determining the robustness of the evidence submitted by the Generator.

Operational Conditions Precedent and the Start Date: For the Start Date to occur, we anticipate that the Generator will be expected to satisfy a number of "Operational Conditions Precedent".

We are still considering the appropriate form of such Operational Conditions Precedent, but anticipate they will be based on those in the DPA and ICC contracts. They will include conditions relating to the electrical output and the CO₂ export of the Facility. We are considering what changes will need to be made to reflect the technical and any regulatory differences for power BECCS projects.

Longstop Date: We anticipate that, following precedent in the DPA and existing CfD schemes, there will be a Longstop Date which falls a defined period of time after the last day of the TCW. We are still considering the appropriate length of this period. The Longstop Date will be adjusted day-for-day for any delays that occur due to "Force Majeure" (discussed below) or T&S Commissioning Delays.

We expect that, following precedent in the DPA and existing CfD schemes, a project will have to achieve its Start Date (as discussed above) by the Longstop Date, or the Counterparty will have the right (but not obligation) to terminate the Dual CfD (discussed below).

The DPA included a further set of "Minimum Longstop Date Commissioning Requirements" which must also be demonstrated before the Longstop Date, and we are exploring whether a similar mechanism would be appropriate for power BECCS.

Termination and Consequences of Termination

Pre-Start Date Termination: Similar to the AR4 CfD and the DPA, the Dual CfD is expected to contain various rights for the Counterparty to terminate the Dual CfD prior to the occurrence of the Start Date. Such rights will ensure that Dual CfD funding that has been committed to support the deployment of power BECCS projects is not tied up indefinitely in a project that has no realistic prospect of being commissioned. The Dual CfD will likely include a right (but not the obligation) for the Counterparty to terminate where:

- Initial Conditions Precedent: the Generator fails to fulfil the Initial Conditions Precedent within the specified time after the date of the agreement (subject to any waiver by the Counterparty);

- **Milestone Requirement:** the Generator fails to fulfil the Milestone Requirement before the Milestone Delivery Date (subject to any waiver by the Counterparty). The Milestone Delivery Date will be adjusted day-for-day for any delays that occur due to Force Majeure; and
- **Longstop Date:** the Generator fails to satisfy the Operational Conditions Precedent by a specified “Longstop Date” (subject to any waiver by the Counterparty).

Consequences of Pre-Start Date Termination: We are still considering the consequences of a Pre-Start Date Termination, but it could follow the precedents in the DPA and AR4 and be on a no-liability basis.

Termination for Prolonged Force Majeure: We may, following the precedent in the DPA, include a Counterparty right to terminate the Dual CfD where, prior to the satisfaction of the Milestone Requirement, the Generator is significantly delayed due to a continuing, unresolved Force Majeure. This is to ensure that committed Dual CfD funding is not tied up indefinitely in a project that has no realistic prospect of being commissioned. If such a termination right is included, we are considering following the DPA precedent where such termination is on a no-liability basis due to the non-fault nature of the event.

Termination for a Prolonged T&S Unavailability Event: We anticipate that, as in the other CCUS business models, there will be a termination right during a Prolonged T&S Unavailability Event. Under such a mechanism, where there is a prolonged non-fault event which prevents the project from accessing the T&S Network for a continuous period, the Counterparty will have a right but not obligation to terminate the Dual CfD. We are considering the precedent set in the other CCUS business models where this involves a 3-year process. In such circumstances, it is expected that, as in the other CCUS models, the relevant Generator(s) would be compensated.

We are still considering this termination and any relevant compensation for power BECCS.

Default Termination: The default termination provisions in the Dual CfD model are likely to follow the AR4 CfD and CCUS business models by giving the Counterparty the right to terminate the Dual CfD for Generator events of default.

Consequences of Default Termination: We are currently considering what type of Termination Payment should be payable from the Generator to the Counterparty following a default termination.

No Generator Termination Right: We note that, similar to the DPA and the AR4 CfD, the Generator will not be entitled to terminate the Dual CfD unilaterally before the Expiry Date.

Termination or Penalties for Poor Performance: We are considering whether to introduce penalties and/or a further termination event in cases where the Generator’s performance is poor for a prolonged period, for example the minimum capture rate provisions in the DPA. This could ensure that generators have incentives to continue maintaining their plant at an acceptable level.

Other Provisions

Representations, Warranties, and Undertakings: We are currently considering following the DPA in respect of the representations, warranties, and undertakings that both the Generator and the Counterparty are required to provide each other.

Generator's Metering Undertakings: We intend to include metering undertakings which are expected to be based broadly on the electricity and carbon metering undertakings in the DPA.

Qualifying Change in Law and Sustainability Change in Law: We are exploring the precedents in the existing CfD scheme and CCUS models to determine how Qualifying Change in Law and Sustainability Change in Law provisions might apply to the Dual CfD.

Reporting and Confidentiality: The form of the reporting and confidentiality provisions in the Dual CfD will likely be based on the DPA and other CCUS models.

Force Majeure: In respect of Force Majeure, it likely that we will largely follow the provisions of the DPA. This would mean that the Generator is afforded an extension of time (pre-Start Date) and relief from performance of its Dual CfD obligations where a Force Majeure occurs which is beyond the Generator's control. We are also exploring how the T&S Commissioning Delay Event provisions in the DPA might apply to the Dual CfD.

Dispute Resolution Procedure: We are exploring the precedents in the existing CfD Scheme and CCUS models to determine the appropriate Dispute Resolution Procedure for power BECCS.

Limited Recourse Arrangements: The nature of the Dual CfD scheme means that some liabilities, duties, responsibilities and obligations of both parties may be tied to the CfDc Difference Payment and some to the CfDe Difference Payment. We are exploring how limited recourse arrangements might apply to the power BECCS contract.

Sustainability Criteria: It is likely that the Dual CfD scheme will include strict sustainability criteria which will take a similar form to those in the existing CfD scheme. The sustainability criteria will include Greenhouse Gas Emissions Criteria and Land Criteria. These criteria will be based on the current sustainability criteria, after they are reviewed and strengthened where possible.

As set out in Section 3, the Greenhouse Gas Emissions Criteria for power BECCS are under development. The wider Land Criteria are to be reviewed and strengthened where possible, and the recommendations will be set out in the forthcoming Biomass Strategy, which will be published in Q2 2023.

Section 3: Sustainability and Negative Emissions

This section set out the initial work being undertaken to ensure that power BECCS will meet a suitable level of CO₂ removal. It asked about how we should assess supply chain emissions and whether the power BECCS business model should reward captured CO₂ on a net-negative or gross removal of biogenic CO₂ basis. This section summarises the responses received.

Greenhouse Gas Emissions Thresholds

Question 21: Do you agree that a power BECCS project should report against a suitable threshold to ensure that we achieve a minimum level of net-negativity from any power BECCS project is achieved?

Context

Section 1 set out that the UK has strict sustainability criteria in place for biomass use supported by government incentives across the heat, electricity, and transport sectors. The sustainability criteria include requirements under the Land Criteria and Greenhouse Gas Emissions Criteria. This question sought agreement on the need to set new Greenhouse Gas Emissions Criteria for power BECCS.

Under the Renewables Obligation (RO) and renewable CfD schemes supporting biomass electricity generation, the Greenhouse Gas Emissions Criteria sets a greenhouse gas (GHG) threshold that the supply chain emissions must not exceed. The supply chain emissions are calculated according to a life cycle assessment method, meaning that all GHG emissions (including methane and nitrous oxide emissions) of all stages in the supply chain are accounted for, regardless of where they occur (i.e., across international boundaries).

Government proposed that we continue to take the same approach in the power BECCS business model, and apply GHG thresholds to ensure that power BECCS results in a minimum level of net-negativity.

Summary of Responses

This question received 22 responses, with a majority agreement (15) that power BECCS projects should be assessed against a GHG threshold. Some of the “don’t know” responses were expressed conditional support for reporting against a GHG threshold. Their support was on the condition of some additional considerations which are elaborated on here. It is worth noting that for some of the respondents who did not support the idea of power BECCS, their view was that if projects were to be developed, then all BECCS power projects should report against a stringent threshold.

There was support across the responses for setting a GHG threshold, as it was considered key to achieving public confidence in the credibility of power BECCS as a GGR technology. It

was also considered key for ensuring there is transparency around the volumes of captured carbon from projects. It was suggested that the threshold could be used to provide a minimum level of 'net negativity' of a power BECCS project, and act as a key performance indicator that could be compared with other GGRs or other uses of biomass. However, the responses set out a view that the calculation for determining whether the threshold is met, and setting of the threshold, should be based on the full life cycle emissions of projects. They set out that this should use real-world, accurate data and be based on a standardised and systematic reporting and verification framework.

Some caveats were presented by a few respondents, for example a few were concerned that the GHG threshold might unduly penalise carbon intensive industries with unavoidable technical limitations. They set out there may be a need to set technology-specific thresholds rather than have one power BECCS approach. It was also suggested that the approach taken by the power BECCS business model should be consistent with the treatment of GGRs more broadly. A few respondents questioned how "net negativity" might be defined and urged Government to provide clarity on the sustainability criteria as early as possible to signal appropriate investment.

A few respondents suggested that the power BECCS model should build on the existing carbon calculation methods used in the Renewable Obligation or renewable CfD schemes (for example, as set out in Ofgem guidance²²). However, others pointed out that the comparator and the system boundaries of the calculation would need adjusting to be appropriate for power BECCS. Some respondents suggested the GHG calculations should include carbon leakage to the atmosphere, independent of where they occur in the supply chain. Some respondents suggested that power BECCS should be assessed against a temporal baseline where foregone sequestration from forestlands, or an alternative fate of waste was taken into account in the assessment of net-negativity.

There were conflicting views on maintaining a waste exemption for GHG calculations (as is done in the Renewable Obligation), with some calling for the usual exemptions to be maintained, while others suggested the supply chain emissions from waste recovery should be included.

Two respondents did not agree with the need to set a power BECCS GHG threshold. One suggested that instead the business model should only reward net-negative emissions (see Question 24) and therefore the business model should be designed so that if the net negativity is too low, the incentive should not be commercially viable.

A few respondents suggested that the GHG threshold should contain some benchmark for efficiency (electrical or carbon capture) to ensure perverse incentives are avoided, which is explored more in a later question.

²² Renewables Obligation: Sustainability Criteria, available at: <https://www.ofgem.gov.uk/publications/renewables-obligation-sustainability-criteria>

Government Response

As set out in Section 3 of the power BECCS consultation, power BECCS must result in an overall net-negative removal of CO₂ from the atmosphere and must only use sustainable biomass.

It is clear from the responses that setting a GHG threshold will help ensure that power BECCS will meet a suitable level of CO₂ removal, providing it is calculated in a way that is appropriate and accurate. Although it is noted that taking a net approach to rewarding captured CO₂ could also achieve the same outcome, (see Question 24), Government will develop options for setting a maximum GHG threshold for the supply chain emissions from power BECCS. Research is underway to gather evidence on the supply chain emissions from a variety of feedstocks being used in a power BECCS plant, that take carbon capture efficiency and conversion efficiency into account. Government agrees that the current methodologies for calculating the supply chain GHG emissions from bioenergy support schemes are a starting point, but agree they need some refinement prior to being appropriate for power BECCS.

Independently of the GHG threshold, all biomass used for power BECCS will be required to meet sustainability criteria. These criteria will be based on the current sustainability criteria, after they are reviewed and strengthened where possible, and the recommendations will be set out in the forthcoming Biomass Strategy, which will be published in Q2 2023. All power BECCS operators must comply with all relevant air quality regulations.

Question 22: Do you have any evidence to share that could support the determination of a suitable supply chain GHG emission threshold for power BECCS, including by how much they could be strengthened?

Context

This question sought information and evidence to support the development of the power BECCS GHG threshold. It was noted that the current GHG threshold used in the RO and renewable CfD schemes was not suitable for power BECCS, due to differing plant efficiencies, and potentially different system boundaries. It was suggested that the thresholds should be adapted for power BECCS, but also strengthened where possible. The consultation also sought evidence about how the thresholds could be strengthened over time.

Summary of Responses

There were 13 responses to this question and the evidence provided was of a qualitative nature. The majority of responses shared views that setting a supply chain emission threshold is critical and consistent with how other biomass technologies are regulated. Others pointed to existing studies on unaccounted emissions from biomass supply chains and suggested that the

methodologies used in those studies could be adapted to account for lifecycle emissions for power BECCS.

Respondents suggested that the current CfD and RO schemes were a suitable starting point, though one response suggested setting a low GHG emission threshold that would more likely support small-medium scale technologies that use local biomass feedstocks. It was suggested that a single GHG emissions threshold for all users would ensure a level playing field, and some suggested only supporting the net-negative emissions, after taking account of supply chain emissions (addressed further in Question 24). It was also suggested that the sustainability criteria should govern how power BECCS impacts on land rights, biodiversity, community and workers health.

Respondents suggested that further research on GHG emissions associated with carbon capture and transport and storage was needed. Another stakeholder suggested that government should recognise the international accreditation and regulatory landscape and accreditation schemes for carbon removals, such as the Integrity Council Voluntary Carbon Market (ICVCM), suggesting this would make for a transparent and robust approach.

Government Response

We will consider the responses received and will develop options for setting a GHG threshold for power BECCS, including how it can be strengthened over time. All biomass used for power BECCS will be required to meet sustainability criteria. The sustainability criteria are to be reviewed and strengthened where possible, and the recommendations will be set out in the forthcoming Biomass Strategy, which will be published in Q2 2023.

Question 23: Out of the three options, which option do you prefer for assessing power BECCS? Do you have any other recommendations on an alternative suitable method?

Context

This section presented three options for assessing the GHG thresholds for power BECCS, in terms of what units of measurement are most appropriate. It presented three options, including the pros and cons of each option.

Option 1 – Electricity basis (gCO₂/MJ electricity) – where the GHG emission limit will only consider emissions from the supply chain per MJ delivered electricity and will not consider the stored biogenic carbon.

Option 2 – Carbon basis (gCO₂/tonne of CO₂ stored) – where the GHG emission limits will consider the emissions from the supply chain per tonne of stored carbon only.

Option 3 – Combined option (gCO₂/MJ electricity) – where the GHG emission limit will consider emissions from both the supply chain and stored carbon, per MJ delivered electricity. Note this would result in a GHG threshold with a negative value.

This question sought views on which approach should be adopted in the power BECCS business model.

Summary of Responses

This question received 18 responses, with Option 3, the combined option, supported in the majority (13) of the responses. Most respondents considered this option to be the most appropriate because they considered it to reflect the aim of the power BECCS business model to deliver negative emissions. One respondent was strongly opposed to BECCS while another was unconvinced of setting a GHG threshold.

Of the majority that expressed preference for the combined approach, it was recognised that this would be a novel and untested approach. Some respondents asked to see further modelling of how the GHG threshold would work in practice, and for government to work in conjunction with industry to fully understand the impacts of setting the threshold in this manner. Respondents also suggested the associated calculations for meeting this type of GHG threshold should be based on validated carbon removals from the atmosphere and should be independently verified.

Respondents noted that the GHG threshold set out in Option 3 would depend on the capture rate of a plant, stating a view that this was probably most suited to a high CO₂ capture rate and when the T&S Network was fully available. Therefore, it will be important to address the impact of any periods of T&S unavailability if this approach is taken and it may be appropriate to adopt a plant-by-plant approach to take account of different capture rates.

Those who preferred Option 2, on a carbon basis, set out their view that doing otherwise would create a loophole for unabated emissions.

Those that preferred Option 1, on an electricity basis, did so because they viewed power BECCS primarily as a source of firm flexible low carbon electricity. They set out their view that electricity from power BECCS projects should be dispatched behind other low carbon generators that are unable to control their fuel supply or output. It was suggested that the starting point for determining the GHG threshold should be the current threshold under the CfD, adjusted for benchmark design efficiencies.

Another suggestion presented in the responses, was that a power BECCS project should be required to meet separate thresholds for support under the CfDe and CfDc. This approach would allow the CfDe threshold to be used if the plant needed to run unabated due to issues with the T&S Network.

A further suggestion of a variation of the ‘combined threshold approach’ was made, under which there could be an overall net negativity target (in %) which factors in gross life cycle

emissions and gross removals, which one stakeholder suggested could also be applied to other technologies which deliver negative emissions.

Government Response

It is clear from the responses that a combined approach, which combines the captured CO₂ with the supply chain emissions into a negative GHG emission threshold, is a preferred option as it recognises that verified carbon removals should be factored in the threshold. However, we recognise that there are some benefits to setting out separate thresholds for electricity and CO₂, as this would allow the power BECCS business model to be able to manage the sustainability of both electricity and carbon outputs in the CfDe and CfDc.

Government will continue to develop the GHG thresholds for power BECCS, considering the responses and information received through the consultation. We will seek to produce a GHG threshold that ensures that supply chain emissions are accurately accounted for, and that the power BECCS project delivers a minimum level of negative emissions in order to qualify for support. We recognise the feedback that the different options for GHG thresholds will be affected by the capture rate that projects achieve and by periods of T&S unavailability, and will consider how to take these into account in our approach.

Rewarding Net Negative or Gross Sequestered Emissions

Question 24: Of the two options considered (net and gross), which do you think is most appropriate for the reward of power BECCS through an appropriate carbon market?

Question 25: Is there any further evidence or arguments we should consider for either taking a gross or net approach in the power BECCS business model?

Context

These questions sought views and evidence on whether the business model should adopt a 'net' or a 'gross' approach to rewarding a power BECCS project.

The consultation set out the two approaches as:

- A 'gross' approach rewards the total volume of carbon stored – after ensuring that a GHG threshold has been reached.
- A 'net' approach only rewards each unit of permanently stored negative carbon after the supply chain emissions have been 'discounted'. This option would still require the GHG threshold to be met.

Both options pose merits and disadvantages, and we sought stakeholder views on which option to adopt in the business model.

Summary of Responses

A total of 17 responses were provided for Question 24. Nine responses showed a preference for a gross approach, though two of these acknowledged that either could work. Six set out a preference for a net approach and one response was content with either. One response did not provide a clear position.

Those who preferred a gross approach did so because they considered it the most practical option and set out views that a GHG threshold was enough to ensure that a minimum level of net-removal was being achieved by a power BECCS project. Some suggested it would be inappropriate to penalise payments for emissions that are already accounted for elsewhere. One respondent suggested that the gross removal approach should only be applied to the biogenic CO₂ and not fossil-generated CO₂. It was suggested that a gross approach could be initially adopted as it may be the most transparent and flexible approach that could accommodate future regulatory structures. It was noted that a gross approach aligns with national carbon accounting practices (e.g., IPCC).

Those who preferred a net approach did so primarily because they felt it better addressed the objective of the business model, as it would only reward a net-GHG removal, which they considered could provide more public confidence in the business model. They also felt a net approach provided an incentive for projects to further improve their lifecycle GHG balance over time, though three respondents suggested a gross approach with decreasing thresholds over time could achieve the same outcome. It was suggested by two respondents that a maximum GHG threshold may still be needed with a net approach. One respondent noted that a net approach more closely aligned with the VCMs.

Some who suggested a net approach appreciated it was more complex than a gross approach, which was the main disadvantage expressed by those opting for gross. It was noted by some that the difference between a gross and net approach would be expected to be small.

Other disadvantages of a net approach that were suggested include that it could lead to double counting of GHG emissions between sectors, and that it could create competition for feedstocks with the lowest GHG emissions from the supply chain. Two respondents suggested that further work would be needed to develop an industry-wide definition of negative emissions or net-negativity, before a net approach could be adopted. It was suggested that a net approach could lead to inconsistencies between GGR technologies.

One respondent pointed out that this question did not apply to unabated generation, which they were against being supported under the business model.

Three pointed out they could be content with either approach, provided that the final choice is well articulated or explained and is consistent with set internationally agreed methods of carbon accounting or treatment of negative emissions under voluntary markets.

There were 6 responses to Question 25, and some wider feedback on the business model relating to eligibility criteria for the power BECCS project submission process, which is out of scope of this consultation.

Two respondents raised the importance of consistency in approaches between power BECCS projects (including between different sized projects), other GGR technologies and the UK ETS.

One respondent suggested a net approach would align with the objective of delivering GHG reductions. Another respondent raised concerns about potential unintended consequences, setting out their view that a net approach could create a price disparity and competition between different fibre sources and regions where biomass feedstocks are sourced. Another respondent suggested a gross payment approach, combined with a net-negativity threshold, would provide a streamlined process that could potentially move away from direct government support faster.

One respondent highlighted that there could be multiple possible approaches that can be used to determine a 'net' calculation of emissions, including whether an attributional or consequential life cycle assessment approach is taken.

Government Response

We welcome the feedback we have received in response to questions 24 and 25. We will continue to consider the advantages and disadvantages of both approaches and will work across government to develop our approach to rewarding captured biogenic CO₂ in the CfDc. We will continue to consider whether to make payments on a net or gross basis and will seek out consistency with government policy around negative emissions markets and other business models.

In responses to both questions it was set out that there are multiple possible approaches to assessing net-negativity, and we recognise that the definition of net-negativity will be key to understanding the impacts of paying on a net or gross basis, and that it will be important to clearly set this out.

Next Steps

Our next steps will be to continue to progress business model development and engagement with interested parties. We will continue to work closely across government to ensure that, where appropriate, there is alignment with emerging policy across the GGRs business model, UK ETS and REMA, the Net Zero Growth Plan and the Energy Security Plan, and that our policy is in line with the forthcoming Biomass Strategy. We intend to publish a report led by the Department for Energy Security and Net Zero Chief Scientific Adviser's Task and Finish Group which sought to establish an evidenced based position on the validity of BECCS as a GGR option to deliver negative emissions.

We recognise that further development is needed to confirm some of the key principles behind the business model as well as the underlying detail about how this will work. We will continue to consider the feedback that we received in this consultation when developing these details.

As part of our policy development, we are keen to continue engaging with industry, NGOs and other interested parties in a series of regular engagement sessions which we intend to establish now the consultation response has been published. We plan to use these engagement sessions to gather further evidence and develop our design of the business model.

In these engagement sessions we will bring some of the potential positions discussed above for further discussion, alongside new proposals where relevant. This will allow us to gather feedback from a variety of different organisations to help inform our final design.

If you would like to attend one of these engagement sessions, please provide contact details for your organisation to us via email at powerbeccs@beis.gov.uk so that we can provide you with further details as the sessions develop.

Glossary

This section provides an explanation for how some of the terms used in this document are used. As the next level of detail of the Dual CfD is developed, contractual meanings for some of these terms will be established, and the definitions included in the Dual CfD contract should take precedence over these explanations.

Term:	Acronym:	Explanation:
Baseload Market Reference Price	BMRP	The Baseload Market Reference Price is one of two reference prices used in the existing CfD scheme. It is set on a seasonal basis.
Bioenergy with Carbon Capture and Storage	BECCS	Bioenergy with Carbon Capture and Storage, which is a class of technologies which combine the use of biomass to produce energy or fuel with carbon capture and storage technologies.
Billing Period		The period of time over which each invoice for a payment between the Generator and the Counterparty is made.
Biomass		Organic matter used as a fuel.
Biogenic CO ₂		Carbon dioxide which has been absorbed by biomass as it grows and has been released through another process, for example using the biomass for power generation.
Biomass Policy Statement		A document, published in November 2021, which sets out the strategic aims for the role of biomass across the economy in the short, medium and long term to deliver towards net zero. Available at: https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero
Biomass Strategy		The Biomass Strategy, which is due to be published in Q2 2023. The Strategy will review the amount of sustainable biomass available to the UK and how this resource could be best utilised across the economy to help achieve the government's net zero and wider environmental commitments while also supporting energy security.
Carbon Capture and Storage Network Code	CCS Network Code	The network codes setting out the commercial and technical rules and arrangements between T&S Companies and Users, and between individual T&S

		<p>Companies. The second draft of which was published in December 2022 and is available at:</p> <p>https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models</p>
Carbon Capture, Usage and Storage	CCUS	Carbon Capture, Usage and Storage, a class of technologies which capture the carbon dioxide that they produce and either make use of it or permanently store it. This model focuses on technologies which capture carbon dioxide for the purpose of permanently storing it.
Carbon Capture and Storage	CCS	A class of technologies which capture the CO ₂ produced from industrial processes and permanently stores it.
Contract for Difference	CfD	A Contract for Difference, which is a scheme which has supported the development of renewable electricity projects in GB.
Contract for Difference for Carbon	CfDc	A difference payment for carbon, referred to as a Contract for Difference for carbon, which makes up one half of the Dual CfD model.
CfDc Reference Price		A reference price within the CfDc Difference Payment, we have not yet determined the best approach to a CfDc Reference Price.
CfDc Strike Price		The strike price within the CfDc Difference Payment. It represents a fixed revenue per unit of biogenic CO ₂ permanently stored. We are still developing the principles behind the CfDc Strike Price.
Contract for Difference for Electricity	CfDe	A difference payment for electricity, referred to as a Contract for Difference for electricity, which makes up one half of the Dual CfD model.
CfDe Reference Price		A reference price within the CfDe Difference Payment. We have not yet determined how the CfDe Reference Price will work.
CfDe Strike Price		The strike price within the CfDe Difference Payment. It represents a fixed revenue per megawatt hour (MWh) of low-carbon electricity output by a project.

Charges Statement		An annual document which sets out the rates of charges for use of the T&S Network. See the CCS Network Codes for more detail.
Combined Heat & Power	CHP	A process that captures and utilises the heat that is a by-product of the electricity generation process.
Counterparty		The organisation which will sign and manage each Dual CfD on behalf of government. The organisation who will take this responsibility has yet to be confirmed.
Consumer Price Index	CPI	An inflationary index used by Government and industries to track the true monetary value by adjusting for inflation.
Development Consent Order	DCO	Under the Planning Act, a Development Consent Order (DCO) is the means of obtaining permission to construct and maintain developments categorised as Nationally Significant Infrastructure Projects (NSIPs).
Dispatchable Power Agreement	DPA	The business model which has been developed for natural gas fuelled power CCUS projects. More information available at: https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models
Dual Contract for Difference	Dual CfD	The power BECCS business model, made up of a difference payment for carbon (CfDc) and a difference payment for electricity (CfDe).
Feedstock		Universal term for the different types of biomasses used as fuel.
First of a Kind	FOAK	Used to denote that this is the first time BECCS technology has been adopted on such a scale in the UK.
Generator		An electricity producing company that holds a Dual CfD.
Greenhouse Gas Removal Technologies	GGR	Technologies that facilitate the permanent removal of human-produced greenhouse gasses from the atmosphere to combat climate change. A GGR technology must remove more greenhouse gases from the atmosphere than it generates once supply chain emissions have been accounted for.
Greenhouse Gas	GHG	A collective name for gaseous elements in the atmosphere which are by-products of human activity.

		These are the primary driving force behind human-induced climate change.
GHG Emissions Criteria		GHG criteria require that biomass used to generate energy does not exceed a set Greenhouse Gas (GHG) threshold compared to emissions from a fossil fuel comparator for electricity and includes a minimum percentage lifecycle GHG emission savings. The calculations require the full chain GHG emissions (e.g., growing, processing, and transporting the biomass) to be included.
Industrial Carbon Capture	ICC	The business model which has been developed for industrial CCUS projects. More information available at: https://www.gov.uk/government/publications/carbon-capture-usage-and-storage-ccus-business-models
Intergovernmental Panel on Climate Change	IPCC	The United Nations body for assessing the science related to climate change.
Land Criteria		The UK's land criteria accounts for a range of social, economic, and environmental issues, including protecting and maintaining biodiversity and land use rights.
Land Use Land Use Change and Forestry	LULUCF	A greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities.
Megatonnes of Carbon Dioxide	MtCO ₂	A megatonne of CO ₂ , which is equal to one million tonnes of CO ₂ .
Monitoring, Reporting, and Verification	MRV	A process for monitoring, reporting, and verifying either the Sustainability Criteria, or the overall Power BECCS process to ensure it is delivering permanent, verifiable and sustainable removal of biogenic CO ₂ .
Negative Emissions Payment	NEP	One of the potential business model options set out in the power BECCS business model consultation that has not been taken forward. Under it, a project would receive a payment of a fixed price for each tonne of CO ₂ it permanently stored.
Net Zero Strategy		A strategy setting out policies and proposals for decarbonising all sectors of the UK economy and

		transition the UK to a green and sustainable future, allowing us to meet our net zero target by 2050. Available at: https://www.gov.uk/government/publications/net-zero-strategy
Operational Conditions Precedent	OCPs	These are a predetermined list of contractual conditions which have to be demonstrated by a power BECCS project before payments start under the Dual CfD.
Power Bioenergy with Carbon Capture & Storage	Power BECCS	Power Bioenergy with Carbon Capture & Storage, a class of technologies which combine the use of biomass for power generation with carbon capture and storage technologies.
Power BECCS Project Submissions Process		A process which enabled power BECCS projects to apply to join the Track-1 shortlist of the cluster sequencing programme for consideration for FOAK power BECCS business model support. The process closed for applications in October 2022. More detail is available at: https://www.gov.uk/government/publications/cluster-sequencing-for-carbon-capture-usage-and-storage-ccus-deployment-power-bioenergy-with-ccs-beccs
Review of Electricity Market Arrangements	REMA	The Review of Electricity Market Arrangements is a comprehensive review of electricity market design, to ensure that it is fit for the purpose of maintaining energy security and affordability for consumers as the electricity sector decarbonises.
Settlement Unit		A period of time where the outputs for the CfDe or CfDc payments are calculated. There are multiple Settlement Units in each Billing Period.
Sustainability Criteria		The Sustainability Criteria are a set of requirements governing the feedstock for supported biomass projects including requirements under the Land Criteria and GHG Emissions Criteria.
Transport & Storage	T&S	The transport and storage of CO2 as part of carbon capture, usage and storage.
T&S Charges		The Flow, Capacity and Network Charges which are paid for use of the T&S Network (including a Mutualisation Charge incorporated into the Network Charge where appropriate).

T&S Network		The Transport & Storage network which transports and permanently stores captured carbon dioxide.
T&S Operator		Also known as a T&S Company (T&SCo), the organisation which operates the relevant T&S Network.
Target Commissioning Window	TCW	A contractual period of time within which the Generator should commission their project and start to receive payments, if they have met specific criteria (OCPs).
UK Emissions Trading Scheme	UK ETS	A 'cap and trade' scheme where a cap is set on the total amount of certain greenhouse gases that can be emitted by sectors covered by the scheme. UK ETS participants are required to obtain allowances equivalent to their annual emissions under the scheme through regular auctions or by trading on the secondary market. The scheme currently applies to energy intensive industries, the power generation sector and aviation.
Voluntary Carbon Markets	VCMs	Markets where carbon credits are purchased for voluntary use rather than to comply with legally binding emissions reduction obligations.

This publication is available from: <https://www.gov.uk/government/consultations/business-model-for-power-bioenergy-with-carbon-capture-and-storage-power-beccs>

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