Department for
Energy Security
& Net Zero

Greenhouse Gas Removals

Update on the design of the Greenhouse Gas Removals (GGR) Business Model and Power Bioenergy with Carbon Capture and Storage (Power BECCS) Business Model

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Introduction

This document outlines the government's latest positions on the design of the Greenhouse Gas Removals (GGR) Business Model and the Power Bioenergy with Carbon Capture and Storage ('Power BECCS') Business Model.

The government response to the GGR Business Model consultation, published in June 2023, confirmed our intention to progress work on a business model based on a 'contract for difference' structure. The aim of the business model is to attract private investment in a portfolio of large-scale GGR projects by providing revenue support for negative emissions, subject to affordability and value for money. This will help to deliver our world-leading ambition to deploy GGRs in the UK at scale, with potentially 75-81 $MtCO_2$/year of engineered removals needed by 2050 to support net zero while creating new jobs and economic opportunities.

Since publishing the government response, the Department for Energy Security and Net Zero (DESNZ) has continued to develop proposals for the key design aspects of the business model. The policy positions outlined in this document have been informed by continued engagement with industry, sector experts and a wide range of other stakeholders, including through the GGR Business Model Expert Group.

The business model update is published alongside, and should be read in conjunction with, the indicative Heads of Terms for the GGR Business Model. This provides a framework for the principal terms and conditions that are expected to be included in the GGR Agreement for initial projects. The policy positions contained in these documents remain subject to further development by government and do not represent final positions. We will continue to develop and refine these positions further in collaboration with interested stakeholders.

The documents aim to provide visibility on the core design elements of the business model, particularly for project developers that may wish to apply for revenue support through the next phases of the Carbon Capture, Usage and Storage (CCUS) Cluster Sequencing process. In Powering Up Britain, the government committed to launch a process to expand the Track-1 CCUS clusters: HyNet and East Coast Cluster (ECC). Alongside this publication, we have launched the Track-1 expansion (T1x) HyNet process, opening an application window for projects to apply to fill the remaining storage capacity anticipated to be available in HyNet.

We are also announcing that the process for expanding ECC will be sequenced into next year, considering new information on storage readiness from the Northern Endurance Partnership. This reflects government's commitment to making decisions based on the best and latest information available and we continue to consider this a key region for CCUS and decarbonising the UK.

In addition, this document contains an update on the design of the Power Bioenergy with Carbon Capture and Storage ('Power BECCS') Business Model, elements of which are common with the GGR Business Model. This builds on previous positions set out in the government response to the Power BECCS consultation in March 2023, which confirmed our

intention to develop this model as a ‘dual CfD’ consisting of a Contract for Difference for electricity (CfDe) and a Contract for Difference for carbon (CfDc).

The GGR Business Model and the CfDc component of the Power BECCS Business Model share a common purpose of providing revenue support for negative emissions through a contract for difference framework. The government therefore seeks to align the design of both policies as far as possible, particularly in relation to the payment mechanism and interaction with negative emissions markets. The GGR Business Model update section provides an update on the core design features of the GGR Business model and highlights where these policy proposals are also applicable to the Power BECCS CfDc. The Power BECCS Business Model update section at the end of the document outlines policy positions specific to the Power BECCS Business Model, including the design of the CfDe.

The government will continue to engage with interested stakeholders to develop and refine its proposals across both business models, ahead of publishing further updates in due course.

Disclaimer

This document sets out the government's current proposals on the business models for Greenhouse Gas Removals (GGRs) and power BECCS. The proposals, as set out in the document and the indicative Heads of Terms for the GGR Business Model published alongside it, in whatever form they are expressed, are indicative only and do not constitute an offer by government and do not create a basis for any form of expectation or reliance.

The updates published within this document, and the accompanying indicative Heads of Terms, are not final and are subject to further development by the government, and approval by Ministers, in consultation with relevant regulators and the devolved administrations, as well as the development and Parliamentary approval of any necessary legislation, and completion of necessary contractual documentation.

We reserve the right to review and amend all proposals within the document and the accompanying indicative Heads of Terms, for any reason and in particular to ensure that proposals provide value for money and are consistent with subsidy control principles.

GGR Business Model design update

Background

The engineered greenhouse gas removals (GGR) sector presents a major opportunity for green industry in the UK. As part of our ambitious plans to deliver net zero, energy security, and economic growth, the UK has demonstrated its ambition to be a global leader in developing and deploying innovative technologies such as Direct Air Carbon Capture and Storage (DACCS), Bioenergy with Carbon Capture and Storage (BECCS), and Direct Ocean Capture. This will deliver new export opportunities and support tens of thousands of high-quality green jobs across the country, while balancing residual emissions from hard-to-decarbonise sectors such as aviation.

We have laid the foundations of a comprehensive policy framework to unlock the potential of this sector. This includes:

- **Investing up to £100m in research and innovation, including through the Direct Air Capture and GGR Innovation Competition.** The objective of this programme is to build a variety of pilot plants to be fully operational by March 2025, accelerating the development and demonstration of these technologies while building up vital supply chains, jobs and skills.
- **Establishing a world-leading ambition to deploy at least 5 $MtCO_2$/year of engineered removals by 2030, potentially scaling to 23 $MtCO_2$/year by 2035 and 75-81 $MtCO_2$/year by 2050.**
- **Consulting on business models to attract private investment by providing investors with long-term clarity and certainty on future revenue streams.** This document follows on from updates earlier this year where the government responded to consultations on both a GGR Business Model and a specific Power BECCS Business Model to support the sector to scale up over the next decade.
- **Setting our intention to include engineered GGRs in the UK ETS**, subject to further consultation, a robust MRV regime being in place and the management of wider impacts. This will incentivise investment in GGRs, provide a source of demand for GGRs from polluting sectors and futureproof the UK ETS so it continues to play a key role in delivering net zero.
- **Developing our approach to the monitoring, reporting and verification (MRV) of negative emissions,** which will be essential to accurately quantify the amount of CO_2 removed from the atmosphere and permanently stored by GGR projects. This will be critical to bolster confidence in the integrity of GGRs, ensure government support is channelled to projects that deliver real climate benefits, and enable the growth of well-functioning and trusted negative emissions markets.

The purpose of the GGR Business Model is to attract private investment in a variety of GGR technologies and accelerate commercial deployment by providing revenue support for negative emissions. This is necessary to overcome current barriers to investment linked to high capital requirements and the absence of a mature and reliable negative emissions market.

The government response to the GGR Business Model consultation, published in June 2023, confirmed our intention to design the business model based on a 'contract for difference' structure, where the payment is determined by the difference between a 'Strike Price' reflecting the cost of producing negative emissions and a 'Reference Price' reflecting the market value. The key priorities for the model are to provide revenue certainty for developers, to stimulate the market for negative emissions, and to maximise value-for-money for the government.

Since publishing the consultation response, DESNZ has continued to work closely with key stakeholders to develop positions on the core design elements of the business model. This has included engagement through the GGR Business Model Expert Group, as well as wider engagement with project developers, trade associations, academics, and other interested stakeholders.

Building on our policy development to date, this document summarises the government's latest positions on the key design aspects of the GGR Business Model as well as our broader policy framework for negative emissions (including markets and standards). Alongside this, we have published the indicative Heads of Terms for the GGR Business Model, which provides a framework for the principal terms and conditions that are expected to be included in the GGR Agreement for initial projects.

This update document is targeted at a variety of GGR stakeholders including project developers, investors, standards bodies and academics, but may be of particular interest to project developers that wish to apply for business model support through the next stage of the CCUS Cluster Sequencing process. Alongside this publication, the Track-1 expansion (T1x) HyNet process was launched, opening an application window for projects to apply to fill the remaining storage capacity anticipated to be available in the HyNet cluster. The application window for projects wishing to apply to the T1x HyNet Process will be open until 23:59 on 28 March 2024. The guidance document is available on GOV.UK.

In July 2023, the government announced Acorn and Viking Transport & Storage (T&S) systems for Track-2 of the CCUS programme which aims to establish two further CCUS clusters. We have now published an update setting out the principles of the government's proposed approach of an initial 'anchor' allocation process to establish the Track-2 clusters, followed by a wider 'buildout' allocation. We will be working closely with Acorn and Viking on next steps.

We are continuing to develop the detailed design of the business model and DESNZ will work closely with interested parties as we develop and refine our proposals. We intend to publish a further update in due course.

General information

The contract structure for the GGR Business Model will follow precedents established in the low-carbon electricity Contract for Difference scheme and other CCUS business models. The GGR Agreement will comprise (i) the Front End Agreement, and (ii) the Standard Terms and Conditions.

As further described in the indicative Heads of Terms, the Standard Terms and Conditions will include (but not be limited to) provisions relating to:

- Term, Milestone Requirements and Conditions Precedent – the duration of the contract and its commencement, milestone requirements that have to be fulfilled by certain dates to evidence project progress, and various initial and operational conditions precedent that have to be fulfilled in order for payments under the contract to commence.
- Payments and Billing – the mechanisms by which negative emissions payments are made, including the calculation of the Strike Price and Reference Price.
- Standards and compliance reporting – the various monitoring, reporting and verification provisions that the developer will be required to comply with in relation to negative emissions.
- Termination and Consequences of Termination – the circumstances in which the contract can be terminated and the procedures and payments that flow as a consequence of the termination.
- Change in Law – the circumstances in which the developer may receive compensation as a result of certain changes in law.
- Representation, Warranties and Undertakings – the various representations and warranties required from the developer in relation to matters such as compliance with laws and authorisations along with undertakings dealing with matters such as metering.
- Force Majeure – the circumstances in which the developer will be granted additional time and/or relief from performance due to the occurrence of events beyond the developer's control.

Across a number of areas, the GGR Agreement will aim to follow the standard provisions of the CfD and other CCUS contracts where it is appropriate to do so in order to ensure consistency between business models. DESNZ is considering where variations are required to reflect the specific features of the business model and the GGR sector.

Policy development to date has focused primarily on the payment mechanism, contract term, MRV, and interaction with negative emissions markets. Industry has highlighted the importance of early clarity from government on the direction of policy on these issues, and the following sections provide an update on our latest positions.

As stated in the consultation response, government policy will aim to support a mix of GGR technologies to achieve commercialisation. This will be essential to allow innovative solutions

to scale up, reduce reliance on any single technology, and spur the growth of a resilient negative emissions market, whilst also maximising the benefits to the UK economy.

The generic Standard Terms and Conditions will be designed to be applicable across all technology types (i.e. 'technology-agnostic'), but with the flexibility to adjust certain provisions based on the specific technology used. The Front End Agreement will be tailored for each project, recognising that variations and specific provisions are likely to be required for certain projects and technologies. This may consider, for instance, interactions with other support schemes relevant to the facility.

In the Track-1 expansion (T1x) application guidance for HyNet, we have published eligibility criteria for GGR projects that may wish to apply for business model support. This eligibility guidance applies only to the T1x HyNet Process, and we reserve the right to revise eligibility criteria for additional expansion rounds and Track-2.

Furthermore, we recognise that there are a variety of GGR approaches that do not require connection to CO_2 transport and storage networks through the CCUS clusters – including mineralisation, biochar and enhanced weathering. As set out in the GGR Business Model consultation response, further work is needed to understand the feasibility of deploying large-scale non-CCUS GGR approaches in the UK – including a robust evidence base on storage permanence and reversibility, regulatory barriers, and wider environmental impacts. Alongside our ongoing research and innovation programmes, we will work closely with interested stakeholders to gather further evidence and develop our position on the future deployment of non-CCUS GGRs.

Definitions for key terminology used throughout this publication can be found in the indicative Heads of Terms, published alongside this update.

Contract Length

The GGR Business Model is expected to have a contract term of 15 years. We consider that this will provide revenue certainty for a proportionate and reasonable period of time while negative emissions markets are still developing, allowing projects to secure financing for first-of-a-kind projects. Based on our engagement with industry and the green finance sector, we believe that this approach is aligned with investor expectations and strikes a balance between ensuring investment certainty and allowing for technological innovation and market maturity. Furthermore, this approach is in line with comparator business models in the UK, including the Power BECCS Business Model, and is competitive with GGR support programmes in other countries.

We have explored a range of alternative contract lengths and considered their implications for government and industry. Our view is that a 15 year contract term offers an appropriate balance and mitigates the risks associated with shorter or longer contract terms, for instance:

- A shorter contract term (of less than 15 years) would lead to higher annual support costs to government, whilst increasing the risk that projects are not able to continue in merchant operation once revenue support expires if negative emissions markets are not sufficiently developed.

- Longer contract terms (of more than 15 years) could lock government into providing long-term support for projects that may not provide the best value-for-money over time, given the rapidly evolving technological landscape and the likelihood that more efficient and competitive technologies will become available in future.

Furthermore, the government has considered whether a single, fixed contract length is optimal for a highly diverse portfolio of GGR technologies. We recognise that there will be considerable differences between technologies, including their overall costs and capex/opex profiles, and have explored the option of allowing projects to negotiate an appropriate contract length within a defined range on a case-by-case basis. On balance, we believe that a standardised contract term of 15 years is optimal as it will create a level playing field between projects and reflect the precedents set in the Contract for Difference scheme for low-carbon electricity and the Low Carbon Hydrogen Agreement.

Strike Price

DESNZ is considering the eligible constituent elements of the Strike Price and is minded to include the following in the calculation of the Strike Price:

(a) capex and opex associated with the construction and operation of the facility; and

(b) an allowed return on investment.

The GGR Business Model is intended to support the production of negative emissions (‘GGR services’), and the Strike Price is not directly intended to include costs associated with co-products that may be produced by the facility, such as electricity or fuels (‘non-GGR services’). However, in some cases we recognise that it may be complex and impractical to allocate costs between GGR services and non-GGR services, and projects may require support in relation to costs that are common to both the GGR and the co-product function of the project (such as feedstock costs and biomass conversion technologies).

We are therefore minded to allow for some or all costs that are required for both the GGR and the non-GGR project function to be included in the Strike Price, subject to bilateral negotiation, where support for those costs is necessary to achieve negative emissions as the primary service of the facility. In these circumstances, revenues from the sale of co-products will be deducted from the Difference Payment to avoid overcompensation. Projects will not be permitted to receive subsidy under the GGR Business Model for costs that are also subsidised under another support scheme. We are considering the potential interaction between the GGR Business Model and other subsidy schemes, and will set out further details in due course.

This position reflects a pragmatic approach to supporting costs that are integral to delivering negative emissions, while ensuring that the scope of the business model is limited to its intended purpose and is compliant with Subsidy Control rules.

CO_2 Transport & Storage Charges

Under the GGR Business Model, we expect that support for the transport and storage (T&S) charges will be calculated and paid separately, outside of the strike price.

The June 2023 CO_2 Transport and Storage Business Model update confirmed T&S Charges will have three elements comprising:

- **Flow Charge:** paid based on actual usage of the network based on the mass of the emissions stream injected into the network (£/tCO2)
- **Capacity Charge:** a fixed charge paid based on a total Registered Capacity over the charging year.
- **Network Charge:** a fixed charge paid based on the User's Delivery Point Size as defined in their Connection Agreement

The charges for each project will be calculated and invoiced monthly by the T&S Operator to the developer, using the rates set out in an annual Charges Statement.

In line with other CCUS business models, the GGR Business Model is likely to pay support for these charges in a separate payment to the developer, so that such charges may be passed through to the relevant CO_2 T&S Operator. This would 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 overcompensates or undercompensates for T&S charges. It simplifies the agreement of the strike price and allows for additional flexibility to account for possible modifications to the CCS Network Code. The approach mirrors that in the Power BECCS and other CCUS business models.

The full details of the payment of T&S charges are subject to ongoing consideration by the government. For instance, we are considering whether support will be provided for all T&S charges or if some charges will be paid only for qualifying volumes, such as CO_2 volumes sold as GGR credits.

Reference Price

The following section applies to both the design of the GGR Business Model and the contract for difference for carbon ('CfDc') element of the Power BECCS Business Model.

For initial projects, we are minded to set the Reference Price based on the developer's 'Achieved Sales Price', i.e. the actual price achieved by the developer for negative emissions credits sold in approved markets. The government considers that the Achieved Sales Price is

the best proxy for the market value of negative emissions in the absence of a mature market or liquid and transparent market prices. It would represent the sales price achieved by the developer in whichever market(s) they are permitted to sell into – whether that is a voluntary market or a compliance market such as the UK Emissions Trading Scheme (see 'Negative emissions markets' section). Furthermore, it is envisaged that the Achieved Sales Price will be agnostic to the method of sale, e.g. whether the credit is sold through a spot market or an offtake agreement.

The Reference Price will be combined with a Price Discovery Incentive, the purpose of which is to encourage the developer to seek the highest sales price on the market. This will be an important feature of the business model to incentivise market engagement, minimise the difference payment, and avoid poor value-for-money outcomes. In the absence of such provisions, the government may be exposed to low sales prices and excessive reliance on the difference payment to achieve the required strike price. We are considering how the mechanism will be designed, but it is expected to operate so that the developer receives a premium linked to the achieved sales price.

Our policy analysis and stakeholder engagement has concluded that the use of the Achieved Sales Price, combined with a Price Discovery Incentive, will be the most effective approach to delivering our policy objectives:

- Investability: Setting the Reference Price as the Achieved Sales Price is likely to be the most investable option in the near-term. It mitigates projects' exposure to unpredictable and volatile prices in a low-liquidity market, and provides revenue certainty by minimising the risk that the Reference Price is greater than the revenue that can be obtained in the market.
- Value for Money: The financial certainty of linking the Reference Price to the Achieved Sales Price may unlock lower finance costs and faster cost reduction by reducing the investment risk as far as practical. It will help to mitigate poor value-for-money outcomes by offering developers protection from market risks that may otherwise have been managed through higher strike prices. Furthermore, the Price Discovery Incentive will help to maximise sales prices and reduce support costs if set at the appropriate level.
- Market Development: Linking subsidy payments to market sales will place the onus on developers to seek a buyer for their product. The Price Discovery Incentive will provide further encouragement to participate in the market in order to seek the highest market price.

In reaching this position, the government has considered and discounted a variety of alternative options for setting the Reference Price. These include:

- Zero Reference Price: The Counterparty pays the full Strike Price to the developer against a £0 Reference Price. If negative emissions credits are sold in approved markets, the revenues would be shared between the government and the developer. However, this option places low emphasis on the market, is not consistent with the government's core strategy of stimulating the market for negative emissions as the

primary driver of deployment, and is likely to represent poor value-for-money for government.

- Average Market Price: The Reference Price is linked to an index of average prices in the negative emissions market, as opposed to the price achieved by individual projects. However, an average market price index may be hard to implement reliably in an immature market. Price volatility and uncertainty due to low liquidity and the 'lumpy' supply of credits into the market will limit projects' ability to forecast the average market price and their ability to achieve it. This in turn may impact the investability of the model. Furthermore, the price index calculation may need to account for price differentiation between technologies and data limitations due to confidentiality in private sector procurements, creating further complexity.
- Fixed Trajectory Reference Price: The Reference Price is based on a fixed trajectory, which is intended to be analogous to the market price of negative emissions. The government would set the value of the reference price for each year of the contract, on an upward trajectory to reflect anticipated carbon price growth. However, it would be highly challenging to determine a credible price trajectory given the small size of the market and lack of historic price data. Furthermore, a fixed trajectory may not be financeable unless set conservatively, due to the risk that the reference price value will be greater than the revenue projects are able to obtain on the market; this in turn would likely represent poor value for money for government.

The government will continue to develop detailed proposals for the Reference Price, including the formula for calculating the Achieved Sales Price and the Price Discovery Incentive.

We are also considering whether to implement a Price Floor alongside the Reference Price. If the developer were to sell a unit of negative emissions at a price below the Price Floor, the difference payment would be calculated as the difference between the Strike Price and the Price Floor rather than the difference between the Strike Price and the Achieved Sales Price. The intention behind a Price Floor would be to minimise the risk of low sales prices and improve value for money for government. The government's final decision on a Price Floor will consider a range of factors such as investability, value-for-money, and the practicalities of determining how an appropriate Price Floor could be set.

In the future, we intend to transition to a market benchmark price for negative emissions when it becomes available. This approach may be adopted for future contracts once we consider that the negative emissions market is sufficiently liquid and there is a robust and representative benchmark price that can be used as the reference price.

Volume support

The following section applies to both the design of the GGR Business Model and the contract for difference for carbon element ('CfDc') of the Power BECCS Business Model.

The government is considering what level of support, if any, would be provided to mitigate volume risk. In this context, volume risk is the risk of a shortfall in market demand which means the developer is unable to sell all of its GGR credits. In developing our approach, we will need to balance a number of priorities including investability from the perspective of project developers, value for money for the government, incentivising participation in negative emissions markets, ensuring that GGR credits are still considered genuinely 'additional' by market participants, and minimising the risk of market distortions or other unintended consequences.

We do not currently consider it appropriate for the business model to provide support for unsold credits by paying the full strike price. This would be inconsistent with the government's ambition to achieve a market-led approach to GGR deployment, increase overall government liability, and weaken the incentive to participate in negative emissions markets if projects are guaranteed to receive the strike price for each credit regardless of whether a market sale takes place.

However, there are various alternative measures that could be used to reduce volume risk for project developers, which include but are not limited to:

- A 'government offtake backstop' that allows government to act as a buyer of last resort for negative emissions credits that do not find a buyer on the market. It would be necessary to determine a limited backstop price that maintains a clear incentive for developers to seek market demand.
- A 'sliding scale' mechanism that manages volume risk through paying a higher level of price support on initial volumes of negative emissions credits, allowing developers to recover costs at lower sales volumes. The level of price support would taper off as offtake volumes increase. This would reflect the approach adopted in the Hydrogen Business Model.
- A variant of the 'sliding scale' mechanism where the level of the Price Discovery Incentive is set at a higher level for initial volumes of negative emissions credits sold, to compensate for any potential shortfall in offtakers. Alternatively, the level of the Price Discovery Incentive could increase as more volumes are sold, to provide a continued incentive for projects to seek out market buyers for all of their credits.

The government will also continue to explore measures to reduce volume risk that sit outside of the scope of the business model contract, including measures to build market demand for high-integrity carbon credits.

GGR methodologies

The following section applies to both the design of the GGR Business Model and the contract for difference for carbon ('CfDc') element of the Power BECCS Business Model.

GGR methodologies define requirements and procedures to quantify greenhouse gas (GHG) removals – including, but not limited to, how to determine project life-cycle assessment boundaries, identify the baseline, assess additionality, monitor the relevant parameters, report, and obtain third-party verification. GGR methodologies will be essential to accurately quantify the amount of CO_2 removed from the atmosphere and permanently stored by GGR technologies.

As set out in the GGR consultation response in June 2023, the majority of stakeholders believed that the government has an important role to play in setting a credible methodological framework for negative emissions. However, there were mixed views on the most effective way of achieving this and stakeholders proposed a range of possible interventions from government: from endorsing existing third-party standards, to partnerships, or the government developing the standard.

We have therefore been developing our understanding of the options for how to define GGR methodologies, balancing the need for clear, consistent, and robust methodologies with the risk of unnecessarily complicating the market if the government intervenes without due regard for methodologies that are already operating or in development. To help guide this process, we published a list of MRV principles in June 2023 that set out the factors we would consider when developing our methodologies, as well as the criteria for defining a negative emission.

Given the range of views expressed in the consultation, the consultancy ERM (Environmental Resources Management) was commissioned to conduct an independent review of monitoring, reporting and verification (MRV) schemes (including standards and methodologies) for engineered GGRs to understand their potential applicability to the UK context. The final report[1] considered the specifications of lifecycle analysis (LCA) and MRV considerations for different engineered GGR technologies, reviewed existing and proposed standards and methodologies for GGRs, assessed their suitability to address key uncertainties and discussed potential implementation options in the UK. Its key conclusions were:

- At the point of the review, no single existing standard would be appropriate to cover all the methodological (LCA/MRV) specificities for all the engineered GGR technologies in scope of support from government business models. However, it recognised that the standards sector for GGRs is evolving rapidly, with multiple new methodologies and updates published since the study was conducted, thus covering an increasing range of methodological and practical LCA/MRV issues of GGR technologies. These new standards will be considered by the government going forward.
- Endorsement of a combination of methodologies may be suitable for adoption in the UK if existing UK standards and policies (e.g. in CCS and biomass) are considered alongside the current GGR standards. However, this could lead to potential inconsistencies as they evolve, such as variation in system boundaries or frequency of reporting.

[1] https://www.erm.com/public-information-sites/a-review-of-engineered-greenhouse-gas-removal-ggr-standards-and-methodologies

- Development of new GGR methodologies by the government would likely carry high credibility but could be time consuming.

Taking into consideration these findings as well as wider policy assessment, it is therefore our intention to define the methodologies that GGR projects supported under the business model will need to meet rather than endorse one, or multiple, third party methodologies. Government methodologies to support the business model will reflect our MRV policy principles and ensure consistency across the wider range existing HMG standards and policies such as the Storage of Carbon Dioxide Regulations 2010, biomass sustainability requirements, and Low Carbon Hydrogen Standard. Government-led methodologies would also support ETS integration in the longer term as the government would be able to develop the methodologies to support the creation of fungible GGR allowances.

In line with other standards for low carbon technologies such as the Low Carbon Hydrogen Standard, we expect methodologies to develop and improve over time. Therefore, as a first step, the government is likely to define methodology quality thresholds for early projects, which would allow projects to come forward with proposed methodologies. These would specify what the projects must cover as part of their calculations and referencing best practices and existing government standards where appropriate, such as the CCS regulations and Renewable Transport Fuel Obligation. This approach will support the development of final methodologies that are robust and allow for the development and innovation associated with first of a kind deployment. This position follows extensive policy development via consultation, third party analysis and government's consideration of policy interdependencies.

Negative emissions markets

The following section applies to both the design of the GGR Business Model and the contract for difference for carbon ('CfDc') element of the Power BECCS Business Model.

The government response to the GGR Business Model consultation highlighted two potential routes to market for negative emissions: the UK Emissions Trading Scheme (UK ETS) and high-integrity voluntary carbon markets (VCMs). It committed to designing the business model in a way that can harness the potential benefits of both types of market.

In addition to the GGR and Power BECCS Business Models, government policy on negative emissions standards and markets will have important implications for the Industrial Carbon Capture (ICC) and Waste ICC business models. Some industrial and waste management facilities supported under these business models will have the potential to deliver negative emissions through the capture and storage of biogenic carbon.

Given the ongoing development of negative emissions policy in the UK, the ICC and Waste ICC business models currently restrict participation in negative emissions markets. However, the government recognises that the sale of negative emissions credits by ICC and Waste ICC projects could be used to reduce government costs of business model support, improve affordability and stimulate the growth of the negative emissions market. The initial restriction on

the generation and sale of negative emissions credits could therefore be lifted by the Counterparty in future, as government policy in this area develops.

UK Emissions Trading Scheme (UK ETS)

In July 2023, the government response to the 'Developing the UK ETS' consultation confirmed that the UK ETS Authority considers the UK ETS to be an appropriate long-term market for GGRs. It intends to include engineered GGRs in the UK ETS, subject to further consultation, a robust MRV regime being in place, and the management of wider market impacts. This would create an integrated market framework within which businesses can make economically efficient choices between paying to emit, paying to remove emissions, or investing to lower emissions.

The UK ETS Authority will carry out a further consultation which will address issues such as market design, what market eligibility requirements could be set, and when inclusion may take place. The GGR Business Model is therefore being developed in tandem with policy on timeframes for the integration of negative emissions within the UK ETS, and will be designed to accommodate this possibility over the course of the contracts.

Voluntary Carbon Markets

Voluntary carbon markets (VCMs) enable carbon credits to be purchased, usually by organisations, as part of their voluntary climate commitments, as opposed to legally binding emissions reduction obligations.

Despite the relatively small size of the global GGR sector, there is clear evidence of a rapid growth in voluntary demand for high-durability carbon removal credits. This is demonstrated by high-value, long-term corporate offtake agreements (e.g. Microsoft, JPMorgan Chase, Amazon) and the Frontier initiative, which mobilises over $1 billion for permanent carbon removal through an advance market commitment. In a supply-constrained market, there is credible evidence that the private sector is valuing engineered removals at a significantly higher price per tonne than traditional carbon offsets and some compliance markets.

The government will shortly consult on specific interventions needed to develop high-integrity VCMs, building on the work of key initiatives such as the Voluntary Carbon Markets Integrity Initiative (VCMI) and the Integrity Council for the Voluntary Carbon Market (ICVCM). We are committed to maximising the potential of VCMs to channel private finance into GGR projects, and are taking steps to ensure that carbon credits issued under our negative emissions business models meet high standards of integrity.

The government will define the process by which GGR credits should be issued under government business models. At this stage, we advise industry of the following:

- All credits generated by projects supported by the business models will be issued using the government's approved standard and methodologies.
- Independent third-party verification will be required to validate compliance with the standard. The government will set out further details in due course.

- Credits will be issued into an approved registry that stores and publicly displays data about the status and ownership of each GGR credit issued under the business model. This will uniquely identify, record and track each carbon credit from its issuance through to its retirement or cancellation.
- In developing our approach to crediting and registries, the government is considering how voluntary markets may interact with the UK ETS in future, including how best to support fungibility and interoperability between markets.
- Projects are encouraged to seek out and engage with potential offtakers for GGR credits. Any offtake agreements should specify that credits will be issued under the government's approved methodologies and registry once verification has taken place, if the project is in receipt of government support.

The upcoming Voluntary Carbon and Nature Markets consultation will consider how voluntary carbon credits should be used and claimed against corporate net zero targets. This will outline the government's view of how companies can make appropriate use of high-quality carbon credits – including GGR credits – while continuing to take ambitious action on their own internal emissions. It will also establish the government's position on the international sale of voluntary carbon credits and national accounting practices for traded credits.

Additionality is a critical feature of high-integrity carbon credits. To qualify as a genuine carbon offset, there must be confidence that the carbon removals from the GGR project would not have occurred in the absence of the incentive created by carbon credit revenues. The government considers that any support provided through negative emissions business models will be fully consistent with additionality requirements, for the following reasons:

- **Business model support will be critical to establishing a liquid and reliable market for negative emissions.** The lack of a mature market is currently a major barrier to bringing forward large-scale projects, meaning that government support for initial projects will be necessary to attract private investment, boost liquidity in the market, accelerate reductions in technology costs, and enable projects to come forward on a merchant basis in future.

- **Business model support will be conditional on the sale of negative emissions credits in the market.** The availability of support is reliant on carbon credit revenues and the business model design will reflect the integral role of the market; for instance, under the GGR and Power BECCS business models we do not intend to provide a top-up to the full strike price if the project does not find a market buyer for its credits.

- **The ICVCM acknowledges a variety of approaches that may be used to demonstrate additionality** – including investment analysis, barrier analysis, market penetration assessments and standardised approaches (e.g. positive lists). The additionality requirements of the ICVCM Assessment Framework do not preclude projects from receiving government support as long as other requirements are met.

Power BECCS Business Model updates

Background

The government remains committed to bringing forward power BECCS as a key GGR technology that could contribute significantly towards the delivery of our world-leading ambition to deploy GGRs at scale in the UK. This is key to reaching net zero, whilst creating new jobs and economic opportunities for the UK.

The government's response to the power BECCS business model consultation, published in March 2023, confirmed the overarching contractual framework and dual payment mechanism of a '**CfDe + CfDc**' for large-scale power BECCS, to recognise the importance of the negative emissions and low-carbon electricity as valuable outputs and the risk allocation required to incentivise both in an appropriate manner. In the response, we had set out that a key priority of the model is to give investor confidence to attract private investment, whilst ensuring affordability and value for money, by reaching a proposition that is investable through appropriate cost distribution and risk allocation.

We stated in our consultation response that we would continue to progress business model development and engagement with interested parties, working across government to ensure alignment with other developing policies. This has involved engaging with industry, industry experts, non-governmental organisations and other interested parties through a series of regular engagement sessions and bilateral discussions which have informed the high-level positions outlined in this document. We will continue to engage with interested stakeholders to develop and refine policy positions pertaining to the power BECCS business model.

The previous section on the GGR Business Model sets out where policy proposals and considerations are also applicable to the power BECCS business model – including on the CfDc reference price, volume support, GGR methodologies (including MRV) and negative emissions markets. This section outlines the government's latest positions across the design of the power BECCS business model specifically, in particular the CfDe reference price and term length. They are intended to provide a clear indication of the current minded-to positions and direction of policy development, to aid interested parties in developing their feedback to government.

CfDe Reference Price

In the March 2023 consultation response, we stated that we were considering how to ensure that the power BECCS business model will meet the objectives to incentivise the production of negative emissions and low-carbon electricity generation for security of supply.

Running profile

Linked to the CfDe reference price decision is the running profile; a baseload market reference price seeks to incentivise baseload running to fit technologies suited to continuous running, whereas an intermittent market reference price seeks to fit dispatchable running for intermittent technologies.

Due to the importance of maximising the potential of negative emissions, we consider that projects will need to run at a profile that incentivises this, with limited exceptions to be confirmed in a future policy update, that may relate to unabated running due to any outages, including T&S network outages.

Minded-to position

The payment mechanism (CfDe + CfDc) will contain a reference price per component. We had considered in our consultation response the options for the reference price for the CfDe.

We had cause to consider what was the most suitable reference price option for future contracts due to several factors. These included:

- Future energy demand scenarios and energy price forecasts
- Biomass feedstock costs
- Specific technical requirements for biomass plants

Taken together, these factors impact upon the economics of projects and subsequently their decision to generate or not. For a power BECCS project, baseload generation is required not only for low-carbon electricity generation, but to produce the maximum available level of negative emissions needed to meet our ambitions.

Since the consultation response was published, we have further considered a wide range of potential future electricity scenarios, the benefits of projects bidding into ancillary and flexible services markets technology requirements, and the social benefits of this technology. Additionally, we conducted further analysis on the benefits and risks of each reference price option, including the benefits of offsetting emissions from hard-to-abate sectors to help reach net zero. Ensuring that key principles such as value for money for electricity consumers and wider society were met remained central to decision-making. As a result, our minded-to position is that the model will use a **baseload market reference price (‘BMRP’**). This is a season-ahead reference price which reflects the weighted average of forward sales from the previous season of the wholesale electricity market.

We consider this to be the most suitable option for the following reasons:

- Baseload generation is required to produce the maximum level of negative emissions possible;
- Current baseload generation Contracts for Difference (CfD) use the Baseload Market Reference Price (BMRP) as this allows for long term hedging in the most liquid season ahead market;

- BMRP incentivises generators to make season-ahead sales of power, locking-in longer term stability of forward power sales;
- The projects are not suited to a dispatchable profile due to start up and shut down capabilities;
- Under stable market conditions, this option remains the most investable, manageable for projects and best value for money option.

There are still several policy considerations to consider regarding the treatment of unabated running during outages which will be communicated in future publications.

Discounted options

Whilst deciding our minded-to position and reflecting on stakeholder feedback, we considered the following alternative approaches:

1. A quarter-ahead reference price (on a three-month basis rather than six);
2. A front-month reference price; and
3. An Intermittent Market Reference Price (IMRP).

These options have one main variable which is the time frame affecting the way the reference price is calculated. The main impact is the way in which it could affect dispatch decisions for projects. In assessing these options, we considered the risks and benefits of each, whether they would support a baseload running profile, the implications of market liquidity and volume risk, and what indicators could be used to establish the reference price.

In engagement with stakeholders and after further analysis, the quarter ahead and month ahead reference price were the least favourable options. The overarching rationale for these being the least favoured options was due to the illiquidity of the market, which in turn could impact negatively upon the investability of the business model. In addition, during our analysis we found the month ahead was less financially beneficial for generators as there are fewer positive CfD difference payments. Similarly, the monthly BMRP option (where the reference price would be adjusted monthly) was discounted as an option as the month-ahead market is less liquid, and the shorter time frame could potentially raise the risk of a reference price exceeding the strike price under volatile conditions more frequently.

The Intermittent Market Reference Price (IMRP) was considered a potential alternative to the BMRP as it mitigated some of the identified risks and offered a plausible alternative to a BMRP. The IMRP is an hourly day-ahead reference price, this is typically used for intermittent technologies (wind and solar) in the current CfD schemes. IMRP for intermittent generators works due to the inability to predict the weather so far in advance. A positive was that this could potentially mitigate market participation costs as incurred under the BMRP option as there is no requirement to sell a season ahead. However, a lack of long-term hedging arrangements can expose the project to volatility that can also disincentivise a project to sell into a market, when compared to the locked-in price stability offered by a BMRP approach.

Contract Length

For power BECCS, the term length announced in the March 2023 consultation response was a minded-to position of 10-15-years. As power BECCS policy has developed, we have reconsidered that alternative term lengths could provide greater value for money, encourage the maturation of the voluntary carbon market and provide a greater volume of carbon removals. Power BECCS specific considerations include risks such as the costs of financing projects, the allocation of biomass feedstock price risk and carbon market maturity. Subsequently, two alternative term length proposals that were considered to have a stronger business case were:

- 15-year term length; and
- 20-year term length.

In considering multiple value for money factors, a 15-year term length demonstrated a balance between subsidy costs and achieving negative emissions through delivering a larger volume of carbon removals, and so the minded-to position is 15 years. However, we remain open to considering the case for possible extensions to this term length if several conditions were met, such as meeting defined value for money requirements and under certain market conditions.

To assess the options, we considered factors such as the total subsidy cost and the social value of the negative emissions, in addition to the implication of extending a risk profile over a longer period, and the implication of a technology lock-in.

We consider an advantage of a 15-year proposal is the additional certainty of support for a longer guaranteed period with a commitment to robust energy security, while mitigating and balancing the risks that are brought about by a longer-term length. This will ensure that projects can both produce negative emissions and generate low-carbon electricity for longer. This will help to secure the UK's energy security needs and has the potential to make an important contribution to the government's GGR ambitions, and to support meeting our carbon budgets and Nationally Determined Contribution. A 15-year dual-CfD will allow power BECCS projects time to help participate and grow the carbon markets and is in line with other CCUS business models, such as the GGR business model.

In considering a 20-year term length, one clear benefit would be the increase in the total amount of carbon removals. However, we recognise that this may increase the overall risk profile for projects as prices for electricity and biomass feedstock can be volatile and managing these uncertainties over a longer period of time could have further implications.

Next Steps

Over the coming months, the government will continue to develop the detailed design of the GGR and Power BECCS business models in collaboration with interested parties, including developing and refining the provisions in the GGR indicative Heads of Terms.

Some of our immediate priorities for policy development include:

- the design of the Price Discovery Incentive and options for setting a Price Floor
- options for volume support to mitigate the risks of a shortfall in market demand for GGR credits
- detailed consideration of the interaction between the GGR Business Model and other support schemes that may be relevant to GGR projects, such as the Renewables Obligation and the Renewable Transport Fuels Obligation
- the design of standards and methodologies for GGRs
- details of the payment of T&S charges under the business models
- cross-chain risk, including relief and compensation in respect of T&S commissioning delays and outage events
- detailed consideration of the interaction of the CfDe and CfDc reference prices under the Power BECCS Business Model

The government will publish a further update on the design of the business models in due course, following further policy analysis and engagement with stakeholders.

The consultation on voluntary carbon and nature markets will be published in the coming months. In addition, the UK ETS Authority will consult further on the inclusion of GGRs in the UK ETS. This will address how the market could be designed, what market eligibility requirements are set, and when inclusion may take place, alongside other relevant considerations.

The government has published a guidance document that outlines the CCUS Track-1 expansion (T1x) HyNet Process, contributing to our ambition of capturing and storing 20-30Mt CO_2 per year across a range of CCUS projects.

The entry process for the T1x HyNet Process consists of three key stages:

- Expression of Interest (EOI) submission – mandatory – by 2 February 2024
- Application window engagement and clarification process
- Application submission by 23:59 on 28 March 2024

After the application window closes on 28 March 2024, each application will go through an eligibility check to make sure that the evidence submitted demonstrates that the application is

consistent with both the central eligibility criteria and relevant business model specific eligibility criteria. Projects will be told if they passed the eligibility check in May 2024.

The process for expanding East Coast Cluster (ECC) will be sequenced into next year, considering new information on storage readiness from the Northern Endurance Partnership. This reflects the government's commitment to making decisions based on the best and latest information available and we continue to consider this a key region for CCUS and decarbonising the UK.

In July 2023, the government announced Acorn and Viking Transport & Storage (T&S) systems for Track-2 of the CCUS programme which aims to establish two further CCUS clusters. We have now published an update setting out the principles of the government's proposed approach of an initial 'anchor' allocation process to establish the Track-2 clusters, followed by a wider 'buildout' allocation. We will be working closely with Acorn and Viking on next steps.

Any feedback or enquiries regarding the design of the GGR Business Model or GGR policy should be sent to GGR.BusinessModels@beis.gov.uk.

Any feedback or enquiries regarding the design of the Power BECCS Business Model should be sent to powerbeccs@energysecurity.gov.uk.

Annex: References and related publications

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This publication is available from: https://www.gov.uk/government/publications/greenhouse-gas-removals-ggr-business-model

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