

27<sup>th</sup> January 2026

# Overview of the Industrial Carbon Capture Business Models **November 2025** **Update**

For the CCSA Industrial Working Group

# Introduction

- UK's first industrial carbon capture contracts signed with Heidelberg Materials UK's Padeswood cement works, and Encyclis's Protos EfW plant. These will forge a cleaner future with secure, long-term jobs for workers and businesses in the North-West.
- This presentation will provide an overview of the business models and our recent update. We will also briefly touch on next steps for the business models.



# Why do we need ICC and Waste Business Models?

- CCUS is fundamental to the deep decarbonisation of industry (e.g., chemicals, oil refining, cement and the waste management sector).
- The current market for CCUS is not investable for most industrial sectors.
- We have designed business models (BMs) that are intended to support CCS projects and stimulate private sector investment.



# Why is the CCS market challenging for Industry and Waste?

## ICC & Waste



High upfront capital, operational, financing and system costs associated with implementing ICC



First-of-a-kind implementation adds a risk premium that prevent project developers from taking investment decisions



Costs cannot be easily passed onto consumers as a low-carbon products market has not fully developed yet



CCS is the only net zero compliant technology for many facilities including cement production and energy from waste



Limited incentive to install CCS: there is currently no carbon price for fossil emissions, and when there is a carbon price, the long-term contracts with waste suppliers allow carbon pricing to be passed onto customers



The residual waste sector has a high percentage of biogenic CO<sub>2</sub> (~50%), which if captured have the potential to create Greenhouse Gas Removals (GGRs). Possible GGR revenues are uncertain due to the nascency of GGR markets

# How are the business models structured?

There are two types of ICC business model: the **ICC business model** (for the industrial sector) and the **Waste ICC business model** (for the waste management sector)\*. Both are funded by the exchequer:

## Revenue Support - Private Law Contract

- “ICC Contract” and “Waste ICC Contract”.
- Up to 15 years.
- Provides emitter with revenue support through a payment per tonne of captured and stored CO<sub>2</sub>.
- To cover operational expenses (Opex), Transport and Storage (T&S) charges and repayment of, and a rate of return on, capital investment in carbon capture equipment (Capex).
- Provides key risk protections.

## Capital Grant Co-Funding

- For a portion of the capital cost of capture projects, available for initial projects only.
- Aims to fill any financing gaps from projects, reduce overall subsidy to industry, and improve affordability and value for money.

Most provisions in the ICC and Waste ICC Contracts are the same. However, given the different commercial circumstances there are some key differences and we have therefore developed separate contracts.

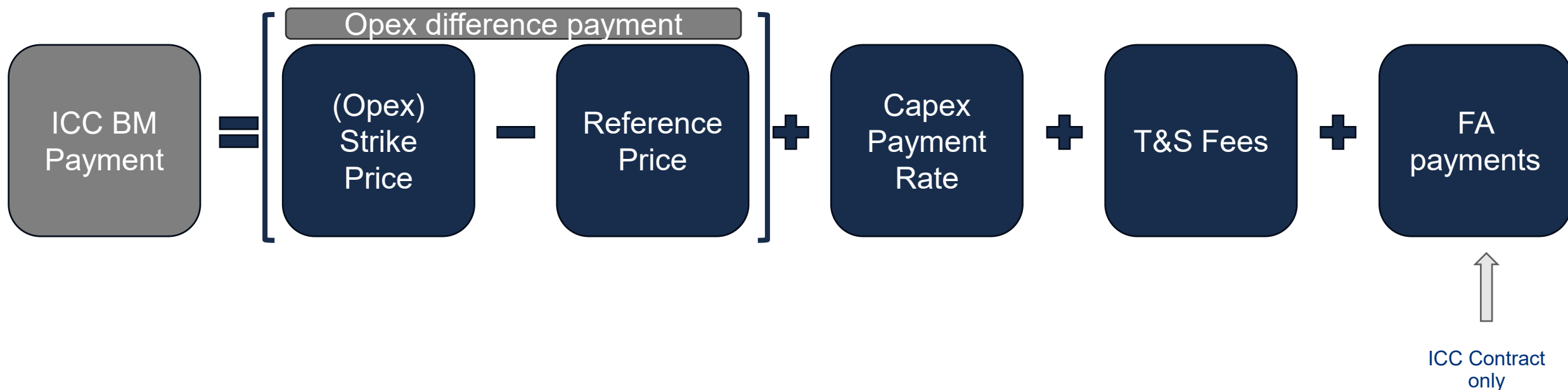
The contract counterparty for ICC/Waste ICC Contracts is the Low Carbon Contracts Company (LCCC).





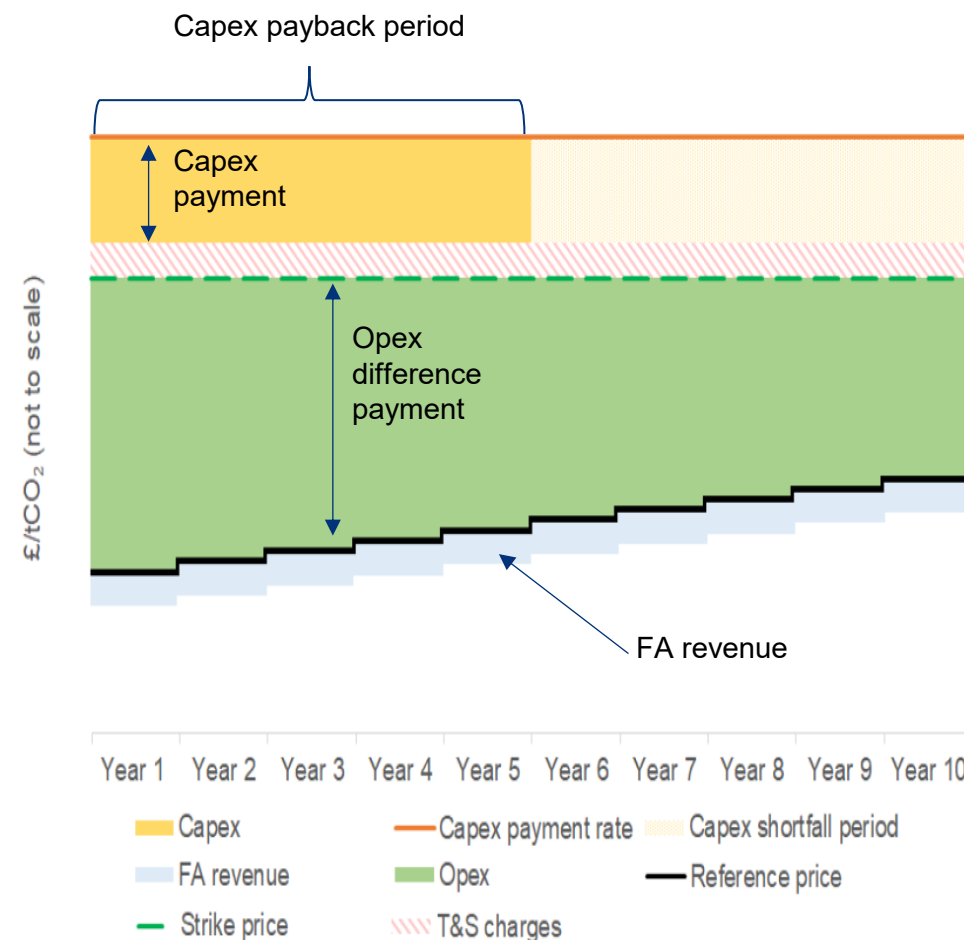
# Revenue support (i)

The ICC/Waste ICC Contract pays the emitter a **payment per tonne of captured and permanently stored CO<sub>2</sub> (covering operational expenses, Transport and Storage (T&S) charges, and repayment of and rate of return on capital investment)**. It will have an overall duration of up to **15 years** (a 10-year initial period with possible extension for up to a further 5 years, subject to project fulfilling certain criteria).



# ICC Revenue support

- **Opex Difference Payment:** For the first 10 years of initial ICC Contracts, opex payments will be asymmetric and calculated by deducting a fixed reference price from the strike price. The reference price follows an equally-stepped annual upwards trajectory, based on historic carbon prices. In the extension period, a carbon market reference price applies.
- **Capex payments** (including capex repayment and return on investment) will be paid in a minimum of 5 years (longer if capture volumes are lower than expected)
- **Free Allowance (FA) Payments:** Contract holders forfeit some of their FAs and in return are paid at the reference price for the first 10 years of the ICC Contract. A portion of these payments are protected if FAs under the ETS reduce.



# Adjustments for the Waste ICC BM

- Applicable **carbon market** reference price from inclusion of sector in the UK ETS.
- Technical requirements to distinguish between fossil and biogenic CO<sub>2</sub>.
- Increasing the capex repayment period of 8\*- years due to lower demand risk for waste projects than Symmetric (two-way) payments throughout the contract.
- Additional extension criteria of participation in the GGR market.





# Risk Protection

- The ICC Contracts allocate risks between the contract holder and the counterparty, considering which party is best placed to manage them.
- Generally, projects take on these with flexibility within which they can operate. Government is allocated risks only where it is necessary.
- Specific protections are provided to the contract holder for **cross-chain risks**, recognising that CCUS involves systems interactions that are challenging for the project to manage. These include:

User stranded asset risk	If the T&S network fails to be constructed or is abandoned post-commissioning, then the ICC project will become stranded.
T&S commissioning delay	Commissioning of the T&S network is delayed beyond the commissioning dates of the industrial capture plant, with the capture plant unable to transport CO <sub>2</sub> while waiting for the T&S network to be completed.
T&S outages	Temporary planned and unplanned outages of the T&S network.
T&S capacity constraint	Lower than expected volumes of CO <sub>2</sub> can be injected into the transport and/or storage facility due to T&S network issues, leading to the industrial facility and/or other industrial facilities being constrained.

# ICC and Waste ICC Business Models

Updates relevant to both ICC and Waste ICC Contracts

# Capture Rate Requirements

The “Capture Rate” is the proportion of CO<sub>2</sub> from streams intended to be routed to the Capture Plant which are captured and stored (or directed to CO<sub>2</sub> Utilisation, if applicable).

We made changes to the capture rate requirements under the ICC Contract since the draft contract published in October 2023. These include:

## **Operational Conditions Precedent capture rate requirements:**

- Changes to minimum capture rate required to complete commissioning and trigger the start date;

## **Operational capture rate requirements:**

- Changes to the minimum capture rate required to be maintained during operations;

## **Extension capture rate requirements:**

- Changes to the minimum capture rate required to allow the project to extent the ICC Contract beyond the initial 10-year term.

# Post Capture CO<sub>2</sub> Measurement

Post-capture CO<sub>2</sub> measurement requirements are added in an annex to the contract. This outlines requirements for measuring CO<sub>2</sub> routed to the T&S Network and (if applicable) to CO<sub>2</sub> Utilisation.

Accurate metering is required for calculating:

- **T&S Flow Charge:** payments to T&SCo for CO<sub>2</sub> sent to T&S.
- **Opex and Capex payments:** contract payments based on CO<sub>2</sub> sent to T&S.
- **Capture Rate and Capture Factor:** pre-capture and post-capture CO<sub>2</sub> data.

DESNZ has a **technology agnostic** approach, i.e. the Emitter is responsible for technology selection, provided that minimum uncertainty requirements are met. At minimum, the measurement system must include:

A “**T&S Flow Meter**” to measure the CO<sub>2</sub> Rich Stream flow rate. i.e. a mass flow meter, or volumetric flow meter. E.g., Coriolis flow meter.

“**T&S Composition Analysis Equipment**” to measure CO<sub>2</sub> concentration and determine CO<sub>2</sub> mass fraction in the CO<sub>2</sub> Rich Stream. E.g., online gas chromatograph optimised for high-purity CO<sub>2</sub>.

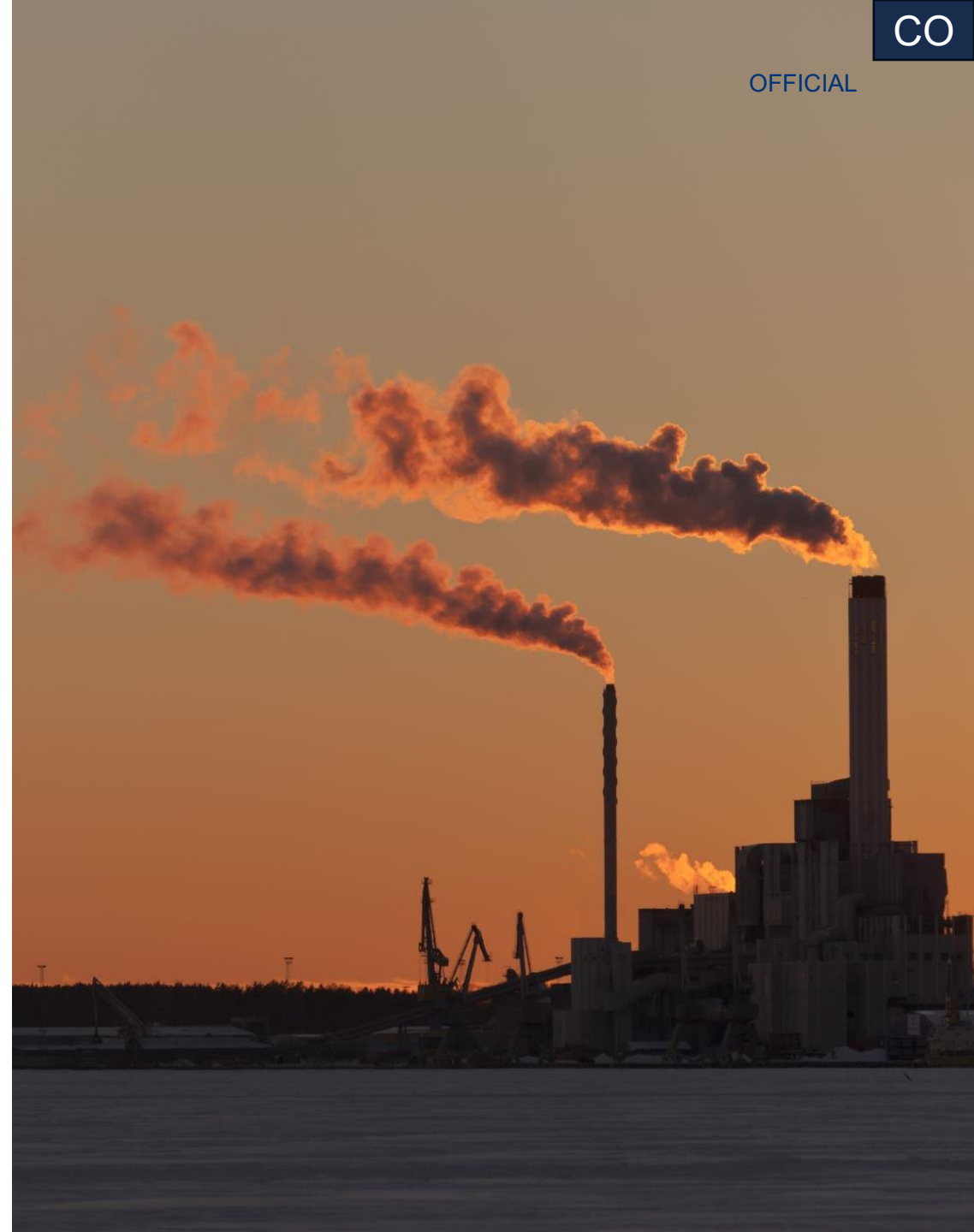
Any other measurement device(s) necessary to enable the calculation of the Metered CO<sub>2</sub> Output to T&S and the Metered CO<sub>2</sub> Rich Stream Output to T&S, for example fluid stream temperature and pressure devices.

A **Data Acquisition and Handling System (DAHS)**.



# Special Purpose Vehicle (SPV)

- Following discussion with industry, DESNZ has adapted the business model to accommodate the use of a separate SPV Alternative Ownership Structure. This means that Capture Plant can now be owned and operated by a separate legal entity to the owner of the underlying Waste Installation.
- This has first been done for the Waste ICC Contract, but we plan to implement similar amendments for ICC projects.





# Cross Chain Risks

The ICC/Waste ICC Contracts provide risk protections, including financial compensation, to projects if the CO<sub>2</sub> transport and storage (T&S) network is unavailable for them to use. Following discussion with industry, we have revised some of these:

## T&S Commissioning Delay Event

- Scope of compensation widened:
- If Emitter is ready to capture and store CO<sub>2</sub>, we clarified that they will be compensated for all out-of-pocket costs which are a direct result of the event, irrecoverable and unavoidable subject to certain exclusions;
- Now includes Capex payments

## CCS Network Code Modification

- Clarified that if the CCS Network Code changes after the Agreement Date, this constitutes a Change in Law.
- This means the Emitter could claim compensation if the event increases costs or, if the event leads to savings for the Emitter, the LCCC may be able to reduce subsidy to the Emitter.

## Stranded asset (T&S Termination, Qualifying Change in Law (QCiL) Construction Event or Operations Cessation Event)

- Scope of compensation widened: If the Emitter is unable to construct or operate the capture plant due to a QCiL, financing break costs may also be compensated.

# Waste ICC BM

Changes relevant for Waste ICC projects only



# Capex repayment period

- Following feedback, we revised the repayment term to be more flexible.
- In the updated contract the Emitter can recover Capex in the first **8 years instead of 10** of the Waste ICC Contract, and any Capex shortfall (which could occur if less CO<sub>2</sub> is captured than expected) in the final 2 years of the Initial Term of the Contract.



# Determining monthly fossil/biogenic CO<sub>2</sub> percentages

- To calculate Opex payments, projects must determine monthly fossil and biogenic CO<sub>2</sub> percentages. These underpin the carbon reference price used in payment calculations.
- These requirements come with contractual obligations, and following feedback, we amended the consequences for non-compliance to ensure assumptions better reflect actual waste composition (around 50% fossil).
- Non-compliance with these obligations results in escalating monthly fees (up to £8,000 per LTSS) before carbon pricing applies.



# Non-compliance after ETS is applied

If the project breaches biogenic-CO<sub>2</sub> rules in any month, the fossil CO<sub>2</sub> percentage used that month becomes the **highest value from the past 12 months plus 5%**. This uplift is **capped at 100% fossil CO<sub>2</sub>**.

A **fixed 5% penalty** is automatically added to each Biogenic LTSS until the annual recalculation. This 5% applies even if there is only one breach.

At the annual review, audited non-compliance **can trigger additional increases**.

These adjustments ensure the reported fossil-CO<sub>2</sub> share reflects actual behaviour, prevent under-reporting and protects against over-subsidy.



# UK Emissions Trading Scheme (ETS) alignment

- The waste sector is not included in the UK ETS but may be in future. The contract includes a mechanism to set the Carbon Reference Price for calculating Opex Payments once UK ETS has expanded.
- To prevent market distortion, we ensured that when carbon pricing is expanded to the sector, **the carbon market reference price applied to an abated facility is aligned (as closely as possible) to the carbon price exposure of an unabated waste facility.**

In summary, protections mean the LCCC will conduct a UK ETS Alignment Review to ensure:

a. There is **no direct conflict** between (i) the requirements set out in the Waste ICC Contract and (ii) UK ETS requirements, which would prevent the Emitter from complying with each set of requirements (“UK ETS Conflict Review”)

b. The Waste ICC Contract **methodology** for determining biogenic / fossil CO<sub>2</sub> emissions **aligns** with the methodology that is used by most of the waste sector under the UK ETS (“UK ETS Alternative MRV Review”).

# Greenhouse Gas Removals (GGRs)

- The Contract initially restricts sale of GGR credits (due to ongoing policy development of GGRs). This may be lifted following a review by the LCCC.
- Following feedback, we **amended the contract** to include a **requirement for the LCCC to conduct a review** 3 months before the end of the Emitter's Target Commissioning Window.
- This means that a review will happen before the Emitter becomes operational. The LCCC will **continue to retain discretion on the outcome** of the review.

This gives more clarity for projects on when they could sell GGR credits, allowing earlier discussions with potential off-takers.

Lifting GGR Credit sale restrictions could reduce overall cost for government. Therefore, it is **desirable for GGR sales by the Emitter to occur as soon as possible** once the Emitter becomes operational, after the restriction is lifted, to ensure these reductions can be realised.

# Next Steps



# Evolution Principles

- In the longer-term, we need to explore alternative models or pathways that lower the cost of CCUS.
- Over time there needs to be a sector that can be more led by the market, that in turn will continue to realise the best value for money for the taxpayer and accelerate towards a fully decarbonised economy.
- Considering this, we plan to evolve the business models for future CCUS allocation phases.

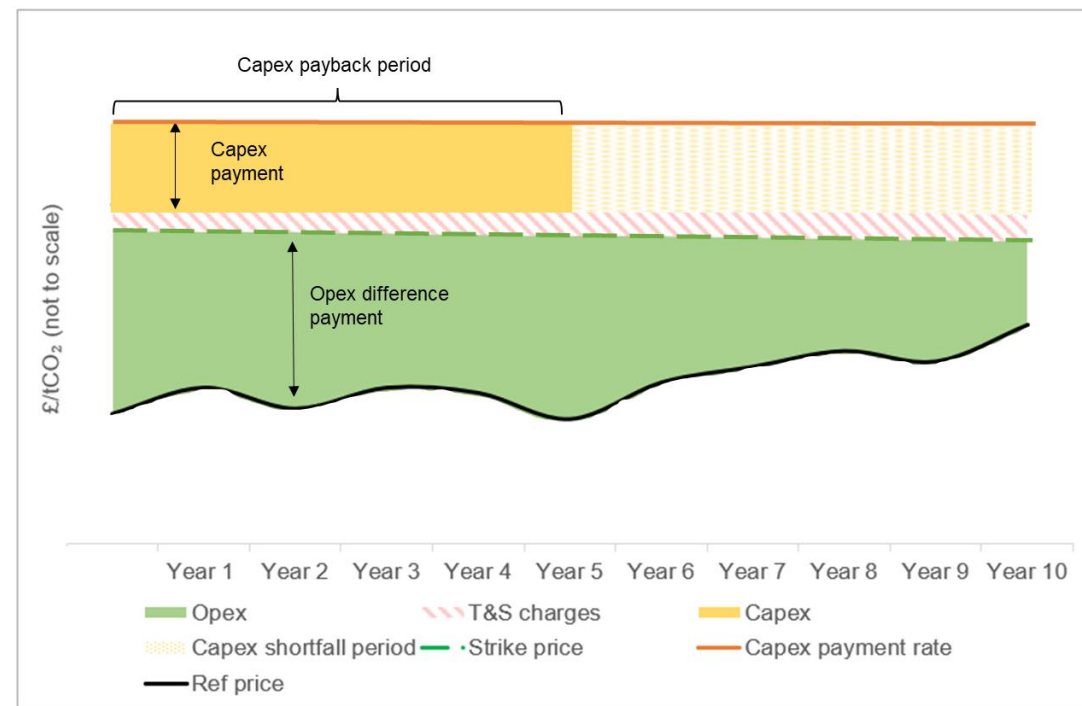




# ICC Business Model Changes

In April 2024, we set out how the Business Model will evolve for future allocation rounds. These changes are:

- Using a **Carbon Market Reference Price** compared to the Fixed Trajectory Reference Price previously offered. We are currently designing how this will work.
- **Removal of UK ETS Free Allowance provisions** within the contract. This will complement the introduction of a CBAM for many sectors.
- **Adaptations for Low Carbon Fuel** support schemes.
- Introduction of **biogenic monitoring** and **sustainability criteria** for ICC projects.



We are still developing these policy changes and will update industry in due course.





Department for  
Energy Security  
& Net Zero

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# Thank you

# OCP Capture Rate Requirements

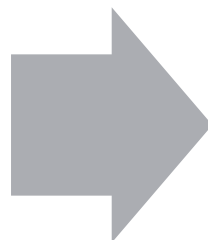
## Previous position:

**“OCP Required CO<sub>2</sub> Capture Rate”** means an OCP Achieved CO<sub>2</sub> Capture Rate equal to or greater than the higher of:

(A) 5 pp (percentage points) lower than the CO<sub>2</sub> Capture Rate Estimate; and

(B) eighty-five per cent. (85%)

Demonstrated via a 24-hour performance test.



## Updated position:

**“OCP Required CO<sub>2</sub> Capture Rate”** means an OCP Achieved CO<sub>2</sub> Capture Rate equal to or greater than the higher of:

(A) 10 pp (percentage points) lower than the CO<sub>2</sub> Capture Rate Estimate; and

(B) eighty per cent. (80%).

Demonstrated via a 24-hour performance test.

This means that the Emitter may start to receive business model payments having demonstrated a lower OCP Achieved CO<sub>2</sub> Capture Rate than the October 2023 position, recognising that it may take some time to optimise the Capture Plant performance, but still requiring the Emitter meeting a minimum performance standard.

# OCP Capture Rate Requirements

There is now an additional obligation on the Emitter to incentivise higher performance standards to eventually be reached, which is called the “**CO<sub>2</sub> Capture Rate Condition Subsequent**”.

The CO<sub>2</sub> Capture Rate Condition Subsequent can be satisfied at any time; **it does not have to be satisfied before the Start Date.**

However, if the Start Date is triggered before this has been satisfied, then, until the date on which it has been fulfilled, a **financial remedy will apply** whereby the return component of the capex payment will be reduced in line with the CO<sub>2</sub> Capture Rate achieved in the OCP performance test.

## New requirement:

“**CO<sub>2</sub> Capture Rate Condition Subsequent**” means... an Achieved CO<sub>2</sub> Capture Rate... equal to or greater than the higher of:

(A) five (5) percentage points lower than the CO<sub>2</sub> Capture Rate Estimate; and

(B) eighty-five per cent. (85%).

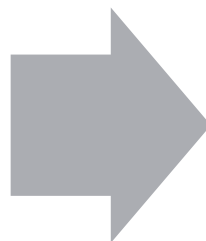
Demonstrated via a 24-hour performance test.

# Average Achieved CO<sub>2</sub> Capture Rate OFFICIAL methodology

## Previous position:

Average Achieved CO<sub>2</sub> Capture Rate (AACR) was calculated as the average of the Achieved CO<sub>2</sub> Capture Rate (ACR) for each Settlement Unit (i.e. day) in a month:

$$AACR = \frac{1}{n} \sum_{i=1}^n ACR_i$$



## Updated position:

AACR is calculated as the total average capture rate across the month, i.e. the total CO<sub>2</sub> output divided by the total CO<sub>2</sub> input to the capture plant over the month. An additional multiplier accounts for Invalid Settlement Units:

$$AACR = \frac{\sum_{i=1}^n ACO2\_Out_i}{\sum_{i=1}^n ACO2\_In_i} \times \frac{Vn}{n}$$

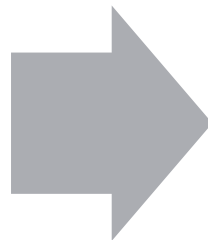
The previous position weighted every Settlement Unit equally, regardless of the CO<sub>2</sub> throughput, meaning periods with very low flow of CO<sub>2</sub> could 'skew' the AACR. The updated method addresses this risk.

# Minimum CO<sub>2</sub> Capture Rate

## Previous position:

“**Minimum CO<sub>2</sub> Capture Rate**” means an Average Achieved CO<sub>2</sub> Capture Rate in respect of a Billing Period which is equal to or greater than the higher of:

- (A) 80%; and
- (B) 10 pp less than the lower of:
  - (i) the CO<sub>2</sub> capture rate achieved during the OCP Performance Test; and
  - (ii) the CO<sub>2</sub> capture rate stated on Phase 2 application.



## Updated position:

“**Minimum CO<sub>2</sub> Capture Rate**” means an Average Achieved CO<sub>2</sub> Capture Rate in respect of a Billing Period which is equal to or greater than eighty per cent. (80%).

This change to the Minimum CO<sub>2</sub> Capture Rate avoids projects being subject to more onerous requirements if they ‘overperform’ during the OCP test.



# Minimum CO<sub>2</sub> Capture Rate Breach

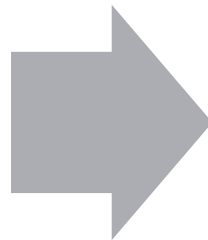
## Previous position:

If the Emitter fails to achieve the Minimum CO<sub>2</sub> Capture Rate (previous slide) for 3 consecutive months or 3 non-consecutive months in a 6-month period a “Minimum CO<sub>2</sub> Capture Rate Breach” has occurred.

Emitter must submit a Rectification Plan setting out how they intend to rectify the breach.

Emitter must rectify breach within 18 months\*.

Failure to rectify by the agreed date results in a termination right for the ICC Contract Counterparty.



## Updated position:

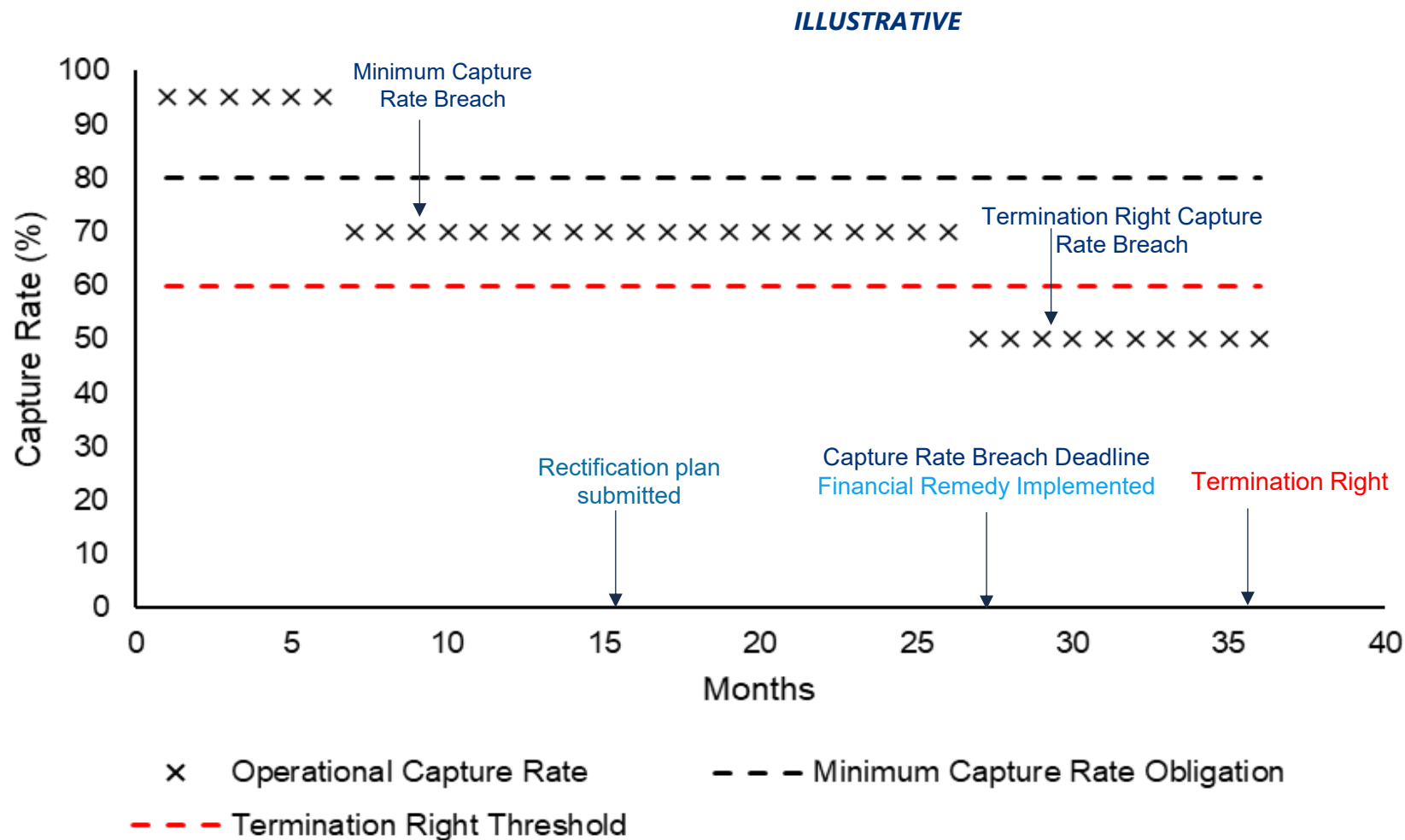
Minimum CO<sub>2</sub> Capture Rate Breach and rectification process remain the same.

However, instead of a termination right, if the breach is not resolved by the agreed date, a **financial remedy** will apply until the breach is remedied.

A separate “Termination Threshold Capture Rate” has been introduced, which is set at **60%**. Sustained breach of this threshold results in a termination right for the ICC Contract Counterparty.

This change mitigates perceived risk associated with the termination right that was previously linked to the Minimum CO<sub>2</sub> Capture Rate.

# Example

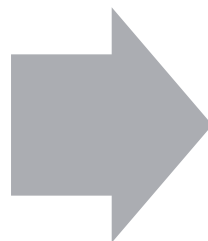


# Extension Required CO<sub>2</sub> Capture Rate

## Previous position:

**“Extension Required CO<sub>2</sub> Capture Rate”** means an Achieved CO<sub>2</sub> Capture Rate equal to or greater than the higher of:

- (A) 5 pp (percentage points) lower than the OCP Achieved CO<sub>2</sub> Capture Rate
- (B) eighty-five per cent. (85%)



## Updated position:

**“Extension Required CO<sub>2</sub> Capture Rate”** means an Achieved CO<sub>2</sub> Capture Rate equal to or greater than the higher of:

- (A) five (5) percentage points less than the lower of: (a) the OCP Achieved CO<sub>2</sub> Capture Rate; and (b) the CO<sub>2</sub> Capture Rate Estimate; and
- (B) eighty-five per cent. (85%)

As with the change that has been made to the Minimum CO<sub>2</sub> Capture Rate, this change ensures that projects are not placed in a worse position for overachieving during their OCP Performance Test.



# Post Capture CO<sub>2</sub> Measurement: Technology Requirements

At minimum, the “T&S Meter Measurement System” must include:

- A **“T&S Flow Meter”** to measure the CO<sub>2</sub> Rich Stream flow rate. i.e. a mass flow meter, or volumetric flow meter. E.g., Coriolis flow meter.
- **“T&S Composition Analysis Equipment”** to measure CO<sub>2</sub> concentration and determine CO<sub>2</sub> mass fraction in the CO<sub>2</sub> Rich Stream. E.g., online gas chromatograph optimised for high-purity CO<sub>2</sub>.
- Any other measurement device(s) necessary to enable the calculation of the Metered CO<sub>2</sub> Output to T&S and the Metered CO<sub>2</sub> Rich Stream Output to T&S, for example fluid stream temperature and pressure devices.
- A **Data Acquisition and Handling System (DAHS)**.

DESNZ has a **technology agnostic** approach, i.e. the Emitter is responsible for technology section.

# Post Capture CO<sub>2</sub> Measurement: Data Requirements

The Emitter must calculate and report the following values to the Contract Counterparty:

## **Metered CO<sub>2</sub> Rich Stream Output to T&S.**

This is the mass quantity of “CO<sub>2</sub> Rich Stream” entering the T&S Network from during the relevant Settlement Unit.

Used to determine the T&S Flow Charge.

## **Metered CO<sub>2</sub> Output to T&S.**

This is the mass quantity of “pure” CO<sub>2</sub>, entering the T&S Network during the relevant Settlement Unit.

Used to determine Opex and Capex payments, and to calculate the Capture Rate (and, for the ICC Contract only, the Capture Factor).

In each case, a Settlement Unit is a period of one day.



# Post Capture CO<sub>2</sub> Measurement: Measurement Uncertainty

The following measurement uncertainty requirements apply:

## **Metered CO<sub>2</sub> Rich Stream Output to T&S.**

$\leq \pm 1\%$  at flow rates  $\geq 10\%$   
of maximum flow rate;  
 $\leq \pm 2\%$  at flow rates  $< 10\%$   
of maximum flow rate.

## **Metered CO<sub>2</sub> Output to T&S.**

$\leq \pm 1.5\%$  at flow rates  $\geq 10\%$   
of maximum flow rate;  
 $\leq \pm 3\%$  at flow rates  $< 10\%$   
of maximum flow rate.

The higher measurement uncertainty allowance for Metered CO<sub>2</sub> Output to T&S reflects the increased uncertainty associated with measurement of CO<sub>2</sub> concentration.

Note that the uncertainty requirements are relaxed at particularly low flow rates, where measurement uncertainty is higher.

# Post Capture CO<sub>2</sub> Measurement: Special Cases

## CO<sub>2</sub> Utilisation

Any Emitter which is directing a proportion of the CO<sub>2</sub> output from the Capture Plant towards CO<sub>2</sub> Utilisation will need to separately measure the mass flow and concentration of CO<sub>2</sub> directed towards CO<sub>2</sub> Utilisation.

## Downstream CO<sub>2</sub> Venting

If an Emitter needs to vent CO<sub>2</sub> from the pipeline downstream of the T&S Flow Meter and upstream of the CO<sub>2</sub> T&S Delivery Point (e.g. to remove Off-Specification CO<sub>2</sub> or to depressurise the pipeline for maintenance operations), the quantity of CO<sub>2</sub> which is vented must be determined, via a calculation based on the internal pipe volume and gas pressure and temperature, and deducted from the measured CO<sub>2</sub> output values.

Projects which require this arrangement will need to agree this with DESNZ during negotiations, and Downstream CO<sub>2</sub> Venting will only be allowed in these specific circumstances.