Waste Industrial Carbon Capture Business Model

Summary of the Department for Energy Security & Net Zero's CCUS offering

All-Energy / Dcarbonise Conference (10th May 2023)
Chris Williams

Agenda

1. Introduction to the CCUS programme
2. Background on the Waste ICC business model
3. Business model design
4. Future policy

CCUS Programme: Policy Landscape in the UK

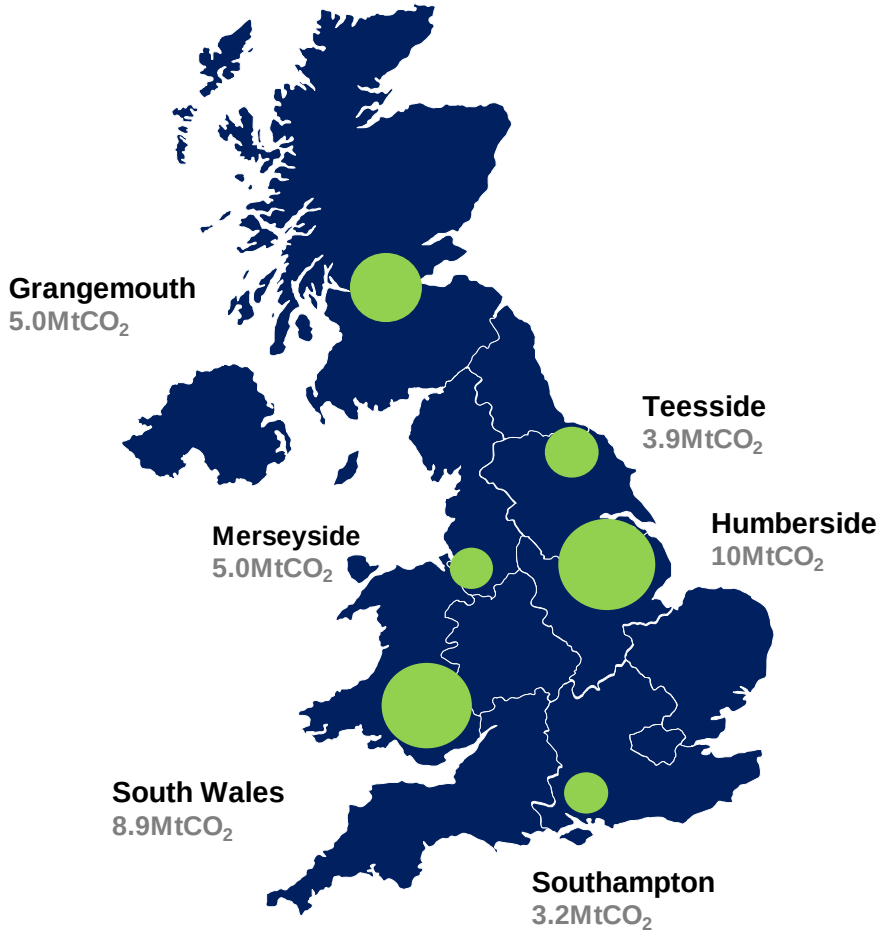
Carbon capture and storage is an essential technology to decarbonise the UK economy.

The government has committed to an ambition to capture **20-30Mt** of carbon dioxide a year by 2030 as part of the Net Zero Strategy.

Deployment strategy for CCUS is to focus in industrial areas where emission concentrations are highest. Government has committed to 2 CCS clusters in the mid-2020s (Track-1) and a further 2 CCS clusters by 2030 (Track-2).

To overcome the market failures hindering the deployment of CCUS, Government is progressing the design of business models, including for:

- CO_2 Transport and Storage (T&S)
- Power CCUS (Dispatchable Power Agreement)
- Industrial Carbon Capture (ICC)
- Waste ICC
- Power BECCS (Bioenergy with Carbon Capture and Storage)
- CCUS-enabled Hydrogen Production



Location of clusters and 2018 emissions

CCUS Programme: Funding

- CCUS business models are expected to draw in private sector investment into the UK.
- UK has a strong oil and gas heritage with a unique geography, giving it great CO_2 storage potential
- Projected market for UK companies of £10bn a year (of a £200bn a year global market for CCUS)

To support this private sector investment, and the deployment of CCS in the UK, the Government has:

- Announced **£1 billion via the CCS Infrastructure Fund** to facilitate the deployment of CCUS infrastructure, including to industrial CCUS projects as part of the business model offering
- In March 2023, the **Chancellor announced funding of £20bn** to support the early development of CCUS to help meet the government's climate commitments
- Set up the **Industrial Decarbonisation and Hydrogen Revenue Support (IDHRS)** scheme to fund our new industrial carbon capture, waste and hydrogen **business models**.

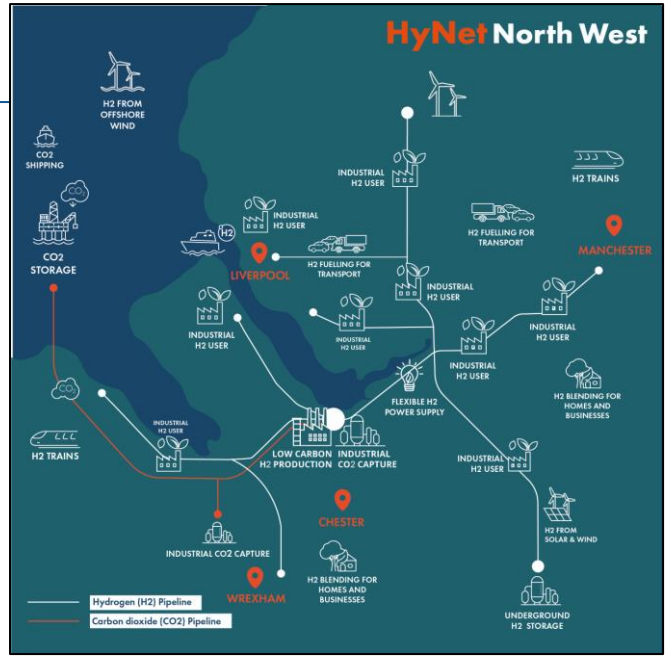
CCUS Programme: Track 1

- For Track 1 of the CCUS programme, a cluster sequencing process resulted in the **HyNet (North West England) and East Coast Clusters** being selected and the Scottish Cluster is a reserve cluster if a back-up is needed.
- Phase-2 then identified individual projects across capture applications (industry, power, hydrogen, waste) that could feasibly connect to the Track-1 cluster locations and be operational by the mid 2020s.
- From a shortlist of 20 projects, in March 2023, **eight projects** were selected to enter the negotiations phase.
    - This included two Waste ICC projects:
        - **Viridor Runcorn Industrial CCS** and
        - **Protos Energy Recovery Facility.**

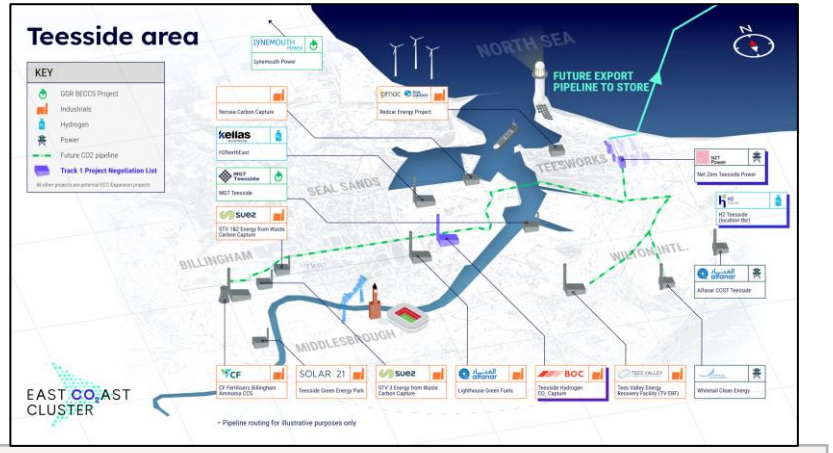
Track-1 Expansion

Beyond currently proposed deployment in Track-1 for shortlisted projects, further usage and expansion of Track-1 clusters will be carried out via Track-1 expansion.

A process to identify and select additional capture projects will launch later this year to enable further expansion of Track-1 clusters.



Map of the HyNet Cluster (Source: hynet.co.uk)



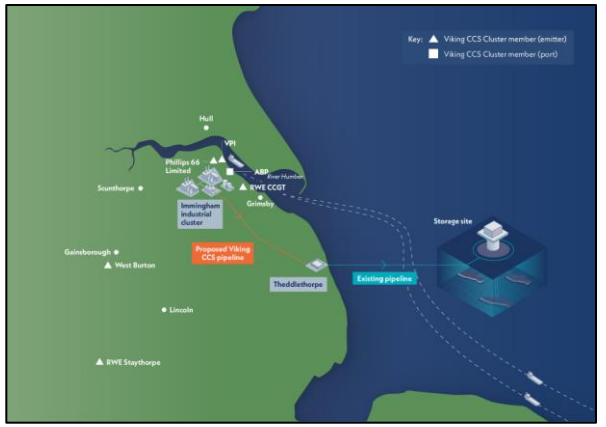
Map of the East Coast Cluster (Source: netzeroteesside.co.uk)

CCUS Programme: Track 2

- Track-2 has been launched to deliver the 3rd and 4th cluster by 2030.
- Government views the **Acorn (Scotland)** and **Viking (Humber)** T&S systems as able to meet the Track-2 eligibility criteria, and best placed to deliver on the objectives for Track-2, subject to final decisions, due diligence, consenting, subsidy control and value for money assessments.
- Other T&S systems have been given the opportunity to submit an expression of interest if they meet the following criteria:
  - are located within the UK
  - are able to credibly demonstrate that they have a clear pathway to rates of injection consistent with the at least 10Mtpa ambition by 2030
  - do not form part of the HyNet or East Coast Cluster (ECC) Track-1 cluster proposals
  - are able to credibly demonstrate that they can connect via pipeline to at least two projects for an initial phase of capture and non-pipeline transport in future phases.
- The deadline for expression of interest submissions was 28 April. The timelines for Track-2 and timings for final decisions are dependent on the outcome of the expression of interest process. We intend to provide an update in the summer.

Potential Track 2 clusters

Map of the Acorn Cluster (Source: Pale Blue Dot Energy)



Map of the Viking Cluster (Source: Viking CCS)

Waste ICC – Market Failures and Objectives

Why is there need for government support for CCUS in the residual waste management sector?

CCS is the only net zero compliant technology for the residual waste management sector, with EfW sector expecting to hold an increasing percentage of power sector emissions as the grid decarbonises

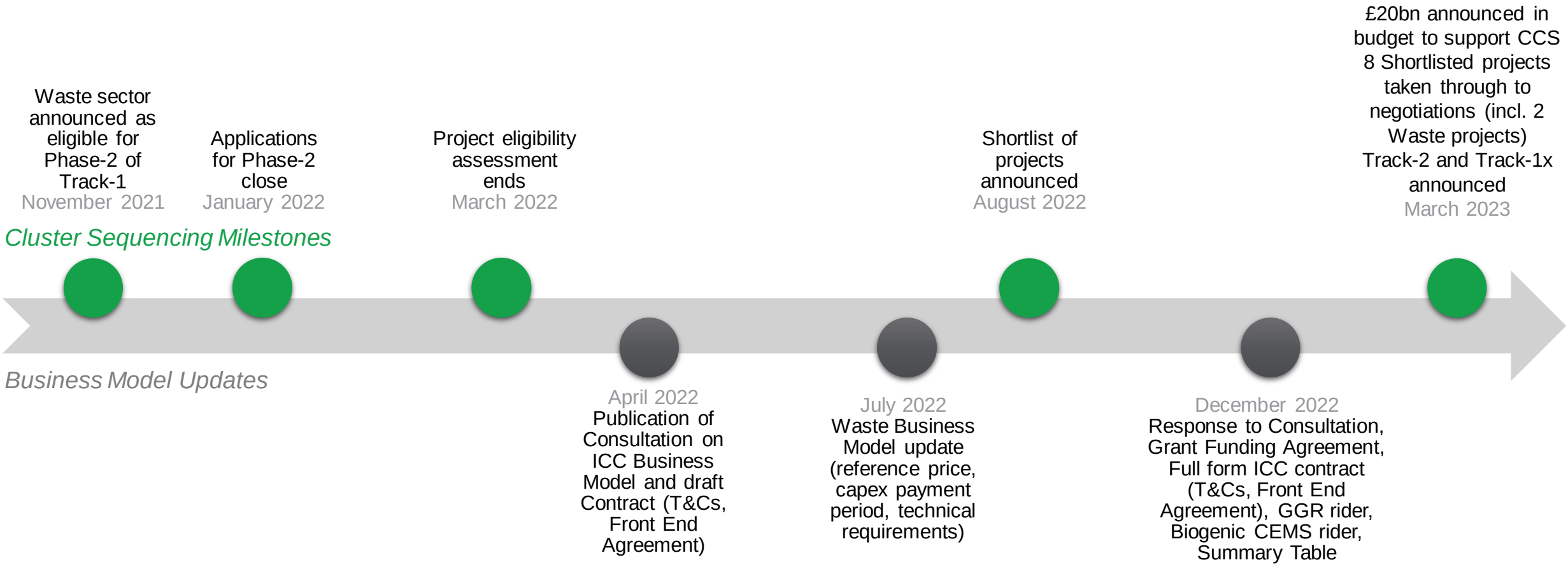
Insufficient incentive to install CCS as there is currently no carbon price, and if there was, the long-term contracts with waste suppliers allow carbon pricing to be passed onto customers

The residual waste sector has a high percentage of biogenic CO_2 (~50%), which if captured have potential to create negative emissions. Investment in CCS for negative emissions is unlikely as revenues are uncertain

High upfront capital, operational, financing and system costs associated with implementing CCS. First-of-a-kind implementation adds a risk premium that prevent project developers from taking investment decisions

Our objective for developing a business model for waste facilities is to provide reliable baseload CO_2 to the T&S network by incentivising investment in CCS that will deliver value for money emission reductions and removals from the residual waste management sector (new builds and retrofits, including energy from waste and waste to fuel projects)

Waste CCUS Policy Development Timeline



Track-1 Eligibility Criteria

Only **eligible ICC projects** could progress to the evaluation and bilateral negotiation stages of Track-1 Phase-2 Cluster Sequencing.

- ✓ Must be able to demonstrate the ability to meet high capture rates of at least 85%.
- ✓ For Waste Management the Project must meet specific eligibility criteria:
  - ✓ Must have a minimum of 20-years of remaining operational life
  - ✓ An eligible waste technology
  - ✓ High efficiency ratings →

Eligible Technology / Sector	EfW (Incineration / combustion of MSW and/or CW with energy recovery)	ATT / ACT			HWI
		Gasification to energy (electricity and/or heat) only	Gasification to molecule (chemicals or fuels)	Pyrolysis	
Efficiency Rating	R1	R1	Not Applicable		

Retrofitting or new-build facilities were both eligible.

For further detail, including evaluation criteria, weightings and negotiations approach, please refer to the Phase-2 guidance.

N.B. Eligibility criteria may change with each round of allocation.

Business model offering

- The Waste CCUS offering, is based on the Industrial Carbon Capture (ICC) Business Model (BM)
- The BM is designed to share the risks and benefits of the CCS projects between HMG and emitters.

The support package offering for initial projects:

i. **A 10-year private law contract (with potential extensions up to 15-years)** between emitter and counterparty, that provides the emitter with a payment per tonne of captured CO_2. The contract provides protections in certain circumstances (e.g. T&S outages, Qualifying Change in Law), if contractual obligations and requirements are fulfilled; and

ii. **Capital grant co-funding** for up to 50% of the total Capex, which will be available for initial projects only and is intended to mitigate against certain risks associated with these projects. This grant support is funded by the CCS Infrastructure Fund (CIF) via the Grant Funding Agreement (GFA)

- Waste ICC Contract payments have three components: (a) opex, (b) capex, and (c) CO_2 Transport and Storage (T&S) fees.

Payments under the Waste ICC BM – (a) Opex

Opex

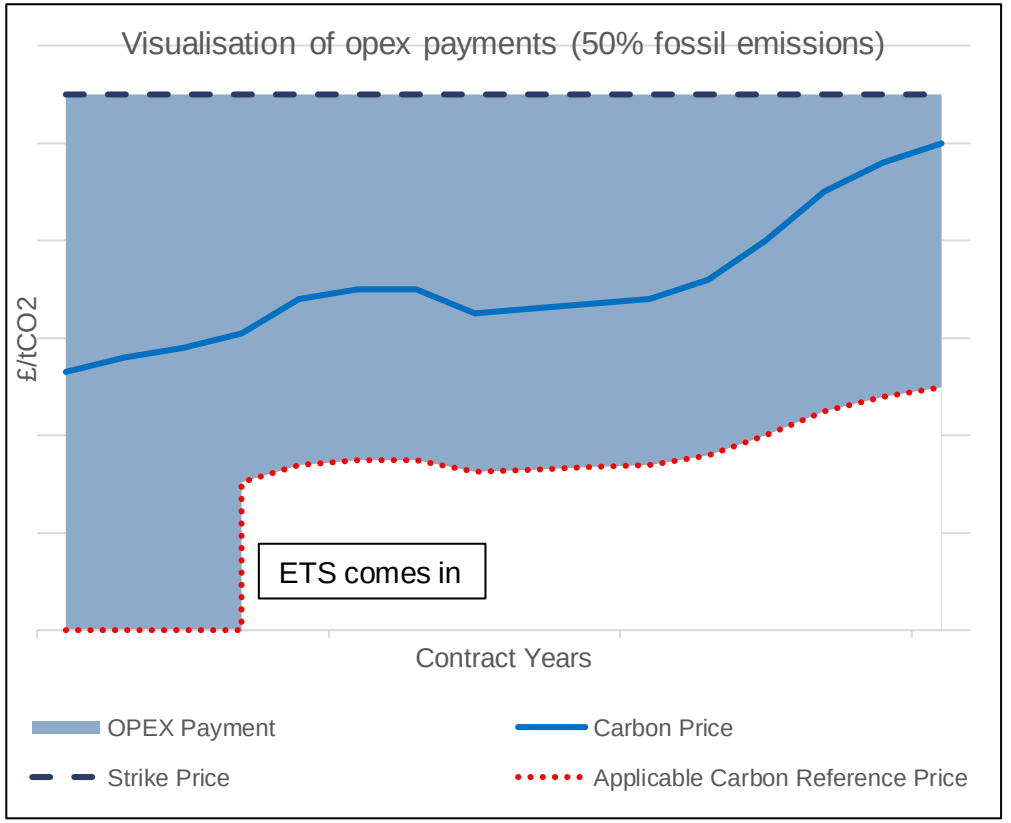
The opex payment is set up as a Contract for Difference, paying on a £ per tonne of CO_2 captured and stored with:

- **Strike price:** negotiated to cover the ongoing operational costs of CCS
- **Reference price:** avoided carbon price

Opex = Strike price – Applicable Carbon Reference price

Where, the 'Applicable Carbon Reference Price' = ETS * Applicable %

The Applicable % is the percentage of the emissions that would have been subject to the UK ETS if those emissions had not been captured (e.g. the fossil percentage if the sector is subject to carbon pricing).



Determining the fossil percentage

Carbon-14 laboratory analysis of a continuous monthly flue gas sample will be required.

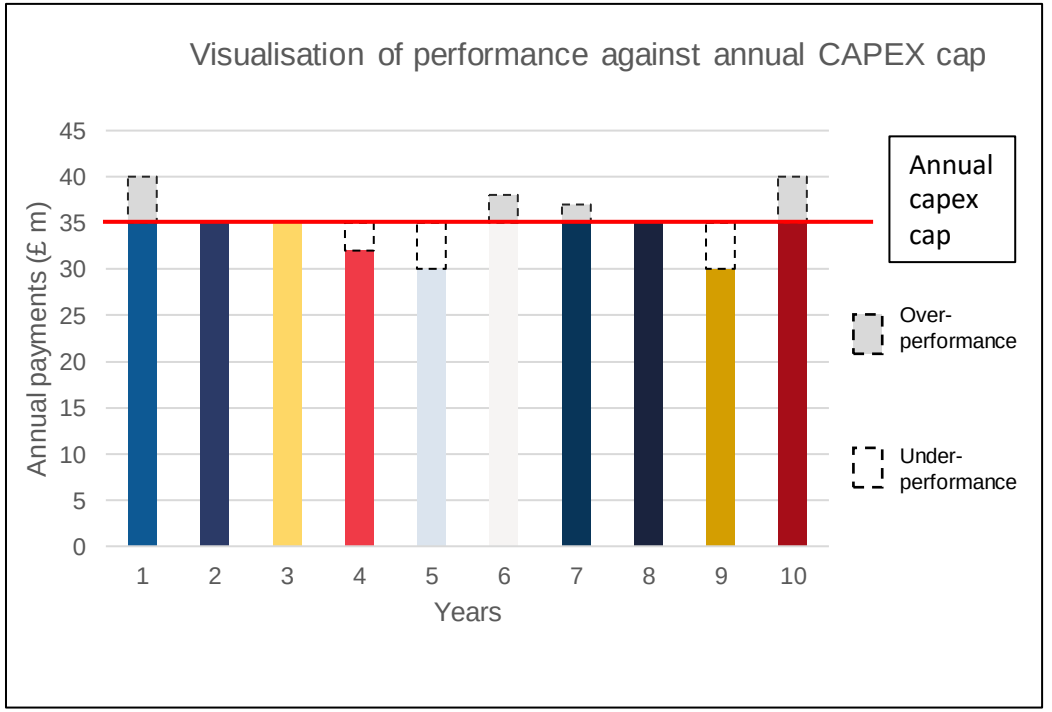
Payments under the Waste ICC BM – (b) Capex and (c) T&S fees

Capex

The capex payment covers the costs of capital and a ROI on that capital over the 10-year repayment period (excluding any Capex support provided through the Grant Funding Agreement).

The capex payment is paid on CO_2 that is captured and stored on £/t rate based on total capex, ROI and total expected capture volumes.

Capex repayments will be capped at the expected output for the project in that year, therefore a project will need to capture their projected CO_2 in every year of the contract to recover all CAPEX and ROI.



T&S

- Projects will need to pay the T&S operator fees to use their network to transport and store CO_2
- These costs are passed through the business model to the emitter, who then pays T&Sco
- Details on T&S fees were provided in December 2022 in the Indicative Heads of Terms

Negative emissions

Municipal wastes contain both fossil and biogenic content. If the biogenic content is captured, this can be considered bioenergy-CCS (BECCS), which is a Greenhouse Gas Removal (GGR) technology which can create negative emissions.

Negative emissions will be required to offset the hard to abate sectors and therefore an essential technology to meet Net Zero by 2050.

Currently, government policy on negative emissions is being developed and therefore the ICC and Waste ICC contracts will restrict participation in negative emissions markets until a consistent approach across government about negative emissions has been set out.

The restriction position will be reviewed, and if the restriction is lifted allowing a contracted project to generate negative emissions, these will have a monetary value which needs to be accounted for in the contracts.

A deduction of 90% of the value of the negative emissions will be made from the subsidy payments.

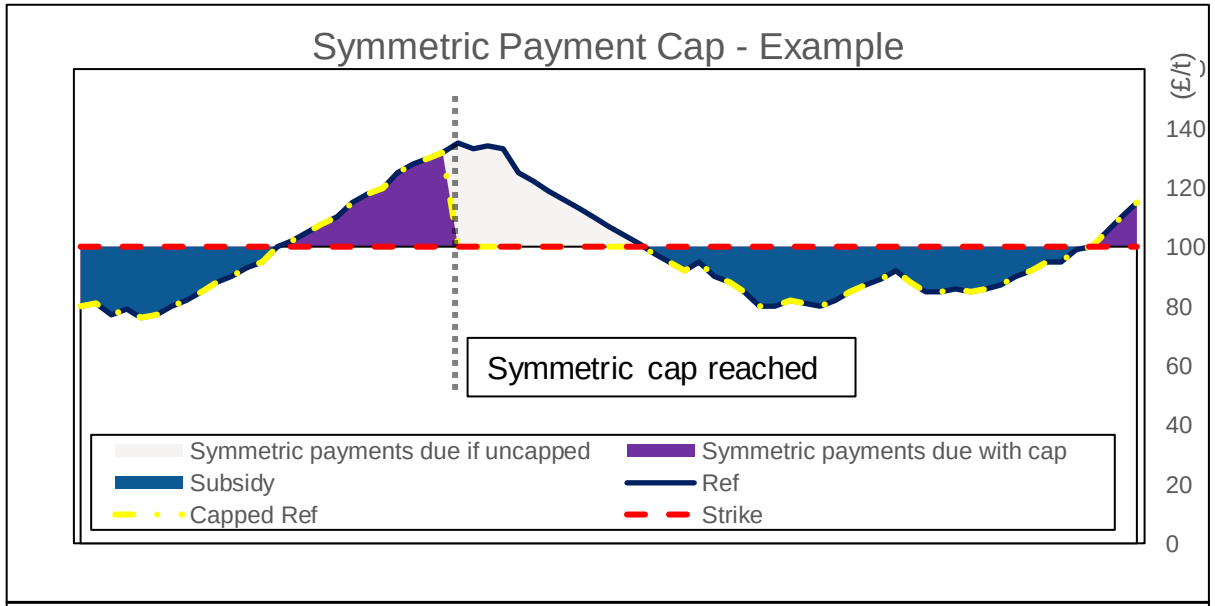
Symmetric payment cap

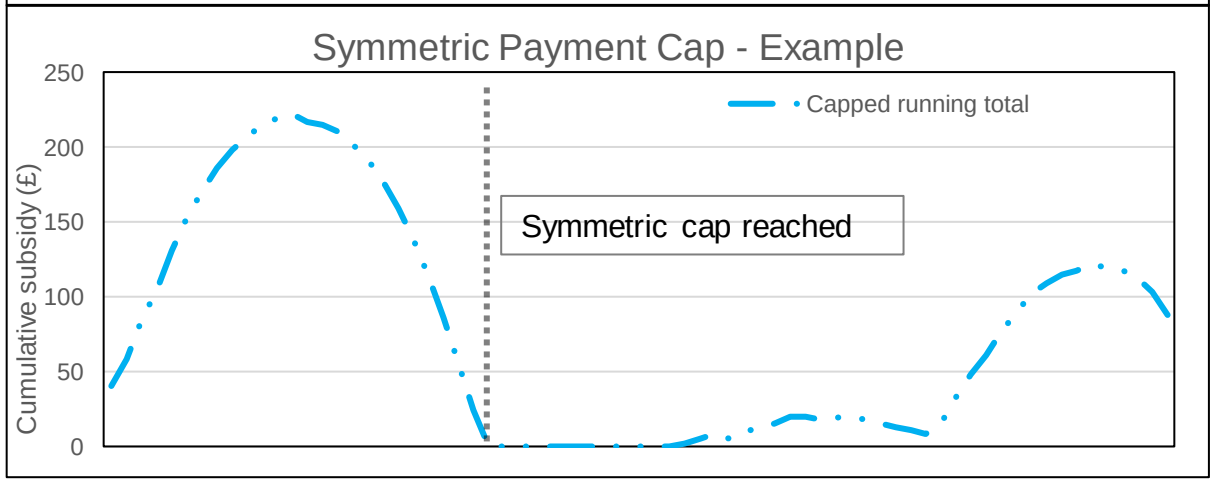
The following elements are combined in a monthly payment calculation:

$$Monthly\ Payment = Opex^{*} + Capex + T\&S - NE$$

- It is possible for monthly payments to be negative, i.e. flow from the Emitter to the Counterparty ('symmetric payments'). Symmetric payments are to be capped.
- The cap on symmetric payments will be reached when the cumulative repayments from Waste Emitter to Counterparty over the Contract term are greater than the payments the Waste Emitter has received through the CIF GFA and the Waste ICC Contract.
- If the cap has been reached, but then subsequently monthly payments are required from the Counterparty, these payments will begin immediately.

**Opex payment can be negative if reference price > strike price*





Extension conditions

The core term of the contract is 10-years, however there is the potential for an extension to be given for facilities that are performing to an acceptable level and the market conditions warrant an extension.

Performance conditions are aimed at ensuring that only facilities that continue to perform well are given extensions.

- A facility has to have:
  - Retained high capture rates (assessed over 5-years)
  - Provided high and accurate capture volumes (assessed over 5-years)
  - Continued connectivity to a T&S network
  - Almost all biogenic CO_2 sent to negative emission markets.

Market assessment is aimed to consider whether the market is sufficient to sustain the project without the need for further support.

- If the avoided carbon costs are greater than the costs of operations (T&S and Opex) minus potential negative emissions value, then a project should be able to continue to run without business model support.
- If this is not case, then Waste ICC Contract support would still be required to run the CCS plant, therefore the market extension conditions would be met.

Future evolution

- We are finalising the drafting of the Track-1 business model contract and plan for publication in summer 2023.
- The Waste ICC Contract for Track-1 ICC projects is specifically designed to bring FOAK industrial CCUS projects online in the mid-2020s by providing revenue support to overcome investor uncertainty and cover wider project risks.
- The Waste ICC Contract will need to evolve for future allocation rounds, which we are currently reviewing. Areas of the business model that we anticipate may evolve include:
  - Starting with a ETS reference price (rather than needing a trigger – dependent on ETS policy development)
  - Biogenic CO_2 reference price (rather than needing the initial restriction and later review – dependent on GGR policy development)
  - More stringent efficiency ratings
  - More competitive allocation

Thanks for listening

Any questions or comments please message ICCbusinessmodels@beis.gov.uk