



Regulatory and Financial Gaps Hindering Carbon Dioxide Removal Technologies

Brussels – November 21, 2019

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Roundtable on
Climate Change and
Sustainable Transition

Structure of the meeting

ERCST will start the session with a presentation, covering:

1. ERCST's work on Carbon Dioxide Removal Technologies (CDRTs);
2. Introduction to CDRTs, and existing innovation gap;
3. Potential mechanisms to incentivise CDRTs through EU frameworks;
4. Potential mechanisms to incentivise CDRTs through international frameworks;

This presentation will be followed by a round of initial remarks from selected stakeholders

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ERCST's work on CDRTs

- On September 24th, ERCST organised a first brainstorm meeting on Carbon Dioxide Removal Technologies (CDRTs).
- This is a new workstream that aims at researching and fostering discussion on **how CDRTs can fulfil the expectations and key role they have received in different energy and climate scenarios.**
- ERCST will focus its work on the existing regulatory and financial gaps, both at the EU and international level, that might hamper the development and deployment of CDRTs.

ERCST's work on CDRTs

- Today's meeting attempts to structure the discussion in two main directions:
 - **regulatory and financial gaps at the EU level**
 - **regulatory and financial gaps at the international level**
- ERCST will continue working on these issues during 2020, and it is planning to publish an **options paper in Q2 2020** on the potential frameworks to promote CO2 capturing as part of the EU decarbonisation strategy.
- Further work might also be envisioned with regard to potential enabling frameworks at the international level, provided that the negotiations on Article 6 of the Paris Agreement are finalised during COP25.

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Introduction to CDRTs

We identify three different types of CDRTs:

- **On-site plant capture** – capturing emissions produced from on-site point sources (e.g. CCS);
- **Direct air capture** – directly removing emissions from the atmosphere (e.g. DAC);
- **Natural capture** – directly removing emissions from the atmosphere through natural carbon sinks (e.g. land management to increase and fix carbon in soils, afforestation, etc.)

- *Bio-energy with carbon capture and storage (BECCS) does not fall under any of these three categories, as it combines elements of natural capture and on-site plant capture. It will therefore be treated separately.*

Carbon neutral vs. carbon negative technologies

- **Carbon negative technologies:** ensure the permanent removal of atmospheric greenhouse gases, and thereby a net decrease in the greenhouse gas concentration in the atmosphere. This removal takes place separately from the point source of emissions.
- **Carbon neutral technologies:** refer to trying to balance a measured amount of carbon released with an equivalent amount sequestered through an on-site capturing intervention – adding a smaller, but still positive, amount of greenhouse gas to the atmosphere.
- **A key difference lies in the perspective taken for the analysis: what matters is the selection of the *system's boundaries* in the analysis (cradle to gate vs. cradle to grave).**
- **E.g.:** by analysing a CCS plant separately from the point source of CO₂ emissions, the CCS plant could be regarded as carbon negative – it ensures a net decrease of the GHG concentration in the atmosphere.
- However, if the analysis includes the emitting plant in the system's boundaries, the CCS plant will be regarded as carbon neutral, at best.

Life-cycle analysis of the captured CO₂

- **It is important to have a full life-cycle analysis of the captured CO₂: cradle to grave approach.**
- *Example of CCU technologies*: a ton of CO₂ converted in methanol and then burnt as green fuel is on climate change not equal to a ton of CO₂ geologically stored or sequestered in concrete.
- If a CCU technology captures the CO₂ but then releases it in the atmosphere at a later stage, it cannot be treated as carbon negative – what we see is a delay in the moment when emissions are emitted.
- Difficulty has arisen in ensuring regulation reflects a differentiation without disincentivising the development of CDRTs in general. For example, the **European Court of Justice in Case C-460/15** held regulation which still saw CO₂ transferred to another installation for production not as emissions.

Carbon neutral vs. carbon negative technologies

- **Should there be a difference when designing the potential incentives to promote CDRTs?**
- Are CDRTs ensuring a net decrease of GHG concentration in the atmosphere through a full LCA (i.e. carbon negative technologies) worth prioritising?
- All CDRTs are important, and some “carbon neutral technologies” are expected to play a key role in the decarbonisation of certain *hard-to-abate* industrial sectors.
- **Both carbon neutral and carbon negative technologies need tailored incentives and enabling frameworks.** This presentation will focus on on both categories.

Framing the discussion

- There are currently gaps in the development, implementation and operationalisation of both on-site capture, direct air capture and natural capture – [*see ERCST presentation from event on September 24th*](#).
- In order for them to be effective, the existing **innovation gap can only be addressed through filling the financial and regulatory gaps**: there is a need to develop public funding, trigger private investments, and adopt relevant regulatory frameworks incentivising CDRTs.
- **Today's discussion will focus on two main dimensions:**
 1. **Regulatory and financial gaps at the EU level**
 2. **Regulatory and financial gaps at the international level**

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Regulatory and financial instruments to incentivise CDRTs at the EU level

We will analyse the different EU regulatory and financial frameworks that might apply for each of the three identified groups of CDRTs:

- **On-site plant capture**
- **Direct air capture**
- **Natural capture**

Regulatory frameworks:

- CCS Directive
- EU ETS
- LULUCF
- ESR

Financial frameworks :

- NER300 (New Entrants Reserve)
- EEPR (European Energy Programme for Recovery)
- Projects of Common Interest (PCIs)

Main barriers for past EU attempts to incentivise CCS

In the past, the main focus of the EU with regard to CDRTs has been for financing CCS projects. However, these attempts fell short of expectations for three main reasons:

- 1. Lack of price signal** that places sufficient value on emissions reductions: low carbon price under the ETS rendered the business case for CCS unattractive, created a “missing market” for CCS and undermining the projects’ main drivers.
- 2. Lack of policy security:** with the move away from i.e. coal-fired power generation, projects struggled to ensure continued positive stakeholder engagement, both on the Member State political and public level (*public acceptability*). Future liability issues also represented a barrier.
- 3. Lack of funding security:** securing sufficient funding for these projects was one of the main barriers for the development of these projects with often a funding gap between public and private sector investment.

EU promotion of on-site plant capture in the period 2020-2030

- In the context of the current EU policy framework to achieve the EU's CO2 reduction target for 2030, we identify the following **existing mechanisms that could incentivise on-site plant capture**:
- Regulatory frameworks:
 - **EU ETS**
 - Price of EUAs.
 - **Article 49** of the Regulation on **Monitoring and Reporting** (601/2012), which allows installations under the EU ETS to subtract emissions covered by CCS facilities from the total number of allowances they need to surrender.

EU promotion of on-site plant capture in the period 2020-2030

- **Existing mechanisms that could incentivise on-site plant capture:**
- Financial frameworks:
 - EU ETS **Innovation fund** – CC(U)S projects explicitly mentioned as a core focus of the Innovation fund.
 - EU ETS **Modernisation fund** – on-site plant capture projects should be eligible as ‘non priority’ projects (i.e. 30% of the fund).

New potential frameworks to promote on-site plant capture in the EU?

- Regulatory frameworks:
 - Specific requirements for on-site plant capture?
 - *E.g. establishing a minimum requirement for CO₂ capturing via CCS for installations under the EU ETS emitting more than a given threshold.*
 - Create specific incentives under the **Renewable Energy Directive (RED II)**?
 - *Under Article 25, each MS has a target of 14% renewable fuels in the transport sector by 2030 (minimum share). Following the example of the Low Carbon Fuel Standard Program (LCFS) in California, could there be an option to generate credits from on-site capture projects, allowing MS to use such credits to meet their 14% target?*
 - **Voluntary market mechanisms** (domestic offsetting under Art.24a EU ETS Directive)?
Harmonisation of minimum standards?

New potential frameworks to promote on-site plant capture in the EU?

- *Financial frameworks:*
 - Tailored calls for proposals for on-site plant capture projects under the **Innovation Fund**?
 - **EU industrial policy strategy** as a way of funding on-site plant capture projects, especially in the context of *hard-to-abate* industrial sectors?
 - **European Investment Bank** upcoming policy (end of 2021) will only consider energy projects emitting less than 250g of CO₂/kWh to be eligible for funding. Gas power plants using CCS could still access funding.

EU promotion of direct air capture in the period 2020-2030

- **Existing mechanisms that could incentivise direct air capture (DAC):**
- Regulatory frameworks:
 - **No existing mechanism** incentivising DAC projects specifically.
- Financial frameworks:
 - EU ETS **Innovation fund** – DAC projects should be eligible under the fund.
 - EU ETS **Modernisation fund** – DAC projects should be eligible as ‘non priority’ projects (i.e. 30% of the fund).

New potential frameworks to promote direct air capture in the EU?

- Regulatory frameworks:
 - Specific requirements for direct air capture?
 - *E.g. establishing a minimum requirement for CO₂ capturing via DAC projects for those installations under the EU ETS emitting more than a given threshold – more problematic than creating a similar incentive for CCS, since DAC is currently not recognised under the EU ETS.*
 - Create specific incentives under the **RED II**?
 - *Under Article 25 of the RED II, each MS has a target of 14% renewable fuels in the transport sector by 2030 (minimum share). Following the example of the LCFS in California, could there be an option to generate credits from DAC projects, allowing MS to use such credits to meet their 14% target ?*
 - **Voluntary market mechanisms** (domestic offsetting under Art.24a EU ETS Directive)?
Harmonisation of minimum standards?

New potential frameworks to promote direct air capture in the EU?

- *Financial frameworks:*
 - Tailored calls for proposals for direct air capture projects under the EU ETS **Innovation Fund?**
 - **EU industrial policy strategy** as a way of funding direct air capture projects, especially in the context of certain *hard-to-abate* industrial sectors?

Existing EU frameworks to promote natural capture in the period 2020-2030

- **Existing mechanisms that could incentivise natural capture** (e.g. reforestation and afforestation; soil carbon sequestration; etc.):
- Regulatory frameworks:
 - **ESR**
 - MS have binding targets under the ESR for non-ETS sectors, including transport, buildings, agriculture, non-ETS industry and waste – *natural capture projects could help achieving these targets, particularly in the agricultural sector.*
 - **Flexibility mechanisms under the ESR**
 - Under **Article 5**, MS may transfer up to 5 % of their annual emission allocation for a given year to other MS in the years 2021 to 2025, and up to 10 % in the years 2026 to 2030 – *this creates an incentive to cut emissions in ESR sectors, and transfer additional allocations.*
 - Under **Article 7**, MS can use up to **280 million LULUCF credits for ESR compliance** (EU-wide), over the period 2021-2030.

Existing EU frameworks to promote natural capture in the period 2020-2030

- Regulatory frameworks:
 - **LULUCF Regulation (2018/841)**
 - Binding commitment for each MS to ensure that accounted emissions from land use are entirely compensated by an equivalent removal of CO₂ from the atmosphere through action in the sector. This is known as the '**no debit**' rule.
 - Emissions of biomass used in energy is accounted towards each MS 2030 commitment under the LULUCF – *this can be seen as an indirect incentive for MS to promote BECCS projects.*
 - **Flexibility mechanisms under the LULUCF**
 - Under **Article 12**, MS can use allocations from the ESR to satisfy the 'no debit' rule.
 - Art. 12 also allows MS to **buy and sell net removals from and to other Member States**, provided that double-counting is avoided and flexibility under the ESR is taken into account.

Existing EU frameworks to promote natural capture in the period 2020-2030

- **Existing mechanisms that could incentivise natural capture** (e.g. reforestation and afforestation; soil carbon sequestration; etc.):
- Financial frameworks:
 - EU ETS **Innovation fund** – natural capture projects should be eligible under the fund.
 - EU ETS **Modernisation fund** – natural capture projects should be eligible as ‘non priority’ projects (i.e. 30% of the fund).
 - Financing opportunities for natural capture projects under the **Common Agriculture Policy**.
 - *E.g. green direct payments support farmers who adopt or maintain farming practices that help meet environmental and climate goals (provided that they ensure maintenance of permanent grassland, crop diversification and ecological focus areas).*

New potential frameworks to promote natural capture in the EU?

- Regulatory frameworks:
 - Incentives under the **Common Agriculture Policy**
 - *E.g. creation of soil carbon credits?*
 - Expanding the **flexibility mechanisms under the ESR?**
 - Expanding the **flexibility mechanisms under the LULUCF?**
- Financial frameworks:
 - Tailored calls for proposals for natural capture projects under the EU ETS **Innovation Fund?**
 - *This could be especially important for BECCS projects, given that BECCS combines elements of natural capture and on-site capture.*
 - Enhance financing opportunities for natural capture projects under the CAP (*e.g. **increasing green direct payment***)?

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Regulatory and financial instruments to incentivise CDRTs at the international level

Current development:

- Not yet consistent with reaching climate target of **well below 2°C** let alone at **1.5 °C**.
- **80% of global emissions not covered by carbon pricing.**
- Those that are covered by carbon pricing, only half are priced at more than **10 USD/tonne**.
- Not enough to create incentives for making CDRT projects bankable and drive much-needed deployment.

Analysis of existing and potential new frameworks at the international level to incentivise:

- On-site plant capture
- Direct air capture
- Natural capture

Overview of international regulatory and financial frameworks

Regulatory frameworks:

- Kyoto Protocol
- Paris Agreement
- OSPAR FRAM: ratified
- London RAMF: not yet ratified, not enough Party support.

Financial frameworks:

- Under Kyoto Protocol (CDM: CERs and JI: ERUs)
- Under Paris Agreement (Articles 5 and 6)

Past regulatory and legal barriers for on-site plant capture

Legal barriers to CCS implementation at the international level, for example for transportation and storage in other jurisdictions.

- **1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter,**
- **1996 London Protocol,**
- **1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Convention.**

CO2 not expressly prohibited but could be categorized as industrial waste, which is prohibited.

Amendments to the legal instruments and framework for dealing with the new technology:

- The **London** Risk Assessment and Management Framework for CO2 Sequestration in **Sub-seabed** Geological Structures (**RAMF**) = not yet ratified.
- The **OSPAR** Guidelines for Risk Assessment and Management of Storage of CO2 Streams in Geological Formation, which includes a Framework for Risk Assessment and Management of Storage of CO2 Streams in **Geological** Formations (**FRAM**) = ratified.

Past regulatory and financial frameworks for on-site plant capture

CCS approved as CDM project activity:

- Decision 10/CMP.7: Kyoto Protocol CMP adopts the modalities and procedures for CCS as CDM project activities.

SBSTA UNFCCC paper FCCC/TP/2012/9 outlines the different scenarios that could arise and the difficulties that could be associated with each:

- **Scenario 1:** Capture in **Party A** and storage in **Party B**;
- **Scenario 2:** Capture in **Party A** and storage in **Parties A and B**;
- **Scenario 3:** Capture in more than one Party and storage in more than one Party;
- **Scenario 4:** Capture in **Party A**, transport through **Party C** and storage in **Party B**.

Different legal and regulatory issues and barriers arise within each scenario, for example the relation to international legislation and to national legislation in the parties involved.

Net reversal of storage and lessons learned from CCS projects under the CDM

Net reversal of storage: *Emissions which exceed emission reductions over the verification period.*

- Any emissions generated by the facilities or seepage from the geological storage site, will result in a net reversal of storage.
- Host country determines on project by project basis the responsible entity for managing net reversal of storage: either the host country or the country purchasing the CERs.
- CDM registry required to establish a **reserve account** for each CCS project where **5% of the issued CERs** will be held.
- If a net reversal of storage occurs then an equivalent number of CERs will be **deducted** first from **reserve account**, second from **pending account** and finally from **holding accounts** of the project proponents.
- If this still does not cover the amount released project participants **must transfer other units** available under Kyoto (AAUs/ERUs/RMUs) until it is covered. (Decision 10/CMP.7, annex, para. 24)
- After post-injection monitoring has elapsed with **no seepage**, CDM registry administrator **releases remaining CERs** in the reserve account to project proponents.
- Provides a financial incentive for project participants to maximize number of CERs received by taking measures to avoid seepage.

Lessons from Kyoto for CCS projects under the CDM:

- In the end, **carbon price signal was never significant enough to make projects bankable.**

Moving to new potential frameworks to promote on-site plant capture: Moving from Kyoto to Paris

A changing project landscape:

- **Under Kyoto**, emphasis on **easy “low hanging fruit” projects** through the CDM as non-Annex I Parties did not have any obligatory emissions reductions commitments.
- **Under the Paris Agreement (PA)**, this will no longer be the case: **all Parties need to submit and reach their NDCs**, outlining their commitment to emissions reduction.
- *Likely this will mean “low hanging”, low cost, abatement options kept for domestic use, and “high hanging”, high cost abatement options will be available for use under the Paris cooperative mechanisms.*

Moving to new potential frameworks to promote on-site plant capture: Moving from Kyoto to Paris

Still a significant gap between the goals of the PA and today's climate response:

- There is a current vicious circle for CCS projects, where slow progress leads to declining political interest in supporting the technology and vice versa.
- This is despite continued emphasis on the importance of CCS in achieving climate targets by the IEA, IPCC and others.
- **The Paris Agreement may provide “circuit-breaker” to this vicious circle.**

New Potential Financial Frameworks for on-site capture: Article 6 and CCS Projects

If CCS projects are included under Art. 6, how would this look like?

- **Art. 6.2** Cooperative Approaches: direct bilateral cooperation between Parties.
- **Art. 6.4** Market Based Mechanism: (also involving private sector stakeholders in the climate change mitigation activities (Art. 6.4(b))).

Accounting and MRV rules?

- Would CCS projects follow the IPCC GHG accounting and measurement, reporting and verification (MRV) rules, along with employing a general CO₂eq metric?
- General accounting issues as with Art. 6, namely how to deal with double counting?

Follow the procedures in this area as outlined under Kyoto's CDM for CCS projects?

- Possibility of a reserve account for credits in the case of a leak of one of the projects under Art. 6?

Leftover credits from Kyoto?

- Problem of potential oversupply of credits affecting price signal under Art. 6.

Direct Air Capture

- **Technology was still in the very early beginning phases for Kyoto, not approved as a project activity under the CDM, but discussions have been held:**
 - inviting “new technologies that have the potential to reduce in net terms the concentration of carbon or carbon dioxide already in the atmosphere;”. This is on top of the CCS discussions (see CMP document on CDM guidance FCCC/KP/CMP/2009/21/Add.1, p. 7)
- As yet, there are no direct incentives under international frameworks, but ongoing private sector engagement.
- Possibility of including DAC projects under Article 6?
 - *There is a need for bankable projects for Art. 6 and these future DAC projects could lead to additional CO2 streams into the CCS infrastructure.*

Natural Capture

- Reference to carbon sinks previously included under **Kyoto**:
 - *National GHG accounts (Art. 3),*
 - *Emissions trading and the Joint Implementation mechanism (Art. 6) and,*
 - *Under the CDM (Art. 12), "Afforestation and Reforestation" involving investment in projects for ecological carbon sinks to gain credits for against emissions.*
- Also included under Paris
 - Article 5
 - Article 6 potential (not finalised yet)
- Current main international framework: **REDD+**

Current international framework for natural capture: Development of REDD+

REDD+ (Reducing Emissions from Deforestation and forest Degradation):

- Provides **payments** to developing countries for better conservation of their forests.
- After first decision adopted at COP 13 2007, framework became more and more robust.
- No REDD+ projects issued **certified emission reductions (CERs)** under **Kyoto** however, **Green Climate Fund (GCF)** in 2017 launched a pilot programme for **REDD+ results-based payments** achieved over the five-year period 2014–2018.
- **2019**: GCF issued **first REDD+ results based payment** for past halted deforestation in the Amazon, highlighting the financial incentives in this area.

New Potential Financial Frameworks for natural capture: REDD+ under Paris (Warsaw REDD+ Framework)?

- Research shows LULUCF activities could make up to **30%** of climate solutions (*30X30 Forests, Food and Land Challenge*), but only receives roughly **3%** of climate financing (UNEP).
- Set to continue: **REDD+** explicitly mentioned in **Art. 5** of the **Paris Agreement**.
- FAO in 2016 assessed that **89 %** of countries cover agriculture and/or land use, land-use change and forestry (LULUCF) in their mitigation contributions of their intended **NDCs**.
- Ensuring **environmental integrity**:
 1. **Additionality**: Reviewing process of Forest Reference Emissions Levels/Forest Reference Levels (**FREL/FRL**) under UNFCCC and submitted Results based payment under Biennial Update Reports (**BURs**) Technical Annex and will go under another review. Posted at **REDD+ UNFCCC Hub** webpage.
 2. **Carbon leakage**: how to ensure reducing deforestation in one area does not reduce deforestation in another. This could be addressed having a **National Approach** and not a **Sub-National Approach**.
 3. **Storage**: how long the storage needs to be guaranteed – often reference is **100 year time** horizon.

New Potential Financial Frameworks: Natural Capture and Article 6 of the Paris Agreement

- Draft CMA decision for **Article 6.2 of Paris** under the Internationally Transferred Mitigation Outcomes (**ITMOs**) **definition**, includes the possibility of removals by **sinks/avoidance**.
- Already fits in with transparency under **Art. 13**, as it is reported under the framework.
- Fulfills environmental integrity since REDD+ uses the **IPCC guidelines**.
- Results under the **REDD+ Hub platform** come from a different variety of projects and not from one single project.
- And after another verification these results could go directly under **Article 6.2**.