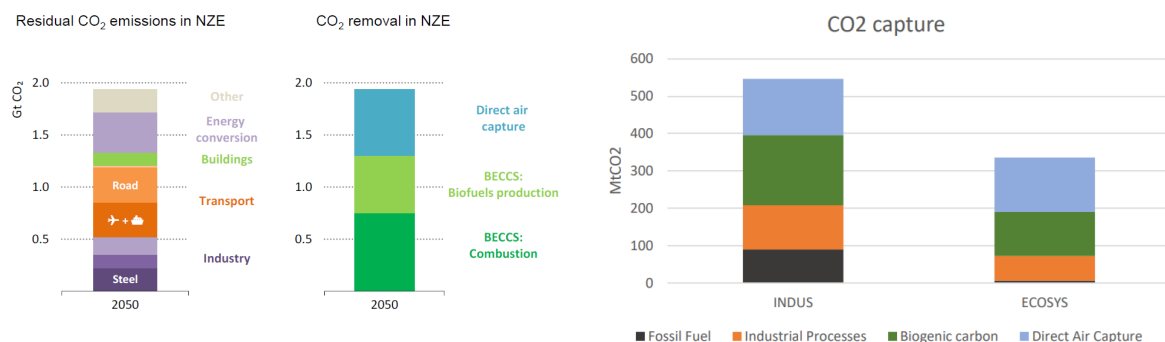


Integration of Industrial Carbon Dioxide Removal methods in the EU policy framework.

1. Why carbon removal?

According to the IPCC, the world and the EU must implement large-scale permanent carbon removal to keep global warming within the temperature targets set by the Paris Agreement. Pyrogenic Carbon Capture and Storage (PyCCS¹), Bioenergy with Carbon Capture and Storage (BECCS) and Direct Air Capture with Storage (DACs) are measurable Industrial Carbon Dioxide Removal (I-CDR) methods with high Technology Readiness Levels (TRLs) to achieve this. The IPCC's Working Group III report on Climate Change Mitigation states that *"The deployment of CDR to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO₂ or GHG emissions are to be achieved"*². The [IEA's NZE by 2050](#) scenario (image below) shows nearly 2 billion tonnes of carbon dioxide (CO₂) removal are required globally by 2050. Looking at CO₂ capture from the EU's [Restoring Sustainable Carbon Cycles](#) Communication it shows between 200 and 300 million tonnes of biogenic and atmospheric carbon to be captured annually by 2050 with CO₂ going into fuels, into products and into permanent storage. The EU's [Clean Planet for All](#) Communication showed approximately 250 million tonnes permanently stored annually by 2050 through carbon removal technologies.³



¹ Pyrogenic Carbon Capture and Storage: The technical process of transforming biogenic carbon (biomass) into a recalcitrant form of carbon (biochar) and the successive long-term storage by use (in materials or soils).

² IPCC, Working Group III contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for Policymakers, p.46 <https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_SummaryForPolicymakers.pdf>

³ In-depth analysis in support of the Commission Communication COM (2018) 773, (Figure 91, 1.5 Technology Scenario) <https://ec.europa.eu/clima/system/files/2019-08/long-term_analysis_in_depth_analysis_figures_20190722_en.pdf>

Amendments are being raised to EU climate policies within the Fit for 55 legislative cycle by Members of the European Parliament, which propose including PyCCS, BECCS and DACS to promote negative emissions in order to enable a climate-neutral EU and, ultimately, to reduce the concentration of CO₂ in the atmosphere. Below we discuss the case for action and how permanent carbon removal should be supported.

1.1 Governing a robust carbon removals market

As per the IPCC AR6 report⁴, only PyCCS (mentioned as biochar),⁵ BECCS and DACS offer the possibility to store CO₂ potentially permanently. Other potentially durable carbon removal solutions enhancing natural processes, such as rock weathering and ocean-based approaches, still require further research to understand their full potential, costs, and trade-offs. This situation requires careful regulatory design and public policy interference safeguarding that CDR is scaled in a sustainable and durable manner, preventing early lock-in effects of solutions that pose challenges if deployed at scale.

Therefore, Negative Emission Platform supports the Commission's approach to differentiate according to storage type and associated permanence timeframes to strengthen the overall success of large scale CDR. It includes dedicated targets for differing CDR approaches and allows for dedicated industry support where most urgently needed. This guarantees a CDR scale-up that resonates well with scientific assessments and helps bridge early investment needs for scalable, high-quality and permanent CDR with associated cost premia. NEP welcomes a clear target for negative emissions for I-CDR which should steadily increase over time and should be linked to the EU's a corresponding carbon budget and Nationally Determined Contribution.

2. Why now?

Permanent removals, also referred to as I-CDR, have to play a key role in enabling the EU to achieve net zero by 2050. In order to achieve climate relevance, initial projects must be constructed in the 2020s such that there is a base of suppliers and developers able to scale in the 2030s and onwards. PyCCS has an emerging business case through the co-production of renewable energy and biochar. Nevertheless, PyCCS was only able to develop so quickly because carbon credits

⁴ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter_05.pdf

⁵ IPCC - Climate Change 2022; Mitigation of Climate Change Working Group 3 see Page 984 Note: *In case of biochar, durability of carbon storage depends on various use cases (going beyond soil application) with differentiation between organic and elemental carbon. For example, the use of biochar addition in cement material leads to permanent storage equivalent to geological storage. Any application requires strong LCAs, evaluation and monitoring of levels of permanence. A method to determine organic and elemental carbon can be found in DIN 19539 "Untersuchung von Feststoffen – Temperaturabhängige Differenzierung des Gesamtkohlenstoffs" (TOC₄₀₀, ROC, TIC₉₀₀)*

are sold on the voluntary market. This development is leading to a CO₂e removal of 100,000 tons in 2022⁶. However, at present the missing ingredient for other technologies, like BECCS and DACS, is a predictable revenue stream. Currently, there is no way of earning financial revenue to cover full costs or warrant investments. Predictable revenue streams through carbon credits would also support the short-term deployment of large-scale carbon sinks through PyCCS.

Appropriate integration in the EU's climate policy framework could change this and start the scale up of important carbon removal technologies that the EU relies on to meet its climate commitments. We need to start now as development timelines for large scale plants can be up to six years. Final Investment Decision (FID) is around 2 years before operation and FID requires certainty on future revenue streams. To harvest learnings, scale and reach industrial efficiency takes a generation.

Therefore, integration under EU climate policy is one element of the business case for permanent carbon removal. The certainty of financial support is a key factor for development and investability of the permanent carbon removals projects. The negative emissions industry is looking for long-term financial stability for projects. We therefore call for:

- Time-limited technology support in the form of innovation funding, such as contracts for difference, the innovation fund, alongside a favourable fiscal regime through tax credits, state aid, and low-cost loans.
- Framework to ensure a predictable revenue stream for carbon removals, ideally in combination with dedicated budgets.
- Timely deployment of national projects supported by recent amendments to State-aid rules passed in early 2022.

With all the above-mentioned conditions fulfilled the EU can start building the business case for I-CDR.

3. Building the foundations

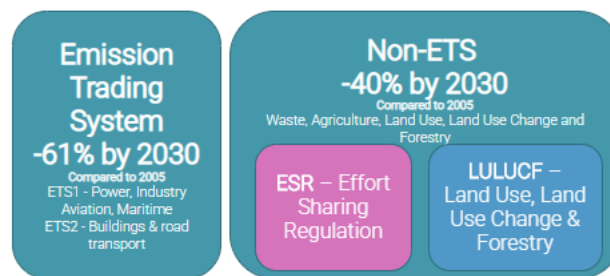
For I-CDRs to be supported by the EU policy framework, there needs certainty that any CO₂ removed from the atmosphere is backed by a strong life cycle assessment and is permanently stored. We ask that the Carbon Removal Certification Mechanism (CRC-M) define the technological scope, the geographical scope, and the governance arrangements to i) achieve permanence or ii) safeguards against shortfalls and reversals. The CRC-M will need to ensure environmental integrity of permanent carbon removal certificates and ensure that they are permanent, and quantified, accounted for and reported for conservatively.

⁶ European Biochar Market Report (2021/2022): https://www.biochar-industry.com/wp-content/uploads/2022/03/EU-Biochar-Market-Report_2022-03-09.pdf

- Industrial carbon dioxide removals - PyCCS, BECCS, DACS and enhanced weathering - must be accounted for with robust monitoring, measurement, reporting, verification, and certification processes to ensure that Carbon Removal Certificates (CRCs) issued for eligible and market-ready methods deliver net-negative emissions.
- The development of a CRC-M should proceed concurrently with the development of options to include carbon removals in EU compliance mechanisms, such as the EU Emissions Trading System (ETS) or Effort Sharing Regulation (ESR), to ensure that carbon removals can be deployed and scaled up before 2050, at a pace commensurate with delivering 200-300 million tonnes captured annually by 2050; and
- Any integration of permanent removals within EU climate policy instruments should not displace greenhouse gas (GHG) emissions reductions. On the contrary/contrarily inclusion of permanent removals should accelerate overall EU efforts to achieve net zero and, beyond, a creation of net carbon sinks.

4. Three pillars of EU climate policy

The three main pillars of climate policy: EU ETS, ESR which sets binding annual greenhouse gas emission reductions by Member States from 2021 to 2030, and Land Use, Land Use Change & Forestry (LULUCF) (see diagram below). The ESR is on a Member State basis and establishes Member State emissions reductions trajectories in non-ETS sectors such as waste and agriculture. This paper does not discuss the role of the renewable energy directive which can also be an important pillar of energy policy for PyCCS/Biochar, BECCS and DACS.



Under the LULUCF framework today, the objective is to balance emissions and removals from the land-use sectors (the 'no-debit rule'). With the proposed update under the Fit-for-55 package, the objective is strengthened to a removal target of 310 million tonnes of CO_{2e} by 2030. In addition, by 2035, the combined land-use, forestry and agriculture sectors should reach climate neutrality. The LULUCF policy is focused on the land sector and is not a focus for permanent carbon removal industry at this moment in time. NEP believes that the EU needs to establish a clearer picture of the long-term need for negative emissions to balance residual emissions and possibly address historical emissions to manage temperature over-shoot scenarios.

- Such analyses should be done per economic sector and country.
- They should include the volume and timing of when GHG emissions reductions reach the “hard-to-abate” levels which can be shown through Marginal Abatement Cost Curves (MAC Curve).
- While those “hard-to-abate” emissions should be decreasing over time, the amount of carbon removals should be increasing.

4.1 Permanent Removal under the Effort Sharing Regulation

Under the current negotiations in the ESR, a definition of eligible removals referring to the concept of a “carbon capture removal” (CCR) and defining it as “the removal of carbon dioxide from the atmosphere by means other than photosynthesis” is being discussed. NEP encourages consistency between the initiatives and favours the term “industrial carbon dioxide removals”. These I-CDRs would be allowed to be used for general compliance of the Member State’s target under the ESR and should be limited to 5% of a Member State’s Effort Sharing target.

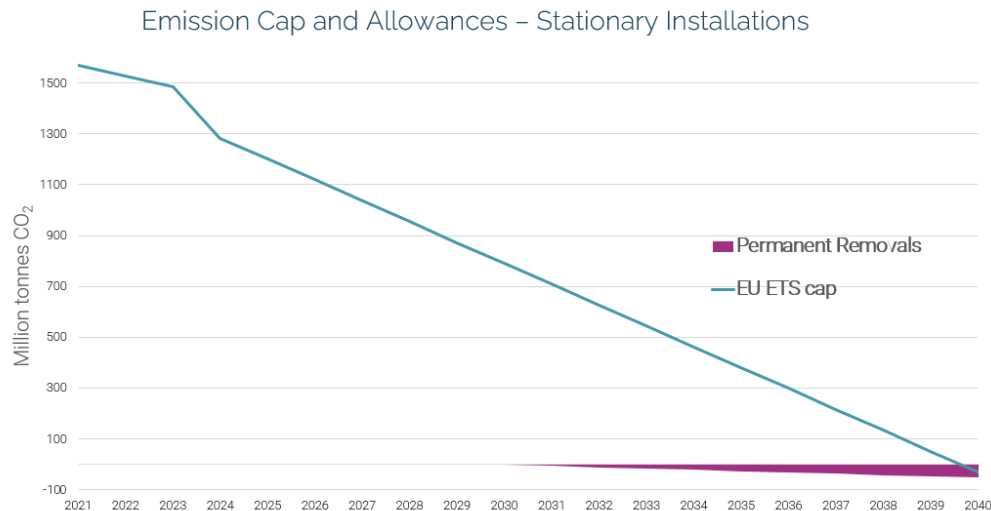
- NEP welcomes that permanent removal is being considered under the ESR which could involve state aid or direct procurement by Member States. We ask that PyCCS/Biochar, BECCS and DACS should be supported and believe that this could form part of the business model for permanent carbon removal.
- Noting that authority over ESR policy design lies primarily within Member States, we encourage the European Union to:
 - Outline possibilities for early Member State engagements through pilot schemes for I-CDRs by public procurement or state-aid. Such information can include precedents seen within non-EU countries or municipalities.
 - Provide guidance on I-CDRs reporting under ESR.
 - Share learnings and contribute towards effective dissemination of best practice between Member States in order to realise spillover effects and synergies.

4.2 Permanent Removal under the EU Emissions Trading System

Below we focus on the EU ETS and its role to deliver climate neutrality. Policy makers from several EU Member States supported by Norway, have previously expressed an openness toward including permanent carbon removal in the EU ETS⁷. Furthermore, the EU ETS should reach zero emission by 2040 from the

⁷ Non-paper on Carbon Capture and Storage (CCS) By the Netherlands, Norway, Denmark and Sweden <<https://www.ft.dk/samling/20201/almde/KEF/bilag/87/2288136.pdf>>

revised EU ETS proposal⁸ (see diagram using a LRF of 4.2% from 2024 and one-off reduction of 120 million tonnes CO₂). Alongside, permanent removals should scale to around 50 million tonnes by 2040⁹.



- NEP welcomes that permanent removal is being considered under the EU ETS. We ask that PyCCS/Biochar, BECCS and DACS be supported and believe that this could form part of the business model for permanent carbon removal.
- We encourage policy makers to consider the options on how to integrate I-CDR alongside or within the EU ETS such as explored in ICAP paper¹⁰ and by Oxera for the UK ETS¹¹.

For future revisions of the climate framework, the EU should consider establishing a fourth pillar for permanent removal to complement LULUCF, ETS and the ESR, which would set compliance targets for negative emissions.

⁸ https://ec.europa.eu/info/sites/default/files/revision-eu-ets_with-annex_en_0.pdf

⁹ Clean Planet for All, supporting figures, Page 113 <https://ec.europa.eu/clima/system/files/2019-08/long-term_analysis_in_depth_analysis_figures_20190722_en.pdf>

¹⁰ ICAP, Emissions Trading Systems and Net Zero: Trading Removals <https://icapcarbonaction.com/system/files/document/icap-netzerpaper_final-draft.pdf>

¹¹ Oxera, Market design for negative emissions in the UK ETS < <https://www.oxera.com/insights/reports/market-design-for-negative-emissions-in-the-uk-ets/>>

4.3 Permanent removals under the EU Innovation Fund

The EU Innovation Fund (IF) is a promising vehicle to support early stage I-CDR projects to scale and allow for demonstrations of the necessary scale-up of carbon removal projects. Within the large-scale call, NEP warmly welcomes the recent support for a Swedish CDR project (Beccs Stockholm) and encourages the EU to continue and expand support for CDR through the Innovation Fund. In order to achieve a wide support of CDR, we encourage the Commission to apply the logic of separated targets for removals and emission reductions within the EU IF design. Earmarking a dedicated amount of ETS revenues for the scale-up of removals would play in favour of achieving carbon neutrality at a sectoral level, since the EU ETS covered entities are often referred to as hard-to abate sectors. Such a sector specific contribution to the realisation of larger scale I-CDR projects could contribute to a cost effective and timely deployment of I-CDR, with costs shared among industrial players.

- We agree with the Commission's analysis that the experience with carbon removal projects under the Innovation Fund would provide important learnings for development of the certification of I-CDRs and their regulatory streamlining in the longer term.
- We believe that a dedicated removals sector in the EU IF supported with earmarked funds could allow for a timely testbed of CRC-M methodologies.

5. Permanent removals in the voluntary carbon market

NEP foresees the establishment of a European Certification mechanism as a necessary contribution to further strengthen the implementation of I-CDR on voluntary carbon markets. Albeit unregulated by design, voluntary carbon markets are set to greatly benefit from a governmental certification framework. The current state of the voluntary carbon market is characterised with buyers' uncertainty and a lack of guidelines, regarding the CDR sector as a whole. Lessons learned from early I-CDR purchasers outlined a lack of standards and clear definitions on what constitutes a removal.¹² The European CRC-M should be designed in an open and transparent manner for it to provide much needed clarity concerning the identified lack of standards and unclear definitions. As mentioned by Joppa et al. (2021), early stage buyers of CDR furthermore lack clarity when it comes to accounting for removals. Here, the variety of methods to remove CO₂ from the atmosphere features a wide range of storage durability, making it hard to compare CDR methods and

¹² Joppa et al. 2021 <https://doi.org/10.1038/d41586-021-02606-3>

results in a distortion of the early voluntary carbon removal market. The European CRC-M should be designed in an open and transparent manner for it to provide much needed clarity concerning the identified lack of standards and unclear definitions.

Conclusion

NEP welcomes the EU CRC-M, and in parallel timely discussions on an integration of I-CDR in the EU climate and energy policy framework to form the EU business case for investment. We see the establishment of clear guidelines and methodologies as a foundation to the policy framework for CDR. For I-CDR methods – such as BECCS, DACS and PyCCS – however, the EU CRC-M alone will not close the business case for investment and these technologies are in high need of policy signals to scale.

Based on the CRC-M, we have outlined ways to incorporate CDR into EU climate policy and encourage the EU to strengthen the course of action and provide for a timely implementation of I-CDR policies. This includes the EU Innovation Fund which represents an opportunity within the European Union to garner early learnings from the pending CRC-M. Establishing a dedicated removals track with project evaluation based on the framework would allow for a timely testbed of the mechanism, in parallel to an integration of I-CDRs into the European compliance framework. Therefore, we welcome a concrete discussion of the EU options to create the business model for investment in I-CDR building on the options we have described above. By presenting the first official standard for I-CDR assessments, the EU will get the opportunity to strengthen the market, provide clarity and thereby enable a sustainable and scalable industry.