

Methodology for measuring net carbon dioxide removal through bioenergy with carbon capture and storage (BECCS)

Executive Summary

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1. Methodology context

Bio-energy carbon capture and storage (BECCS) is a carbon dioxide removal (CDR) approach that captures carbon dioxide (CO₂) from sustainably sourced biomass and permanently stores it in geological storage. BECCS and other CDR approaches will be an essential part of the global response to climate change, according to the Intergovernmental Panel on Climate Change (IPCC).

Today there are no comprehensive methodologies available to calculate the impact of BECCS projects and generate carbon credits. Therefore, Drax and Stockholm Exergi set out to collaboratively develop a high-integrity approach for quantifying the net CDR contribution of a BECCS project, in a rigorous methodology prepared by EcoEngineers.

The methodology is built on the principle of conservativeness, preferring to undercount the net volume of CO₂ removed. This can be observed in figure 1 below. While the “project” (i.e., the direct intervention which generates carbon credits), refers to the installation and operation of CCS, the methodology conservatively takes into account the full operational supply chain emissions which occur in the production of renewable electricity and / or green heat. Additionally, it requires calculation and subtraction from removals of any indirect effects (known as leakage) which the project could cause (e.g., increase in demand for CO₂ transportation and storage leading to new infrastructure). Emissions which one can be certain did not occur due to the project (e.g., emissions from constructing long-standing infrastructure) are excluded from the calculation of net CO₂ removals (known as baseline emissions)

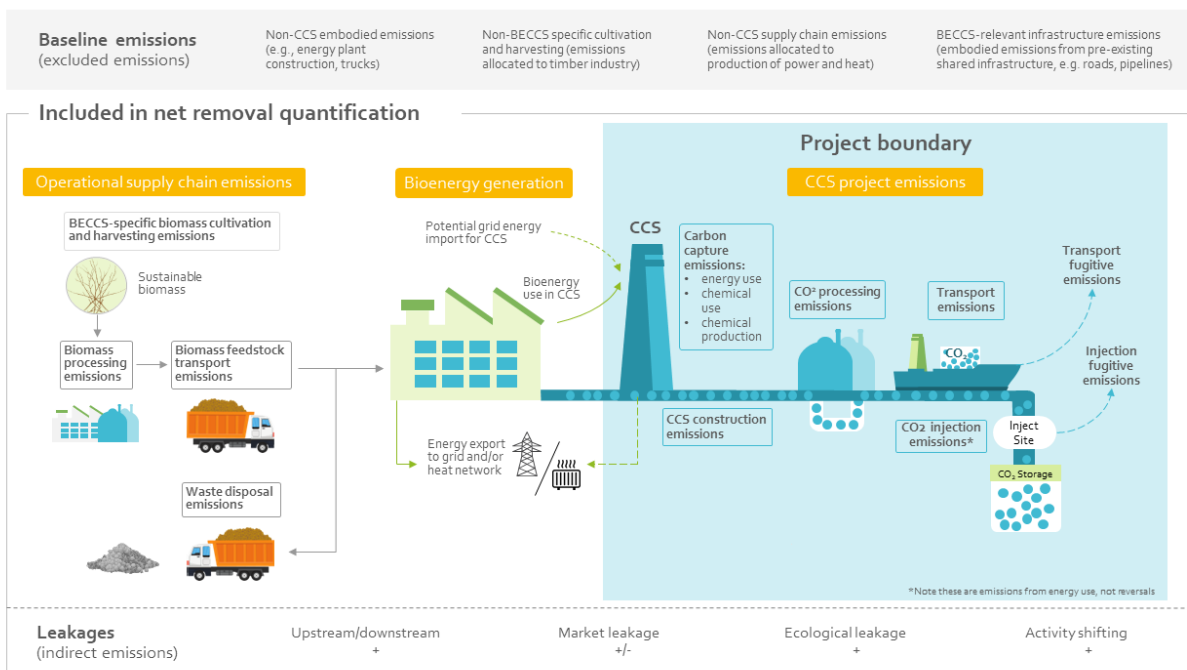


Figure 1: emissions that fall within project scope

2. Key criteria to BECCS projects

This methodology currently applies to power and/or heat BECCS projects that meet strict criteria. To be eligible to issue CDR credits under this methodology, a project must:

- be 'additional' – meaning they would not happen without revenues from carbon credits.
- use only sustainable biomass feedstock.
- only store CO₂ where the risk of reversal is scientifically determined to be negligible.
- not use CO₂ for enhanced hydrocarbon recovery (EHR).
- put in place strong safeguards for social and environmental impact.

Additional

BECCS projects are developed for the purpose of delivering carbon removals. Removals are additional if they would not have taken place absent the incentive created by CDR credit revenues. All projects must demonstrate regulatory additionality (i.e., no legal requirement to capture CO₂) and prior consideration (e.g., that carbon market revenues were considered before the project was started). Where a project either receives no support or government support envisages VCM participation, the project is additional. In all other cases, an auditor statement is required, showing that VCM revenues were a necessary factor in the decision to initiate the project.

Sustainable biomass

Forest biomass shall only be sourced from areas with stable or increasing forest carbon stock. Biomass shall not be sourced from lands with high biodiversity value, namely primary forest, old growth forest, highly biodiverse forest, or forests recently established on highly biodiverse grassland. Furthermore, stringent criteria apply to ensure the sustainable management of forests and maintenance of biodiversity, which are either in line with or exceeding the rules set out by the EU Renewable Energy Directive. Biomass shall not be sourced from material suitable for use in long-lived wood products such as sawtimber or veneer. Initially the methodology only applies to forest biomass, however we expect that suitable criteria will be developed to include additional sustainable biomass sources over time for example from agricultural sources and waste.

Storage and permanence

The methodology only allows for CO₂ storage where the risk of reversal is scientifically determined to be negligible, and there are high regulatory enforcement levels in place. IPCC indicates that for such well-designed projects, CO₂ storage is likely to be >99% over the first 1000 years. Initially the methodology will apply in The European Economic Area, the UK, and the USA. In these jurisdictions, there are strong requirements for site selection, injection, and monitoring. In the event of any emissions released from the storage site, the storage operator will be required to take mitigation measures according to local regulations (for example in the EEA storage operators must surrender ETS emissions allowances). Permanence is further strengthened by the transfer of responsibilities to government following site closure.

No enhanced hydrocarbon recovery

To ensure the BECCS projects under this methodology are not playing a role in incentivizing extraction of fossil fuels, captured CO₂ shall not be used for enhanced hydrocarbon recovery. In situations with shared pipeline infrastructure, the developer should provide mass balance evidence that the amount of CO₂ the developer is entitled to was injected in an applicable non-EHR storage site.

Safeguards for social and environmental impact

As a minimum, projects must have all relevant environmental and business permits in the jurisdictions of sourcing, capture and storage operations. They must also demonstrate to have conducted robust stakeholder consultations and have put grievance mechanisms in place. Furthermore, project developers must review an extensive list of sustainable safeguards, building on the safeguards outlined by the Integrity Council for Voluntary Carbon Markets and either i) provide a confirmation that they have not identified any risk of breaching any of these, or ii) provide a mitigation plan for any identified risks.

3. Conservatively calculating net emissions removed

The methodology provides a conservative means of quantifying impact as shown in figure 2. The 'net emissions removal' figure corresponds to the volume of carbon credits that a developer can issue. This number is determined by taking the amount of CO₂ that has been permanently removed and stored by the BECCS project, and subtracting the direct CCS project emissions, operational supply chain emissions, and indirect emissions from leakage.

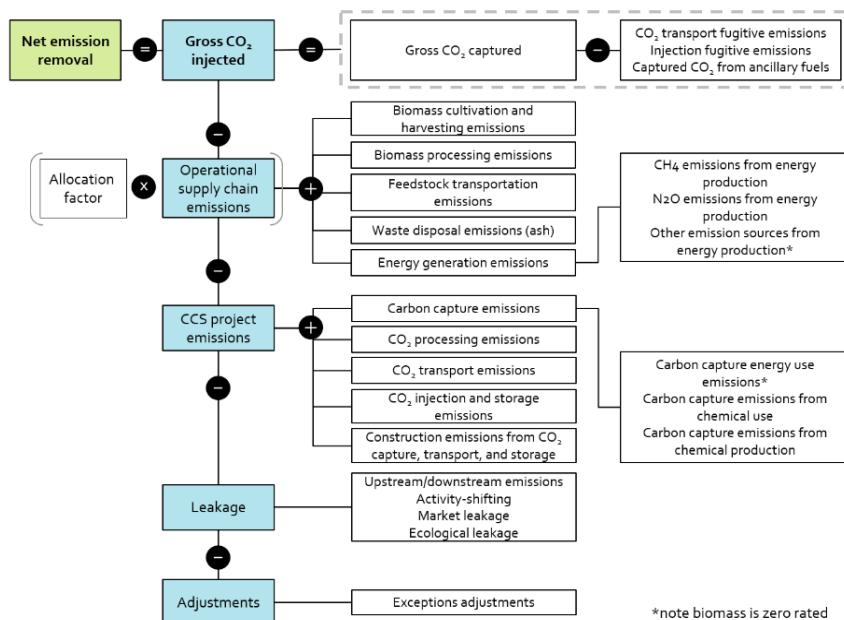


Figure 2: CDR calculation approach

4. Robust reporting and independent verification

The methodology requires BECCS projects to develop a comprehensive monitoring framework that enables third party validation and verification bodies (VVB) to transparently assess project outcomes. Before issuing credits, a project must be successfully *validated* by an accredited VVB. To issue credits, a project must calculate net removals that have already taken place, and have this calculation independently *verified* by a third party VVB. If successful, the project developer will be issued carbon credits through a carbon market registry. The frequency of credit issuance, and hence the need for independent verification reports, is at the discretion of the project developer. Streamlined verification events may take place throughout the year, with a full verification required at least once per year to assess the project's continued adherence to all requirements.

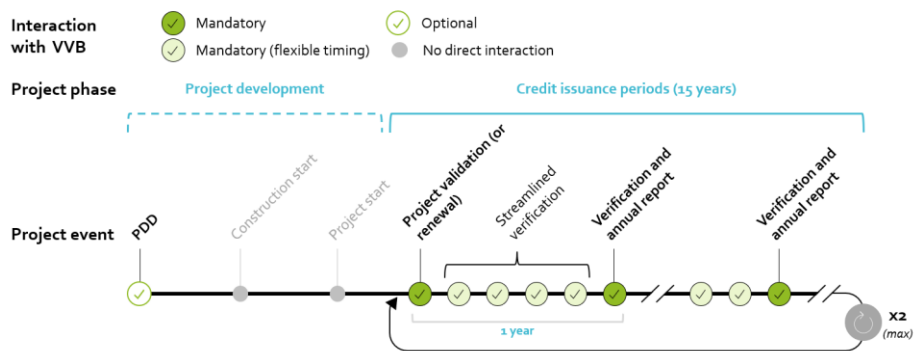


Figure 3: Illustrative timeline for project validation and verification

Going forward, the authors hope for this methodology to keep evolving with industry developments and scientific advances. We will invite further BECCS developers to join us in refining the methodology, with the aim to harmonize approaches, build buyer trust, and help the BECCS industry to scale. Finally, we hope to see the contents of the methodology adopted by the carbon market standards bodies, regulators, and policy makers, to be the ultimate owners of this methodology.