



Biorenewable Insights: Biomass Energy Carbon Capture Storage (BECCS) & Biomass with Carbon Removal and Storage (BiCRS)

BECCS & BiCRS is one in a series of reports published as part of NexantECA's 2023 Biorenewable Insights program.

Overview

To meet decarbonization goals, carbon capture and/or renewable energy are needed for reducing carbon intensities from conventional, fossil fuel-based processes. Biomass is one of the options (if not, the only option) that has unique properties to capture, store carbon and provide renewable energy. Biomass carbon removal and storage (BiCRS) utilizes the natural carbon cycle to store carbon in biomass, which could be agricultural, plantation-based biomass, or fast-growing perennial crops. The carbon stored in the biomass can then be harvested, pre-treated and processed into solid biofuels for generating renewable energy or specifically, bioenergy.

Bioenergy can be generated through direct combustion of the biomass, producing sufficient heat for a steam turbine to generate power. The corresponding carbon emissions can be reduced further by using amine-based carbon capture and storage systems that sequester the carbon dioxide in suitable underground geological formations. The result is a bioenergy with carbon capture and storage (BECCS) system that potentially has negative carbon intensities.

However, there are uncertainties of the impacts of using vast amounts of biomass for decarbonization. This Biorenewable Insights report provides a status update of BiCRS and BECCS and addresses questions such as:

- What are the suitable types of biomass for capturing and storing carbon?
- What are the resulting carbon intensities for a specific type of biomass from indirect or direct land use change?
- What is the fertilizer and water consumption needed for BiCRS?
- What is the cost of biomass from BiCRS for BECCS to be economically viable?
- What are the upcoming trends or technologies for BiCRS and BECCS?

Technologies & Processes

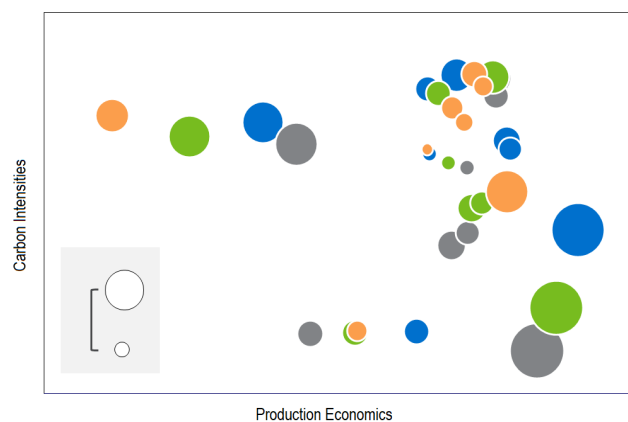
The technologies and process that are covered include:

- Combustion, gasification
- Carbon capture and storage
- Biomass carbon storage mechanisms (above ground and below ground soil content)

Process Economics

The report provides detailed cost of production estimates for different types of biomass (from BiCRS or other sources) for BECCS. Wherever possible, the cost of production is correlated to the carbon intensities of the biomass type:

Example of Carbon Intensity Correlated to Production Economics for Different Technologies and Regions



Commercial Impact and Strategic Insights

- Constraints and limitations from the correlation between production economics and carbon intensities are discussed for potential implications on commercial BECCS and BiCRS deployment.

For more information. please contact
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- Process economics – comparative costs of production estimates for different technologies across various geographic regions
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Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

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