TECHNO-ECONOMIC ANALYSIS OF BECCS USING AG-WOOD PELLETS

Theme: Biomass Uses

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Project Overview

Bioenergy using ag-wood pellets

Pros
- High energy density
- Highest combustion efficiency among densified biofuels

Challenges
- Greenhouse gases and pollutant emissions
- Control measures are usually in larger systems but not in small systems

Research questions:
- How do we reduce emissions from wood pellets in small-scale systems?
- Can we and how do we capture CO2 emissions in small-scale systems?

Relevance

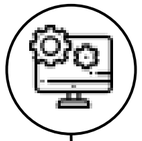
01

Achieves Activity 5 of Biomass Canada Cluster “tranform low value agri-food processing wastes to high value chemicals and materials”

02

Advances Canada’s bioeconomy strategy of “accelerating the adoption of bioproducts” (biofuel)

Approach



RETSCREEN Analysis

- Case study: Agricultural building (farm)
- Power & heat requirements e.g. boiler size, pellet quantity and source
- Pellet storage and distribution

BECCS Investigation

- Air quality without control measures
- Technology review
  - energy efficiency
  - emission control effectiveness
  - energy consumption

BECCS = Bioenergy with Carbon Capture and Storage

Economic Feasibility

- What sensitive factors affect technology adoption in this case study?

Results & Accomplishments

- Exhaustive analysis on the technical feasibility of BECCS on a small-scale biomass combined heat and power (CHP) system
- In-depth economic feasibility of the same system
- Established a pellet supply chain for this system

Contribution

- Conduct a lifecycle analysis of agricultural wood pellets from sourcing to combustion to assess their carbon footprint.
- Use models to quantify emissions reductions with BECCS, comparing pre- and post-integration emission levels.
- Evaluate energy consumption, capture rates, and costs of BECCS versus other technologies using simulations or data.
- Develop a techno-economic model to estimate BECCS cost, complemented by a sensitivity analysis to assess economic risks.

Challenges

- Introduction of uncertainties by relying on assumptions in models and, potentially hindering the ability to mirror real-world outcomes accurately.
- However, an accurate model will inform key parameters that influence the adoption of combined heat and power biomass systems on farms and other small-scale systems.

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