Business model analysis

CETP CO2RR – Deliverable 4.3a [*interim*]

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Setting the scene

Under current market conditions, developing a viable business model for BECCS is still a challenge. This document is a first step in assessing existing business model options and developing others to scale BECCS projects – the goal being to set up viable, cost-neutral projects that include the construction of the necessary infrastructure and CO2 transport and storage.

Refer to Deliverable 4.2 for context on revenue options, market overview and regulatory landscape.

Purpose

- To analyse financial, economic and legal feasibility of BECCS in different sectors
- To identify key barriers and opportunities for investment and scaling

Scope

- First year iteration and preliminary assessment of key BECCS sectors: i) waste-to-energy; ii) biogas; iii) biomass incineration; iv) sewage sludge incineration
- Focus on revenue models, investment risks, cost structure and regulatory hurdles

Expected impact

- Provide groundwork for sector-specific financing strategies
- Align business models with policy and market conditions

Methodology and approach

Analysis criteria

- ✓ Financial viability (costs and revenues)
- ✓ Market demand (CO2 removal credit pricing, policy incentives)
- ✓ Cost structures (capture, transport, storage)
- ✓ Legal and regulatory considerations (EU and national policies)

Data sources

- Feasibility studies for emitters
- Market reports (e.g. on voluntary carbon credit pricing, BECCS funding schemes)
- Stakeholder consultations (emitters, investors, regulators, buyers)

Comparison of BECCS project types – Financial and economic view

Sector	Typical CO2 volumes (tCO2/ year)	CAPEX (EUR millions)	OPEX (EUR per tCO2)	Revenue streams	Challenges
Waste-to-energy	50,000–500,000	30–200	80–300	Carbon credits, energy sales	High regulatory scrutiny, waste input variability
Biogas	2,000–15,000	5–20	100–400	Carbon credits, biomethane premiums	Small-scale emitters, transport costs
Biomass incineration	20,000–200,000	50–150	80–300	Carbon credits, district heating	CAPEX-heavy, sustainable biomass supply security
Sewage sludge incineration	10,000–50,000	5–30	80–300	Carbon credits, municipal subsidies	Regulatory uncertainty

Note: indicative ranges only, based on market intelligence and publicly-available information e.g. IEA Bioenergy, Waste to Energy International, Scottish Government

Business model analysis: Waste-to-energy

Sector overview

- Converts municipal solid waste (MSW) into energy, producing biogenic and fossil CO2
- Strong candidate for negative emissions through CCS integration

Revenue model

➔ Sale of electricity and district heating
➔ Carbon credits for biogenic carbon removal
➔ Potential public-private funding for CCS

Challenges

- High upfront CAPEX
- Regulatory complexity (including classification of CO2 streams)

Opportunities

- Well-established sector with existing infrastructure
- Municipal partnerships can de-risk investments

Business model analysis: Biogas

Sector overview

- CO2 emissions from anaerobic digestion of organic waste
- Typically small-scale emitters, which may require clustering to access transport and storage facilities

Revenue model

➔ Sale of biomethane (existing subsidy schemes in EU)
➔ Carbon credit for carbon removal
➔ Potential for transport integration (CCUS)

Challenges

- Small volumes – transport and storage can be uneconomical for individual plants
- High OPEX for capture and liquefaction

Opportunities

- Clustering approach (refer to WP1 deliverables)
- Strong policy incentives (including EU Fit-for-55 and RED III)

Business model analysis: Biomass incineration

Sector overview

- Uses wood waste, agricultural residues for energy production
- Can be larger emitters, making CCS economically viable

Revenue model

➔ Sale of electricity and district heating
➔ Carbon credits from biogenic CO2 capture
➔ Long-term power purchase agreements (PPAs) with industries

Challenges

- High CAPEX, requiring long-term investor confidence
- Sustainable biomass supply risk, with competing demand from other industries

Opportunities

- Integration with district heating networks for added value

Business model analysis: Sewage sludge incineration

Sector overview

- CO2 from incineration of wastewater treatment byproducts
- Typically medium-sized emitters

Revenue model

➔ Carbon credits from capture of biogenic CO2
➔ Public funding available in some cases
➔ Sale of waste heat and byproducts

Challenges

- Regulatory uncertainty, including CO2 classification and disposal regulations
- Potential public opposition to incineration expansion

Opportunities

- Potential for integration with urban sustainability projects

Legal and regulatory challenges across project types

CO2 classification

- Varies by country (consideration as waste product vs industrial gas)
- Impacts transport and storage regulations

Liability for long-term storage

- Responsibility for CO2 leakage risks, among other risks

Funding gaps

- EU Innovation and Horizon funds provide support, but limited access for smaller projects

Permitting bottlenecks

- Lengthy approval processes for new CCS projects

Proof of implementation: First-year milestones

Sector-specific feasibility studies initiated

- RWB Nesselnbach (Biogas) – first-mover funding secured
- Azerailles biogas cluster – clustering model under development
- Waste-to-energy – pre-feasibility studies ongoing for Swiss plants

Policy engagement on regulatory barriers

- White paper on CO2 transport and storage submitted to Swiss authorities
- Paper on BECCS incentives in France also published

Preliminary cost-sharing models testing

- Evaluating risk-sharing options for small emitters

Next steps and roadmap (2025)

H1 2025

- Dive into comprehensive analysis of business models per type of projects, as well as legal structuring
- Expand cost modelling and economic viability studies
- Engage policymakers on incentives for BECCS projects

H2 2025

- Pilot business models in first commercial projects
- Expand emitter participation in transport and storage networks