Market Compass

Carbon Dioxide Removal Series

August 2025
Scope: Global

Bioenergy with Carbon Capture and Storage

Current Landscape

Bioenergy with Carbon Capture and Storage (BECCS) is the second largest source of current carbon removals (after afforestation/ reforestation), collectively removing about 1.25 million tCO_2e per year—primarily from ethanol facilities in the U.S. and power plants in Europe. However, over 100 plants are expected to come online by 2030 with more than 70 million tCO_2e per year planned annual capture capacity, backed by increasing policy support and institutional investment.

Investments

Cumulative investments have surpassed $2.5 billion, with 2025 marking a record year at $2 billion (till date), fueled by both public and private capital. The largest single commitment to date is the Swedish Energy Agency's $1.8 billion grant to Stockholm Exergi, aimed at developing Europe's largest BECCS facility. In the U.S., the Department of Energy has supported ethanol-based retrofits and infrastructure upgrades, while the UK's Contracts for Difference (CfD) and the EU Innovation Fund are backing large-scale and integrated BECCS projects.

Carbon offtake agreements are accelerating the commercialization of BECCS. Between 2022 and 2025, contracted volumes for BECCS-based carbon removal credits grew from just 2 million to over 12 million tons of CO_2, signaling increasing demand certainty. In total, more than 24 million tons of BECCS CDR credits have been contracted to date.

Corporate buyers such as Microsoft (20.3 million tCO2e), Respira, Frontier, and Equinor have emerged as major demand drivers. On the supply side, companies like AtmosClear, CO280, Stockholm Exergi, Orsted, and Drax are at the forefront of credit generation.

Registry issuance is slowly picking up with 371,856 tons issued between 2024 and 2025 and 182,929 retired within this time.

cCarbon Viewpoint

The appeal for BECCS is its ability to deliver both renewable energy (or clean fuel) as well as durable carbon removal. This dual value proposition is attracting growing interest—not only from government but increasingly from the private sector.

In the near to mid-term, BECCS represents an economically viable way to create a negative carbon cycle. Most of the revenue will come from the sale of energy or fuel; and by an equivalent

Sector Statistics

BECCS Removal Capacity Till Date

Operational	~1.25 million tCO2e/yr
Planned	~70 million tCO2e/yr

BECCS Capital Raised Till Date

Equity	USD 91 million
Debt	USD 204 million
Grant	USD 2234 million

BECCS Offtake Commitments Till Date

Tech sector	20.3 million tCO2e
Financial Sector	3.5 million tCO2e
Other sectors	0.3 million tCO2e

Top 5 Buyers of BECCS credits (tCO2e)

Microsoft	20,311,500
Respira	2,000,000
Frontier	1,016,000
J P Morgan Chase	450,000
Equinor	330,000

Top 5 Sellers of BECCS credits (tCO2e)

AtmosClear	6,750,500
Stockholm Exergi	5,880,000
CO280	4,135,000
Orsted	4,001,500
Drax	2,027,000

Issuances Till date (tCO2e)	Retirements Till date (tCO2e)
378,356	182,929

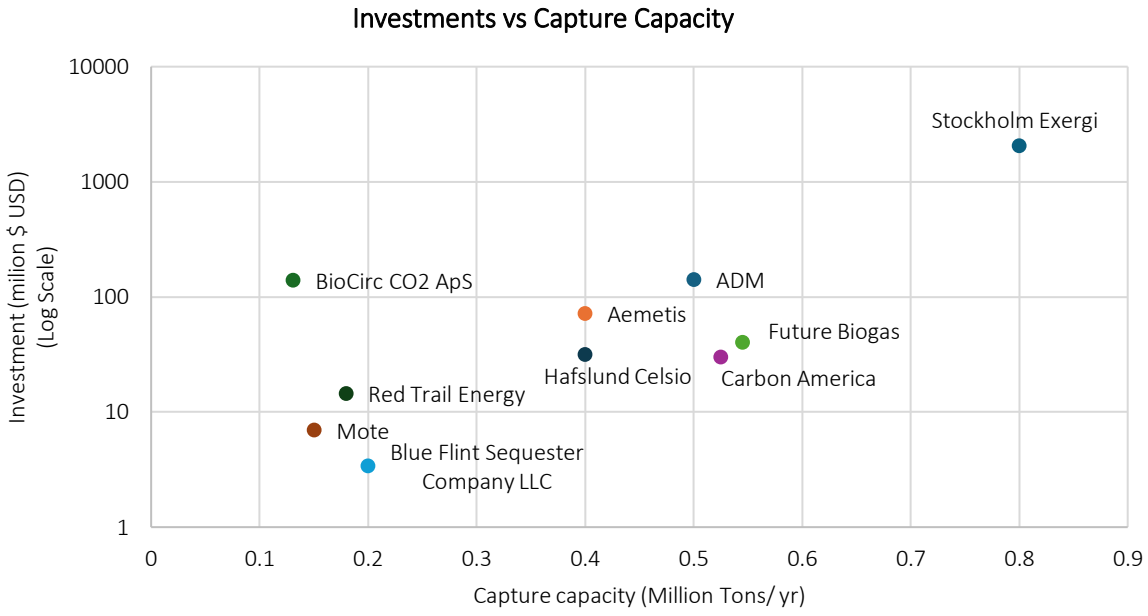
Company Profiled in This Market Compass

Evero energy Group	London, UK

carbon cost of between USD 30/ t CO2e and USD 100/ t CO2e, the projects can generate a respectable return. That in-turn can attract private capital and create a virtuous cycle of more projects.

cCarbon sees most potential in waste-to-energy plants with CCS and ethanol generation with CCS pre-2030. Government concessions, storage pipelines and timely permitting will play an important part.

The chart below captures the amount invested (log scale) and the capture capacity of some facilities.



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Defining BECCS

Bioenergy with Carbon Capture and Storage (BECCS) is defined as a carbon dioxide removal (CDR) approach that combines the use of biogenic feedstocks for energy generation with the capture and permanent geological or mineral storage of process-emitted CO_2. The defining characteristic of BECCS is that it leverages the natural carbon uptake of biomass during growth, followed by engineered capture of CO_2 during conversion processes such as combustion, gasification, fermentation, or pyrolysis.

How is it different from the traditional CCS?

Traditional Carbon Capture and Storage (CCS) has been in use for decades, and BECCS (Bioenergy with Carbon Capture and Storage) is often described as a subset of this technology. However, it is important to distinguish between the two, especially in the context of carbon removals.

BECCS captures CO_2 emissions from biogenic sources—such as bioenergy or biofuel production. Since biomass absorbs CO_2 as it grows, capturing and permanently storing these emissions results in net-negative emissions, making BECCS a true carbon removal solution.

Traditional CCS, by contrast, captures CO_2 from fossil fuel processes. While this prevents additional emissions from entering the atmosphere, it only achieves emissions avoidance or net-zero outcomes, not net-negative or carbon removal.

For BECCS to qualify as a carbon removal technology, the captured biogenic CO_2 must be permanently stored—typically in geological formations like saline aquifers or depleted oil and gas reservoirs. There is ongoing debate about whether CO_2 used for enhanced oil recovery (EOR) should count as BECCS, since not all injected CO_2 remains permanently stored. Similarly, if captured CO_2 is used in durable products, it generally does not qualify as BECCS.

This distinction highlights BECCS's unique role in delivering verifiable carbon removals, setting it apart from traditional CCS.

For this report, we define BECCS strictly as bioenergy with carbon capture and permanent geological storage, explicitly excluding projects where captured CO_2 is used for enhanced oil recovery (EOR) or other forms of utilization. This approach aligns with the principle that only permanently stored biogenic CO_2 delivers true carbon removals, while EOR and other usage pathways do not guarantee long-term sequestration and may result in re-release of CO_2 to the atmosphere. By focusing solely on BECCS projects without EOR or utilization, we ensure the integrity of negative emissions accounting and avoid conflating carbon removal with emissions avoidance or temporary storage.

Stage 1: Biomass Conversion for Energy or Fuels

BECCS systems use a variety of thermochemical or biochemical processes to convert feedstocks—such as agricultural residues, forestry waste, or energy crops—into usable energy or fuels. The most common pathways include:

- Combustion: Biomass is burned to generate heat and electricity. Common in large-scale bioenergy power plants.
- Gasification: Biomass is converted into syngas ($CO + H_2$), which can be used for power or liquid fuels.

- Fermentation: Biological conversion of sugars into bioethanol, with CO_2 released as a by-product (e.g., corn ethanol plants).

Feedstock type influences emissions, process efficiency, and CO_2 purity. Sustainability of feedstock supply, particularly land-use impacts and carbon intensity remains a critical consideration in lifecycle assessments.

Stage 2: CO_2 Capture & Storage

At this stage, CO_2 is captured primarily from process emissions, which are generally more concentrated and easier to treat compared to atmospheric capture methods like DAC. This concentration makes capture more energy-efficient and cost-effective in BECCS systems.

The capture process typically relies on well-established, commercially available technologies, including amine-based absorption, physical absorption, membrane separation, and cryogenic separation. Given the maturity of these technologies—many of which have been deployed for decades in industrial gas treatment and post-combustion applications—capture itself is not the technical bottleneck for BECCS deployment.

However, the scale-up of transport and storage infrastructure is emerging as a critical enabler for BECCS growth. Significant investments are currently underway in developing dedicated CO_2 pipelines, storage hubs, and injection wells—particularly in key regions such as North America and Europe. These infrastructure buildouts are essential for connecting capture facilities to suitable geological storage sites and for ensuring the permanent, verifiable sequestration of captured CO_2.

Ultimately, while CO_2 capture technologies for BECCS are well understood, the availability, scale, and regulatory readiness of CO_2 transport and storage infrastructure will strongly influence deployment timelines and project economics in the coming decade.

Current State

As of 2025, global carbon removal capacity from operational BECCS projects is approximately 1.1 to 1.3 million metric tons of CO_2 equivalent ($MtCO_2e$) per year, concentrated in a small number of facilities worldwide. The majority of this capacity comes from the ethanol production sector, with a smaller but growing contribution from power and heat generation (If CO_2 used for enhanced oil recovery (EOR) were included—where a portion of the injected CO_2 may be permanently stored—reported figures would be higher)

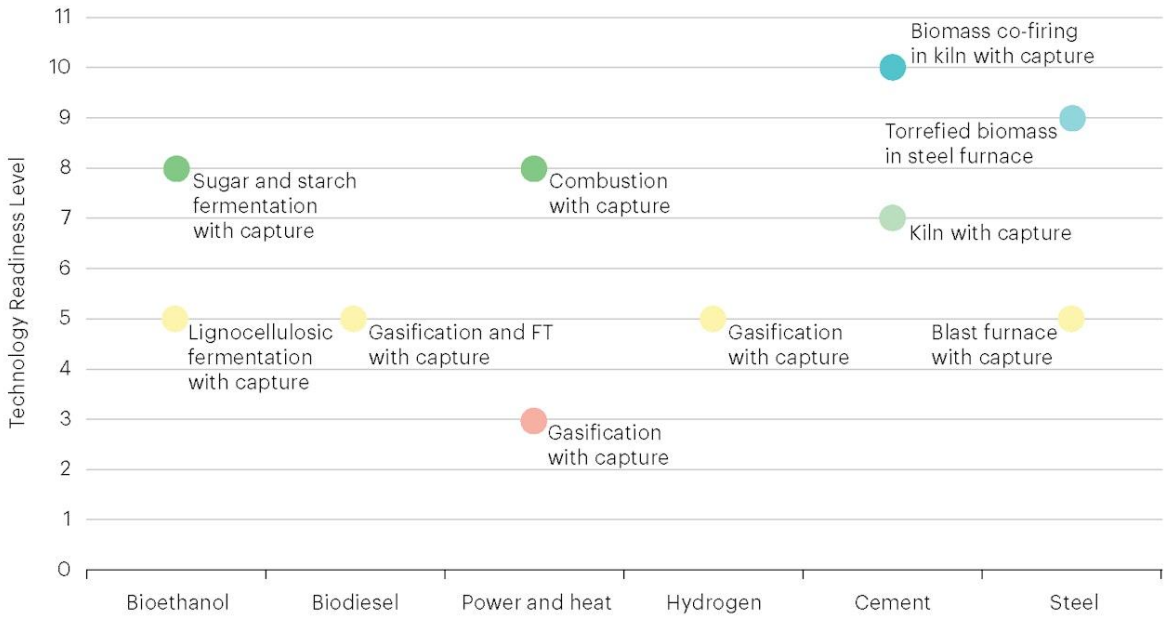
The key facilities are listed below:

- The Illinois Industrial Carbon Capture and Storage (IL-CCS) project, led by Archer Daniels Midland (ADM) in Decatur, Illinois, is one of the largest operational BECCS facilities globally. It captures CO_2 from ADM's bioethanol production process and stores it in a deep saline formation on-site.
- Red Trail Energy BECCS Project (North Dakota, USA) acquired by Gevo in 2025, became operational as a BECCS facility in 2022. It captures around 180,000 metric tons of biogenic CO_2 per year from ethanol fermentation and injects it into a deep saline reservoir for permanent storage. Red Trail Energy was the first U.S. ethanol producer to issue carbon removal credits, setting a precedent for the industry.
- The Midwest AgEnergy Blue Flint Ethanol (North Dakota, USA) owned by Harvestone Low Carbon Partners (formerly Midwest AgEnergy Group) is a 70-million-gallon-per-year corn ethanol facility near Underwood, North Dakota. Since late 2023, it has been capturing and permanently storing approximately 200,000 metric tons of CO_2 annually in a deep saline formation. This project is a key part of the facility's "Vision Carbon Zero" strategy and is one of the first commercial-scale BECCS operations in the U.S. ethanol sector.

- **Mikawa Post Combustion Capture Demonstration Plant** (Japan) owned by: Toshiba Energy Systems & Solutions Corporation (in partnership with J-POWER) is a biomass and coal co-firing power station. Its post-combustion CO_2 capture demonstration began in 2020, with a capacity of about 180,000 metric tons of CO_2 per year. The project is a flagship example of BECCS deployment in Asia, demonstrating integration with biomass power generation.
- **Nordbex BECCS Plant (Sweden)** owned by Nordbex AB is a Swedish BECCS facility capturing approximately 200,000 metric tons of CO_2 annually from biomass. The captured CO_2 is injected into geological formations beneath the North Sea, supporting Sweden's climate neutrality goals and the scaling of BECCS in Europe.

These facilities represent some of the earliest and most significant BECCS operations globally, with Kansas commencing operations as early as 2017. The technologies employed at these sites are among the most advanced, ranking high on the Technology Readiness Levels (TRLs) for key BECCS pathways as identified by the IEA.

Figure 1: Technology Readiness Levels for key pathways



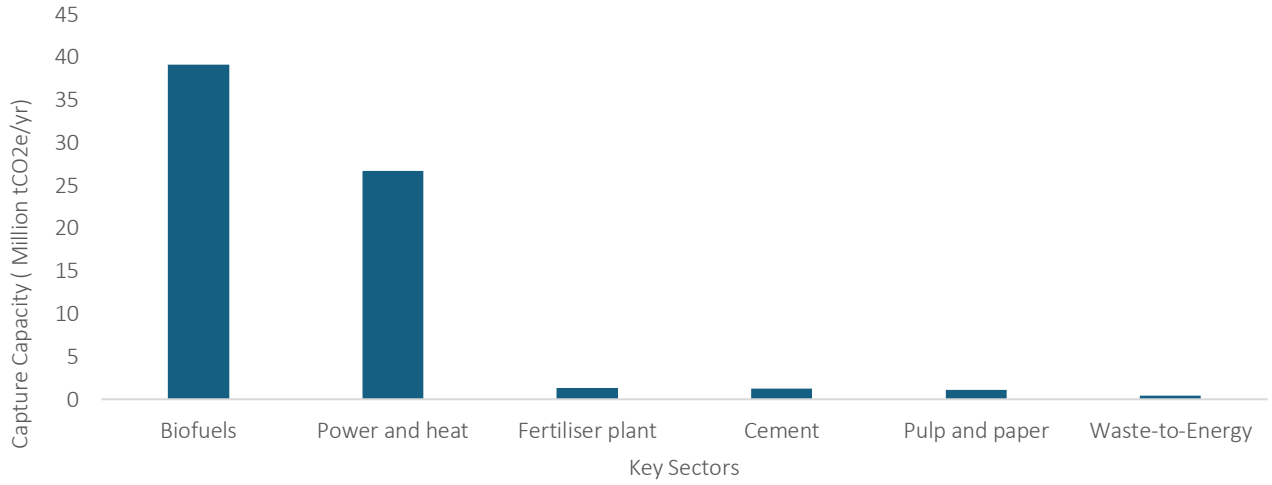
Source: IEA

Future Planned Capacities

The future planned capacities for BECCS show a promising trajectory of growth across various sectors, driven by growing global demand for carbon removal solutions and continued technological advancements.

Significant Growth in BECCS Capacity: By 2030, the capacity is expected to increase to approx. 70 million tons, signaling a substantial scaling of BECCS operations. However, this includes projects at varying stages including some of those which are still under evaluation. The chart below shows a split of expected BECCS capacity by various pathways

Figure 2: 2030 Estimated Capacity by Sector



Source: IEA, cCarbon Research

Biofuels Leading the Way: The Biofuels sector shows the most pronounced growth in terms of capacity. and is projected to grow to close to 40 million tons by 2030, maintaining its position as the largest contributor to BECCS capacity, representing a significant scaling in carbon removal capacity from this sector.

Expansion of Power and Heat Plants: Power and heat plants, though smaller in scale compared to ethanol, show notable growth, with planned capacities of around 27 million tons by 2030. This increase in power and heat capacity suggests strong commitment from players like Drax and Stockholm Exergi.

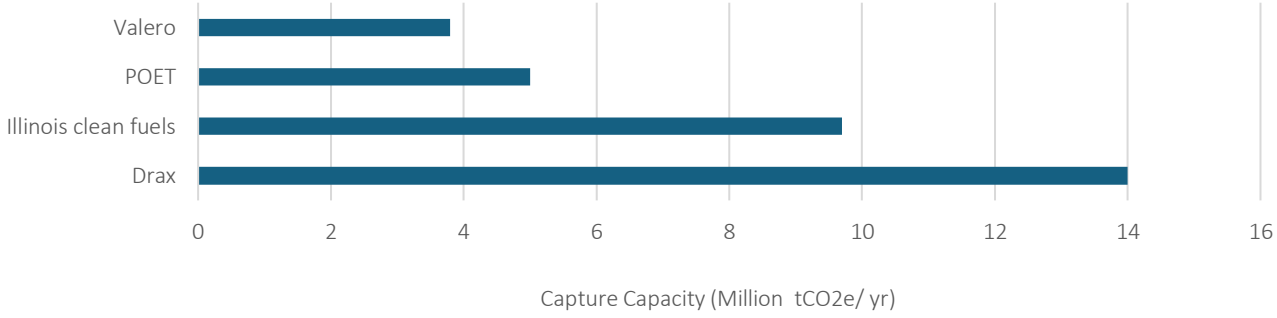
Diversification into New Sectors: Sectors such as Fertilizer plants, Cement, Pulp and Paper and Waste to Energy will also enter the BECCS domain.

Top Plants in development

Drax is a major emerging player in the power and heat sector for BECCS, with plans to achieve a carbon capture capacity of nearly 14 million tonnes per year across its flagship plants. By targeting carbon capture within power generation, Drax underscores the pivotal role of BECCS in decarbonizing the energy sector and advancing net-zero ambitions.

Meanwhile, Illinois Clean Fuels, POET, and Valero are leading U.S. biofuel producers at the forefront of BECCS deployment, leveraging large-scale biofuel operations to drive significant carbon removals and position bioenergy as a key sector for early commercial BECCS adoption.

Figure 3: Top BECCS developers



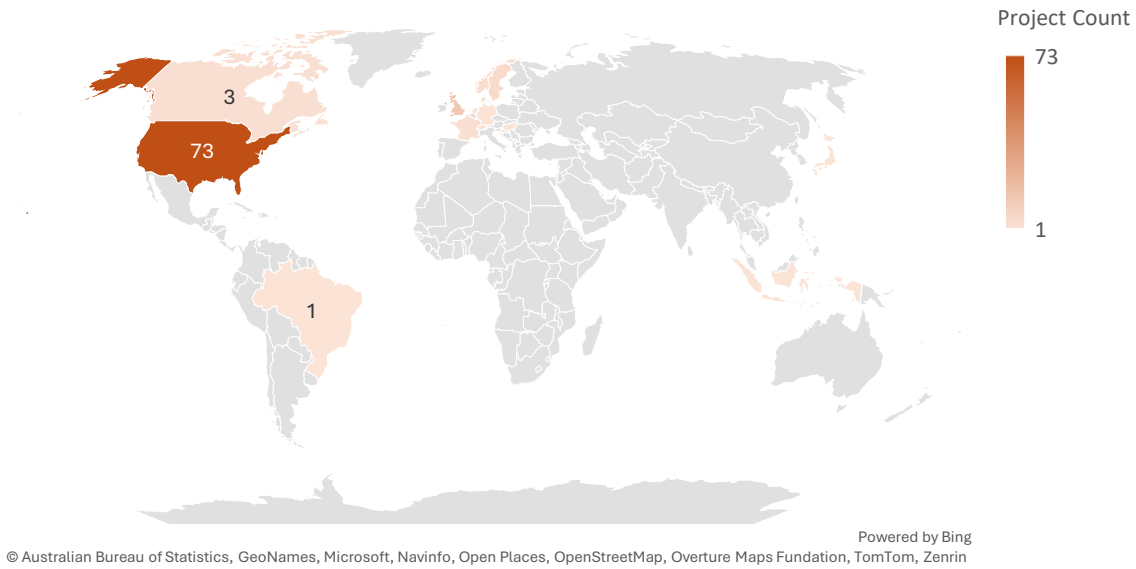
Source: IEA, cCarbon Research

Categorization of Developers and Regional Spread

The number of BECCS plants is also expected to grow to 100+ plants in 2030. This increase highlights the scaling of BECCS operations across the globe, as industries and governments recognize the importance of carbon capture and storage solutions.

Countries around the world are adopting BECCS technologies across various sectors to drive decarbonization. The United States leads in ethanol-based BECCS, utilizing its bioethanol industry for carbon capture. In Europe, the United Kingdom, Denmark, and Sweden focus on integrating BECCS into power and heat generation, capitalizing on their renewable energy infrastructure. The chart below provides the regional spread of BECCS developers.

Figure 4: BECCS developers - Regional spread



Source: IEA, cCarbon Research

Sweden also emphasizes pulp and paper, a high-emission industry, while Belgium and Indonesia are exploring BECCS in the cement sector. Denmark's investment in biogas with BECCS further reflects its commitment to circular economy solutions. These trends highlight the growing global adoption of BECCS as a key strategy for reducing emissions and achieving sustainable growth.

This growth trajectory reflects a confluence of technological advancements, supportive policy frameworks, and substantial institutional investments in large-scale facilities

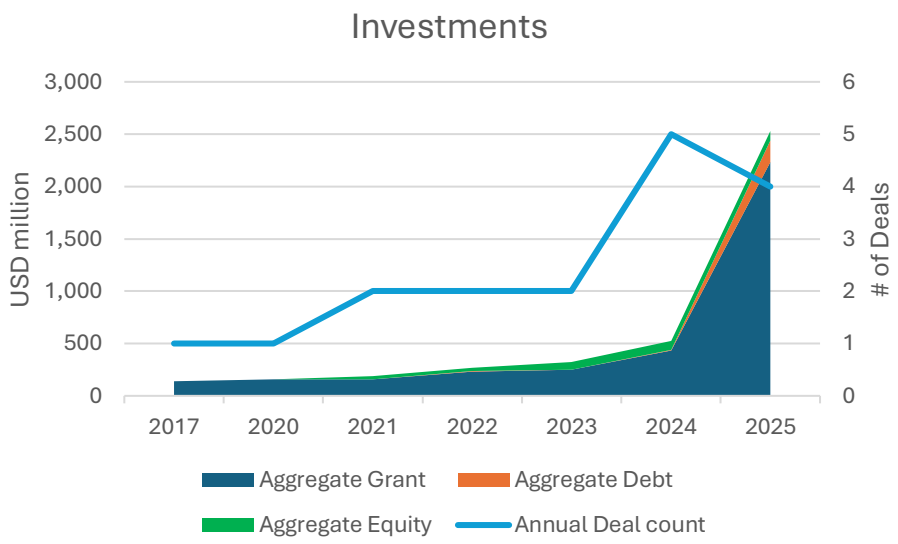
Investment Landscape

The investment landscape for BECCS (Bioenergy with Carbon Capture and Storage) has undergone a remarkable transformation, with a significant surge in investments, especially in 2025. Total investments in BECCS technologies reached around $1.8 billion so far in 2025, marking a record year compared to previous years. This rise in funding highlights the increasing recognition of BECCS as a pivotal solution for large-scale carbon removal and climate change mitigation.

Over the last 10 years, total BECCS investments have cumulatively reached $2.28 billion USD, with 2025 standing out due to the substantial grant of $1.8 billion secured by Stockholm Exergi's BECCS Project from the Swedish Energy Agency.

Of the total funding, 90% has been grant-based, 8% debt, and 2% debt—underscoring the public sector's outsized role in catalyzing early BECCS deployment. As project pipelines mature and offtake markets deepen, financial instruments are expected to diversify further, paving the way for blended finance and project-level investment. The chart below shows a split of the investments by year.

Figure 5: Investments Across Time



Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Public Sector: Paving the Path for BECCS Advancement

The public sector plays a pivotal role in the early development of BECCS technologies, laying the foundation for large-scale deployment. In 2025, governments worldwide significantly boosted BECCS investments. For instance, the Swedish Energy Agency committed over **20 billion SEK** to Stockholm Exergi's BECCS Project[1], marking the largest single investment in BECCS to date. This funding will enable the development of Europe's largest BECCS facility for capturing and storing biogenic carbon dioxide.

Internationally, countries like Canada, the United Kingdom, and Denmark are ramping up public-sector investments in BECCS. For example, Denmark's NECCS Fund has committed up to DKK 1166.2 million [2](USD 183.45 million) in subsidies to support BECCS projects, with the goal of achieving 0.5 million tons of additional negative emissions annually starting from 2025. Similarly, the UK Government has outlined plans to support BECCS in the power sector, confirming funding for large-scale commercial facilities. Another notable investment is $141 million investment by the U.S. Department of Energy(DOE) in the Illinois Industrial Carbon Capture and Storage (ICCS) project in Decatur, Illinois.

The table in the Appendix summarizes key grant-based investments, highlighting the recipients, funding amounts, and corresponding news sources.

Private Capital: Momentum Yet to Build

Despite growing interest in BECCS as a durable carbon removal pathway, private capital flows—particularly equity investments—remain modest. A few notable players, including Arbor, Mote, and Carbon America, have secured equity funding rounds, but the overall scale of such investments continues to be low.

Debt financing is still at an early stage but showed early signs of momentum in 2025. A landmark development was the Nordic Investment Bank's $200 million commitment, signalling increasing institutional confidence in the bankability of BECCS projects.

For a detailed breakdown, the Appendix provides a summary table of key equity and debt transactions, including information on the recipient companies, funding amounts, and source disclosures

Offtake Deals :surging ahead

The BECCS off-take agreements underscore the growing recognition of BECCS's role in achieving climate goals, with substantial CO_2 removal volumes expected over the period. In 2022, an initial commitment of 2 million tons was made, followed by significant increases in subsequent years: 2.7 million tons in 2023, 5.5 million tons in 2024, and 13.6 million tons in 2025. This growing volume demonstrates the increasing confidence in BECCS technologies and their scalability in meeting global carbon reduction targets.

Total BECCS offtake volume	> 24 million tCO2e (contracted)
Top Buyers	Microsoft, Respira, Frontier, Equinor, Nordea
Top Seller	AtmosClear, Stockholm Exergi, Orsted, CO280, Drax

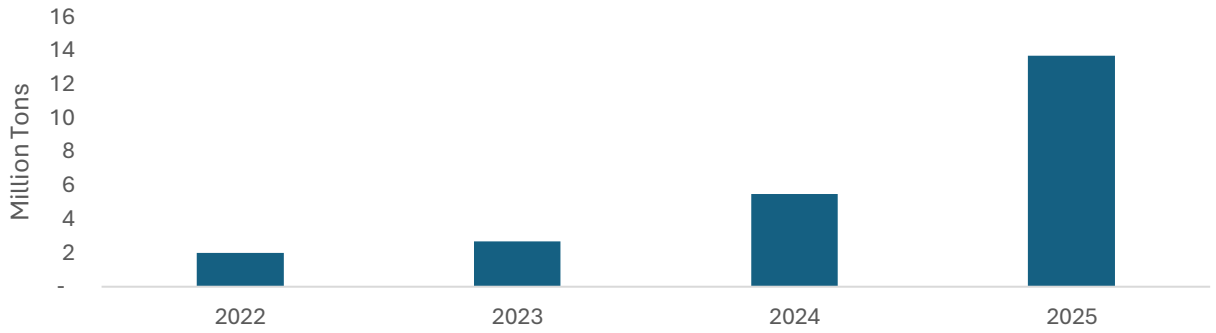
Offtake agreements for BECCS range from one year to as long as fifteen years. This multi-year structure underscores the long-term viability of BECCS as a cornerstone solution for carbon capture and storage. Such

[1] https://beccs.se/news/stockholm-exergi-wins-auction-for-government-support-for-beccs/

[2] https://ens.dk/en/press/three-new-ccs-projects-have-been-pledged-support-capture-and-store-biogenic-co2

contracts are essential for establishing a reliable market for carbon removal credits, providing the certainty needed to attract investment in BECCS infrastructure and support the broader energy transition

Figure 6: Offtake Deals -Capture Volume

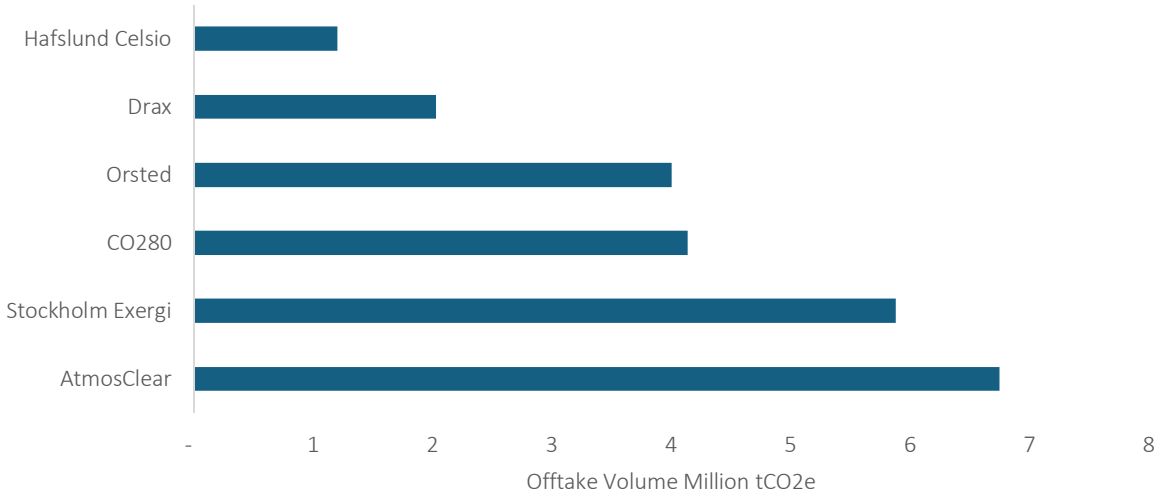


Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Top Buyers & Sellers: Corporates, Intermediaries, Platforms

The largest sellers in the BECCS market by deal volume are primarily companies with extensive experience in carbon capture and storage technologies, as well as bioenergy solutions.

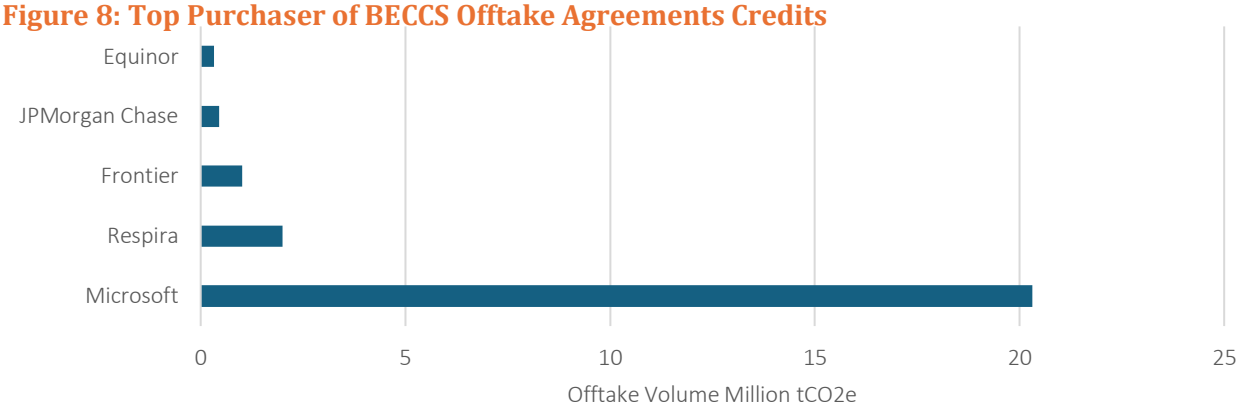
Figure 7: Top Suppliers of BECCS Offtake Agreements Credits



Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

On the buyer side, major corporates are leading the way in securing long-term agreements for carbon removal credits to meet their sustainability goals and achieve net-zero emissions. The largest buyers by deal volume reflect significant commitments to carbon capture and storage:

Figure 8: Top Purchaser of BECCS Offtake Agreements Credits



Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Intermediaries and platforms, such as C-Zero and Climate Cent Foundation are also purchasing credits indicating the growing integration of various stakeholders in facilitating large-scale carbon removal transactions.

These key players are not only contributing to the expansion of the carbon capture market but are also integral to the successful scaling of BECCS technology as a strategic solution.

The table in the Appendix summarizes key offtake deals, highlighting the recipients, funding amounts, and corresponding news sources

Registry Data: Issuances and Retirements

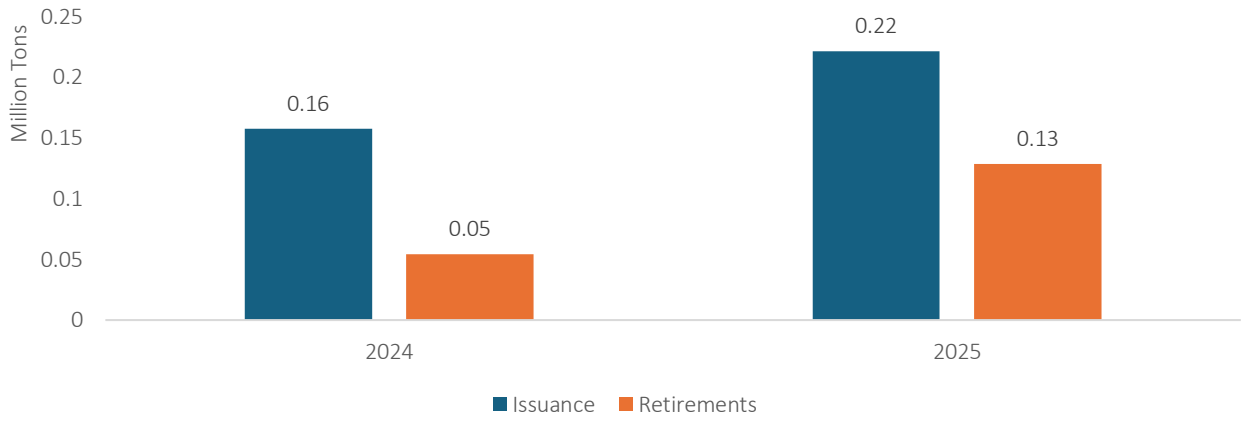
VCM Issuance & Retirements linked to BECCS Projects

The BECCS segment of the Voluntary Carbon Market (VCM) is currently shaped by a concentrated set of actors on both the demand and supply sides, with the market predominantly centered around registries such as Puro Earth and Isometric. Although the majority of BECCS removal credits are transacted through offtake agreements, these registries play a crucial role in ensuring the credibility and traceability of carbon credits. Currently, there is a small pool of players and projects issuing and retiring credits under these registries,

In 2024, 157,592 tons of VCMs were issued, with 54,276 tons of carbon credits retired. The issuance figure indicates the supply of carbon removal credits, while the retirement number represents the demand, reflecting companies and organizations fulfilling their carbon offset commitments.

In 2025, 221,264 tons of VCMs are issued, showing a continued increase in supply and 128,653 tons retired, representing a significant uptick in demand as companies ramp up their carbon offset efforts.

Figure 9: Issuance & Retirements



Source: cCarbon Research, Puro. earth

Top Players and Registries

On the Retirements side, Red Trail Energy LLC is the dominant player, having retired 172,929 tons of BECCS-linked carbon credits—over 90 percent of total retirements observed. PwC follows with a retirement volume of 10,000 tons, showing increasing participation from professional services in fulfilling their carbon offset goals.

On the Issuance side, Red Trail Energy LLC also leads, issuing 378,856 tons of BECCS-linked credits to date. Their market influence is amplified by their role as both a major project developer and consumer of carbon credits, reflecting a trend where organizations are increasingly taking ownership of the entire carbon removal process to guarantee the integrity of their offsets.

Comparison of Key players

The current generation of BECCS developers reflects a broad mix of industrial incumbents, biofuel producers, power utilities, and climate-tech startups. In North America, ethanol-based BECCS dominates the landscape, led by companies like ADM, Red Trail Energy, and Carbon America, which leverage high-purity CO_2 streams and favorable geology. In Europe, power-focused developers such as Drax and Stockholm Exergi are pursuing utility-scale BECCS as part of national climate strategies. While some companies manage the full BECCS value chain, others rely on partnerships for capture, transport, or storage, highlighting the sector's collaborative and regionally adaptive nature.

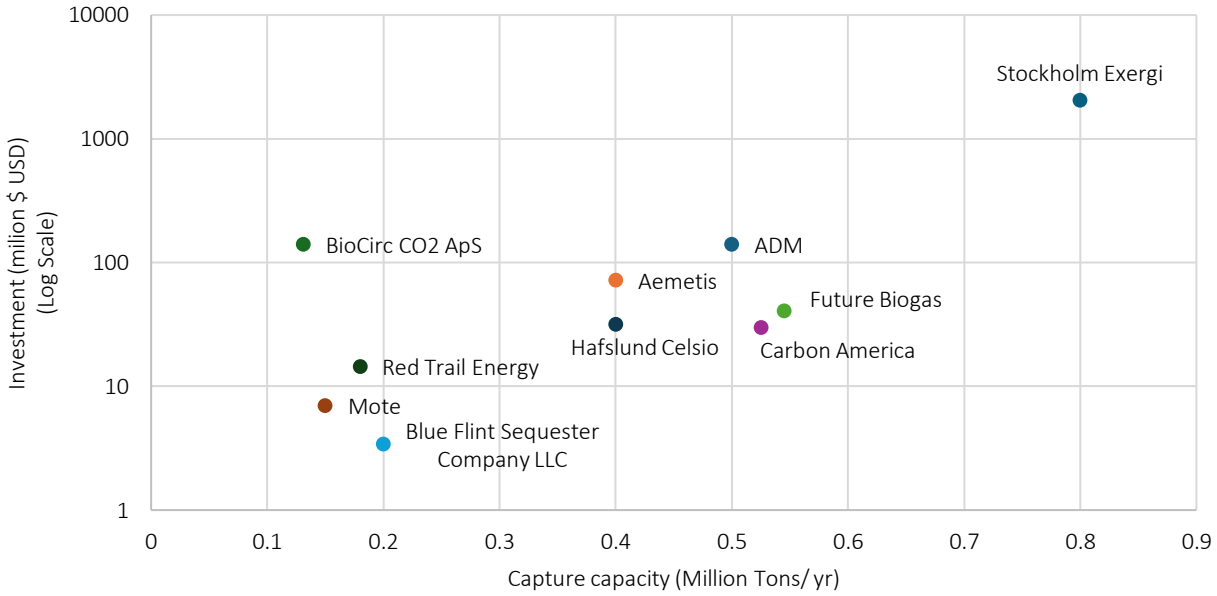
Financial Endorsement

The analysis of investments raised by BECCS companies in relation to their carbon capture capacity offers valuable insights into the financial endorsement of the company and the technology.

The following graph highlights key BECCS companies and the total investments they have raised, alongside their respective BECCS capacity (measured in MtCO2e, or million tons of CO2 equivalent).

While most projects fall in the $10–$100 million investment range, with capture capacities between 0.2–0.6 million tCO2e/year, indicating moderate scalability and cost efficiency, Stockholm Exergi stands out as the clear outlier, with both highest investment (>$1B) and largest planned capacity (~0.8 million tCO2e/yr), highlighting the scale and ambition of Europe's leading BECCS project

Figure 10: Investment vs Capture Capacity



Source: cCarbon Research

Developer Profile

Developer Profile

Evero Energy Group

HQ	28 Austin Friars, London EC2N 2QQ
Website	https://evero.energy/
Key contact	Alex Young, Head of Development
Links to the product	https://evero.energy/

BECCS Project Developer			
TRL Scale	5	CRI	1
BECCProjects		**Deployment Status**	**Capture Capacity**
Project 1	Chester (UK)	In Development	250,000 Tons/year
Project 2	Widnes (UK)	In Development	245,000 Tons/Year

Primary Technology

Evero, a leading low-carbon waste-to-energy company in the UK, converts one million tonnes of waste and wood into renewable electricity, powering over 100,000 homes annually.

The company's two CCS projects have passed the UK Government's Hynet Track 1 expansion's "deliverability assessment," paving the way for the delivery of world-class Greenhouse Gas Removals (GGR) facilities by 2030. Technology partner MHI, in collaboration with Kansai Electric Power, will provide the Advanced KM CDR Process™ for both projects. These plants currently process over 320,000 tons of locally sourced waste wood annually, converting it into renewable energy.

- **Ince Biopower (InBECCS)**: Located near Ellesmere Port, this facility will capture 250,000 tonnes of carbon annually starting in 2029, connecting to the HyNet cluster for underground CO2 storage in the Irish Sea.

- **Mersey Bioenergy (MBECCS)**: Situated near Widnes, this plant will capture up to 200,000 tonnes of CO2 annually, contributing to the UK's carbon reduction efforts upon completion.

Key Takeaway	Evero would be able to meet ~10% of UK government's target of 5Mtpa of GGRs by 2030 once it reaches full scale operation in 2029 (expected)

Operational Excellence	
Feedstock Lifecycle	
Feedstock Type	Grade C (Non-recyclable) locally sourced waste wood
Feedstock Usage	○ 170ktpa for the Ince facility ○ 150ktpa for the Mercey facility
Feedstock Source & Transportation	All biomass comes from the UK and is brought to site via a third party by road
Feedstock Sustainability	>95% biogenic content
Biomass Transformation	
Methodology	Post combustion solvent-based technology
Absorbent	Both projects will use amine based solvent technology provided by MHI

Thermodynamic Requirements	Steam and electricity
Co-Products	○ Process effluent discharge- cleaned up through a new wastewater treatment plant with a small, concentrated amount being disposed of. ○ Solvent waste- Small amount of concentrated solvent waste (sludge consistency) from reclaiming process, will be collected and stored for offsite removal.
CO2 concentration (%) in flue gas stream	10-13%
CO2 Capture Efficiency	95%
Other emissions	N2, O2, CO2, H2O, SO2, Nox.
CO2 Storage Lifecycle	
Captured CO2 composition	>95% biogenic CO2 to specification for HyNet
CO2 Transportation	Hynet Pipeline
CO2 Storage	Depleted offshore gas fields in Liverpool Bay (Dedicated Storage)

Capabilities – In Process	
Govt. Policy Support	Project has applied for subsidies from UK government (HyNet Track Expansion) In the process of applying for the UK GGR business model which will provide funding for CCS projects in the UK using pipeline transport. The funding will be in the form of a CfD topping up the price received for selling carbon removals to an agreed strike price, allowing the project to be investable.
MRV	Project aims to use approved MRV methodology. Products of combustion from biomass gasification facility regulated by environmental permit with emission limit values for key products of combustion. Continuous Emissions Monitoring System (CEMS) installed to monitor and report.
Environmental Impact Assessment	The project is undergoing a planning application, included in this is a EIA which will be submitted to the local planning authority and publicly available once submitted.
Co-Benefits	Project benefits include employment and improved carbon footprint for the facility (negative emissions).

APPENDIX

Equity Investments

Date	Investor	BECCS Developer	Total Value (M USD)	Links
Dec, 2021	Canada Pension Plan Investment Board, ArcTern Ventures, Energy Impact Partners and others.	Carbon America	$ 30.0	Link
Apr, 2024	Lowercarbon Capital, Voyager, 11.2 Capital, Cantos Ventures, Climate Capital, and others	Arbor Energy	$ 13.5	Link
Mar, 2025	Nella Next and Preston-Werner Ventures	Mote	$ 7.0	Link

Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Debt Investments

Date	Investor	BECCS Developer	Total Value (M USD)	Links
Nov, 2022	NatWest	Carbon Capture Scotland	$ 4.9	Link
Mar, 2025	Nordic Investment Bank (NIB)	Stockholm Exergi	$ 199.8	Link

Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Grants

Date	Donor	BECCS Developer	Total Value (M USD)	Links
Apr, 2017	U.S. Department of Energy (DOE)	ADM	$ 141.0	Link
Jan, 2020	North Dakota Industrial Commission (NDIC) Renewable Energy Program	Red Trail Energy	$ 14.5	Link
Jan, 2021	North Dakota Industrial Commission	Blue Flint Sequester Company LLC	$ 3.4	Link
Jul, 2022	Federal grants (site/facility upgrades)	Aemetis, Inc.	$ 72.0	Link
Dec, 2023	EU Just Transition Fund	INEOS Greenport Scandinavia	$ 16.5	Link
Apr, 2024	Danish Energy Agency	Biocirc CO2 ApS	$ 139.9	Link
Apr, 2024	Danish Energy Agency	Bioman ApS	$ 30.9	Link
Apr, 2024	Danish Energy Agency	Carbon Capture Scotland	$ 13.4	Link
Jul, 2024	Scottish Government	Carbon Capture Scotland	$ 2.7	Link
Jan, 2025	Swedish Energy Agency (reverse auction)	Stockholm Exergi	$ 1,800	Link

Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Offtakes

Date	Purchaser	BECCS Developer	Volume (tons)	Links
Sep, 2022	Respira	Drax	2,000,000	Link
Apr, 2023	NextGen	Summit Carbon Solutions		Link
May, 2023	C-Zero	Drax	2,000	Link

Date	Purchaser	BECCS Developer	Volume (tons)	Links
May, 2023	Microsoft	Orsted	2,671,500	Link
Sep, 2023	Climate Cent Foundation	CO_2 Energie	21,800	Link
Mar, 2024	KarbonX	Drax	25,000	Link
May, 2024	Microsoft	Stockholm Exergi	3,300,000	Link
May, 2024	Microsoft	Orsted	1,000,000	Link
May, 2024	Carbonx Climate	Carbon Capture Scotland	2,699	Link
Jun, 2024	Frontier	Stockholm Exergi	800,000	Link
Sep, 2024	Equinor	Orsted	330,000	Link
Sep, 2024	Microsoft	Arbor Energy	25,000	Link
Sep, 2024	British Airways	CUR8	3,750	Link
Dec, 2024	Arkwright Consulting	Inherit Carbon Solutions		Link
Jan, 2025	Farvatn	Inherit Carbon Solutions		Link
Mar, 2025	Nordea	Inherit Carbon Solutions	68,000	Link
Apr, 2025	Frontier	Hafslund Celsio	100,000	Link
Apr, 2025	Microsoft	CO280	3,685,000	Link
Apr, 2025	Microsoft	AtmosClear	6,750,000	Link
May, 2025	Microsoft	Stockholm Exergi	1,780,000	Link
Jun, 2025	Wild Assets	Frontier Infrastructure Holdings	120,000	Link
Jun, 2025	Microsoft	Hafslund Celsio	1,100,000	Link

Source: cCarbon Research- CROM (Carbon Removal and Offset Monitor)

Issuance & Retirement Table

Date	Issuer	Volume (tons)	Registry
Mar, 2024	Red Trail Energy LLC	157,592	Puro
Feb, 2025	Red Trail Energy LLC	221,264	Puro

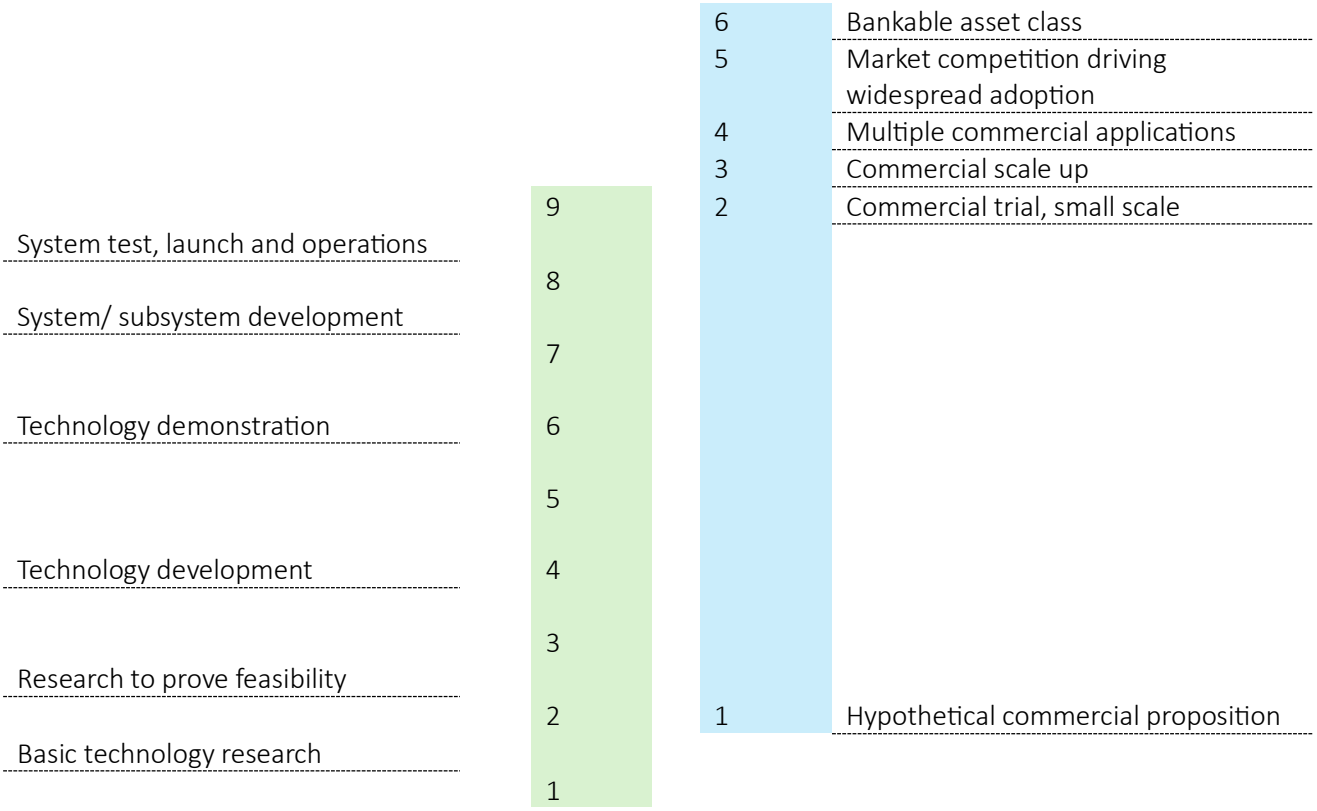
Date	Purchaser	Developer	Volume (tons)
Mar, 2024	PwC International Limited	Red Trail Energy LLC	2,500
Mar, 2024	PwC International Limited	Red Trail Energy LLC	2,500
Mar, 2024	PwC International Limited	Red Trail Energy LLC	5,000
Mar, 2024	Red Trail Energy LLC	Red Trail Energy LLC	44,476
Feb, 2025	Red Trail Energy LLC	Red Trail Energy LLC	128,653

Source: cCarbon Research, Puro.earth

Technology Readiness Level and Commercial Readiness Indicator

This report maps the solutions against the Technology Readiness Level (TRL) and Commercial Readiness Indicator (CRI). The TRL was initially developed by NASA and CRI has been adapted from ARENA[3]; and both actively used by several government agencies[4].

TRL and CRI



Source: ARENA, NASA

[3] https://arena.gov.au/assets/2014/02/Commercial-Readiness-Index.pdf
[4] https://fossil.energy.gov/archives/cslf/sites/default/files/documents/TRL-and-CRI.pdf

About Market Compass

Market Compass is a **benchmark report** about various low-carbon and carbon-removal interventions empowering carbon market stakeholders, policymakers, and investors with credible & actionable intelligence.

The Market Compass builds a **bottom-up view of a sector** by aggregating plant and production pathway information. It builds on the cCarbon database that includes the following parameters:

- Project/ plant capacities
- Project ownership
- Project/ plant performance
- Investment raised
- Offtake commitments
- Issuance and retirement
- Technology Readiness
- Patents and IP
- Project/ plant economics

cCarbon has created a Market Compass for the following sectors:

Carbon Removal

- Bio-energy with Carbon Capture and Storage (BECCS)
- Biomass Carbon Removal and Sequestration (BiCRS)
- Enhanced Rock Weathering (ERW)
- Direct Air Capture
- Af/Reforestation
- Marine carbon dioxide removal
- Soil Carbon

Sustainable Fuels

- Renewable Natural Gas
- Renewable Diesel
- Sustainable Aviation Fuel

Over 2000 plants and projects are captured in the cCarbon database.

Companies Participating in Market Compass

Companies participating in the Market Compass benchmarking can access the following from cCarbon:

- **Gain industry visibility** – Be recognized by global investors, carbon buyers, and policymakers.
- **Benchmarked position** – Understand how the technology stacks up across performance dimensions.
- **Showcase innovation** – Highlight company's unique capabilities, scalability, and R&D strengths (Receive discounted access to participate in cCarbon convenings).
- **Access curated intelligence and trends** shaping the ecosystem.

To be featured in a Market Compass report or to learn more, write to us at InSights@cCarbon.info

CDR Resources From cCarbon

1. Public database: Carbon Removal and Offsets Monitor is a free resource developed by Carbon to share announcements and analysis occurring in the CDR sector.

2. **Offsets and CDR Essential** market intelligence subscription
    a. Detailed Trendsheets on Buyers, Investments, and Offtakes
    b. Periodic articles with analysis and views
    c. Monthly reports synthesizing market happenings
    d. Webinars to get the latest expert view

    Learn more at https://www.ccarbon.info/essential-membership/

3. **Offsets and CDR Pro** market intelligence subscription that include everything in Essential and also have the following:
    a. CDR Core Market Dashboard that covers analysis on demand, supply, investments
    b. Forecasts on compliance and voluntary offset markets
    c. APIs to access the database

    Learn more at https://www.ccarbon.info/membership-plans/

4. Modeling and data-led convenings

    Learn more at https://www.ccarbon.info/events/

About cCarbon

cCarbon (pronounced 'see-carbon') specializes in providing business intelligence, analytics, and forecasts for global environmental markets. Founded in 2012, we offer comprehensive coverage across global compliance and voluntary carbon markets, sustainable fuels markets, and other environmental commodity markets.

Organizations seeking in-depth research for decarbonization, compliance strategies, climate investments, and forecasting environmental markets, can leverage our suite of analytics and data tools or work with our experienced analysts to tailor solutions that meet their needs.

cCarbon is a division of **cKinetics**, a US-based, global sustainability specialist, providing solutions for investors, businesses and policy makers.

For more details visit www.cCarbon.info

cCarbon

10080 N. Wolfe Rd., Suite SW3-200, Cupertino, CA 95014

+1 650 331 1931

ccarbon.info

insights@ccarbon.info