

Preliminary Assessment Public Summary

This *Preliminary Assessment Public Summary*, prepared by Puro.earth, contains general information about the CO₂ Removal Supplier and its project, as evaluated at the time of the Preliminary Assessment (PA). It also includes a *Non-Technical Project Summary* and a *Criteria Assessment Report* detailing: i) key criteria assessed and their associated outcomes, ii) Puro's comments, and iii) evidence provided by the CO₂ Removal Supplier.

The *PA Public Summary* serves as a transparent communication tool, enabling potential investors, buyers, and stakeholders to quickly understand the supplier's carbon removal capabilities and assessment status.

The supplier has also received an extended *Preliminary Assessment Report*. This confidential document offers in-depth insights, including specific remarks and actionable recommendations to guide the supplier's progression through the certification journey.

1. Supplier and Project Information

CO ₂ Removal Supplier	
Company name	Biofine Developments Northeast Inc.
Company address	14-16 York St. - Portland ME 04101 - United States
Business ID	83-3204250
KYC status	Completed (07/09/2025)
CO ₂ Removal Project	
Methodology	Biochar, Edition 2022, Version 3
Production Facility name	Biofine - Maine Phase I
Facility registration date	07/03/2025
Production Facility ID	429627
Production Facility location	Depot Street - Lincoln ME 0457 - United States
Host Country of removal	United States
Has this facility been registered in another registry?	☒ No ☐ Yes, additional information:
Preliminary Assessment Details	
Date of assessment	10/10/2025
Status of assessment	Final
Conclusion of assessment	Passed

2. Non-Technical Project Summary*

The Biofine - Maine Phase I facility converts a lignin-rich waste by-product from Biofine's renewable fuel production process into biochar for use as a soil amendment in the northeastern United States. The facility is located in Lincoln, Maine, and represents an important step in scaling integrated biorefinery systems that generate both low-carbon fuels and durable carbon storage products.

The project utilizes a continuous Verenovo slow-pyrolysis reactor operating at temperatures between 450 °C and 550 °C, with residence times of approximately 15 minutes. This process transforms a previously under-utilized lignocellulosic residue, otherwise destined for incineration, into a stable, carbon-rich material capable of sequestering biogenic carbon for hundreds of years.

Produced biochar will be characterized for key environmental and agronomic parameters, including C_{org} content, H/C_{org} ratio, PAH and heavy-metal concentrations, to ensure compliance with international biochar quality standards. Biofine collaborates with the University of Maine's Forest Bioproducts Research Institute to optimize soil application practices and assess long-term benefits to soil health.

*Filled by the Supplier. Between 150-200 words

The definition of CO₂ Removal Supplier and Production Facility can be found in the Puro Standard.

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3. Criteria Assessment Report

Reminder: Sub-criteria either concern the Production Facility's technical eligibility or its maturity and quality. There are three types of sub-criteria:

- **Required to be passed:** These correspond to the core criteria related to the eligibility of a Production Facility. Suppliers must meet these criteria, as they may otherwise be impossible or costly to change at a later stage of the certification journey.
- **Required to be assessed:** These criteria are important for evaluation but do not necessarily determine pass or fail at this stage, as it is understood that the suppliers may be at different stages of development.
- **Not required:** These criteria are optional at this stage. They may provide additional information about the project maturity but are not essential for passing the preliminary assessment.

For a facility to be considered eligible for listing, all the sub-criteria that condition eligibility must be met (i.e. passed or assessed). If one of those sub-criteria is not met, the facility in its current state of development is not eligible for listing.

Disclaimer: The assessment has been made against the criteria in the current version of the methodology. Puro.earth relied on the CO₂ Removal Supplier for the correctness of the provided information during the time of the preliminary assessment and will make no representation as to the accuracy or completeness of this report. The CO₂ Removal Supplier must undergo a third-party audit before issuing CO₂ Removal Credits (CORCs). **Passing the preliminary assessment does not guarantee a success in the third-party audit.**

Important Notice Regarding Biochar Methodology Update: This Preliminary Assessment has been conducted against Edition 2022, but to some extent, reflected some important changes in the updated Biochar Methodology – Edition 2025.

Table 1. Criteria and sub-criteria assessment by Puro based on the documents submitted.

ID	Criteria / Sub-criteria	Outcome	Comment	Evidence reviewed	Requirement for listing	Purpose of criteria
c1	Planned biomass feedstock(s) is(are) eligible	Passed			Passed if required sub-criteria are met	
c1.1	Biomass feedstocks are identified and compatible with EBC positive list	Passed	The supplier has reported feedstock as waste ligneous biomass – feedstock for biochar manufacturing (secondary process) - produced as a by-product of levulinic acid production (primary process) at Biofine's site in Lincoln, Maine. <i>For Biochar Methodology Edition 2025, this feedstock must be categorized according to Puro Biomass Sourcing Criteria.</i>	[Biofine] Project Description v1.0.docx; [Biofine] Biomass Types and Origins List – BCH; [Biofine] Municipal Solid Waste (MSW) Feedstock Sourcing Strategy.pdf	Required to be passed	Technical eligibility
c1.2	Biomass feedstock sustainability and chain-of-custody can be demonstrated, if applicable	Passed	The supplier has reported that the initial waste biomass feedstocks feeding into the primary and secondary process originates from sites around the Maine area, and is defined as sorted municipal	[Biofine] Municipal Solid Waste (MSW) Feedstock Sourcing Strategy.pdf	Required to be passed	Technical eligibility

			waste, primarily consisting of waste paper. <i>For Biochar Methodology Edition 2025, this feedstock must be categorized according to Puro Biomass Sourcing Criteria and must meet the criteria of that category.</i>			
c1.3	Bioenergy leakage related to feedstock use is minimal	Assessed	The feedstock – waste ligneous biomass – would otherwise be incinerated without energy recovery. Bioenergy leakage risks for the feedstock are deemed minimal.	[Biofine] Baseline and Additionality Questionnaire v1.9.docx; [Biofine] Project Description v1.0.docx; [Biofine] Treatment of Ligneous Residue in Baseline Scenario.pdf	Required to be assessed	Technical eligibility
c1.4	Land use change related to feedstock use is minimal	Assessed	The selected feedstocks and their sources are deemed to have minimal to no effects on land use change.	Biofine] Project Description v1.0.docx; [Biofine] Municipal Solid Waste (MSW) Feedstock Sourcing Strategy	Required to be assessed	Technical eligibility
c1.5	Sourcing of biomass is secured (e.g. letters of intent, contracts)	Assessed	Sourcing is secured in-house and the role of Biofine is reported as feedstock and biochar producer. The same operator's primary production is levulinic acid, and that process provides biomass residues to biochar production process.	Biofine] Project Description v1.0.docx	Not required	Maturity & Quality
c2	Planned biochar production equipment is technically sound	Passed			<i>Passed if required sub-criteria are met</i>	
c2.1	Several options of reactor design have been identified	Passed	The supplier has selected Verenovo biochar reactors with continuous process.	[Biofine] Reactor Information [Biofine] Process Description	Required to be passed	Technical eligibility
c2.2	Reactor design has been decided, contracted, or purchased	Passed	The supplier has purchased two reactors optimized for different feedstock particle sizes. The vertical reactor can process smaller particle sizes and the horizontal reactor larger particles. At the time of the submission (summer 2025) pyrolysis trial runs are ongoing.	[Biofine] Reactor Information [Biofine] Process Description	Required to be assessed	Maturity & Quality
c2.3	Reactor design is vetted, regarding production of biochar with H/C ratio below 0.7	Passed	The supplier states that the temperature during the pyrolysis step will range from 450°C to 550°C combined with the residence time of approximately 15 minutes in the Verenovo slow pyrolysis reactor systems. If operated according to specifications, the selected equipment and biomass feedstock are deemed capable of producing biochar with a molar H/Corg ratio below 0.7. This will need to be confirmed by laboratory analysis during the audit.	[Biofine] Production Equipment Questionnaire	Required to be passed	Technical eligibility
c2.4	Reactor design is vetted, regarding risk for CH ₄ emissions	Passed	The pyrolysis gas is combusted, with energy recovery back to the pyrolysis system. The combustion system is a thermal oxidizer specially designed to combust all vapors generated during pyrolysis and adjust air input automatically. The feedstock (Biofine ligneous waste) generates reduced volumes of syngas and bio-oil as raw biomass, because it is partially de-volatilized in the primary process. Any condensed oils are minimal and are intended for disposal.	[Biofine] Production Equipment Questionnaire	Required to be passed	Technical eligibility

c2.5	Reactor design is vetted, regarding air pollutant emissions in line with local regulation	Passed	The Verenovo pyrolysis system is designed to be compliant with U.S. federal and state environmental regulations, including those applicable in Maine for emissions to air, water and soil. The applicable local regulations are listed. The plant is required to perform on-site environmental pollutant testing as part of the air permitting process under Maine DEP regulations.	[Biofine] Production Equipment Questionnaire	Required to be passed	Technical eligibility
c2.6	Facility design is vetted, regarding disposal of waste streams, including any liquid streams (wastewater, oil, tars)	Passed	The system is planned with containment and loading area controls to prevent soil contamination and materials spill in compliance with local regulations applicable in Maine. Small quantities of pyrolysis oils are planned to be condensed and disposed.	[Biofine] Production Equipment Questionnaire	Required to be passed	Technical eligibility
c2.7	Facility is co-producing bioenergy (e.g. heat, power) for internal use	Assessed	Yes. The pyrolysis gas is combusted with energy recovery back to the pyrolysis system.	[Biofine] Production Equipment Questionnaire	Required to be assessed	Maturity & Quality
c2.8	Facility is co-producing bioenergy (e.g. heat, power, fuel) for external use	Assessed	No. Bioenergy produced during the pyrolysis process is not planned for external use.	[Biofine] Production Equipment Questionnaire	Required to be assessed	Maturity & Quality
c3	Biochar planned end-use(s) is(are) eligible	Passed			<i>Passed if required sub-criteria are met</i>	
c3.1	Biochar end-uses are eligible	Passed	The biochar is intended to be sold to end users and applied as a soil amendment in the Northeast U.S.	[Biofine] Project Description v1.0.docx	Required to be passed	Technical eligibility
c3.2	Plans of biochar end-uses are tangible	Assessed	The sale of biochar to end-users is identified as the main revenue source, and Biofine is engaged in discussions with potential end-users.	[Biofine] Statement on Biochar End Use	Required to be assessed	Maturity & Quality
c3.3	Biochar environmental quality thresholds are known for the identified end-uses	Assessed	The supplier is planning to collaborate with University of Maine's Forest Bioproducts Research Institute to ensure optimal soil health outcomes and use pre-application testing to identify soil risks, such as contamination and erosion from improper biochar application.	[Biofine] Project Description v1.0.docx	Required to be assessed	Maturity & Quality
c4	Additionality is demonstrated	Passed			<i>Passed if required sub-criteria are met</i>	
c4.1	Carbon storage additionality to baseline	Passed	If not used for biochar production, the biomass ligneous waste, would otherwise be incinerated, which results in the release of the material's biogenic carbon back into the atmosphere.	[Biofine] Project Description v1.0.docx; [Biofine] Treatment of Ligneous Residue in Baseline Scenario.pdf	Required to be passed	Technical eligibility
c4.2	Financial additionality of facility	Passed	Carbon credit revenues are required to make the biochar production process financially viable. The only other revenue source is the sale of the biochar material itself to end users, which alone is insufficient to economically justify the project.	[Biofine] Project Description v1.0.docx Biofine Financial Model.xlsx	Required to be passed	Technical eligibility
c4.3	Regulatory additionality	Passed	The project is not required by any local, state, or national laws or regulations.	[Biofine] Project Description v1.0.docx	Required to be passed	Technical eligibility

c4.4	<i>Production equipment is newly built (i.e. not an existing facility or a retrofit of existing facility)</i>	Assessed	The continuous pyrolysis reactor system engineered and supplied by Verenovo, designed for pyrolyzing the lignin-rich biomass residues generated from Biofine primary process, will be newly built.	[Biofine] Project Description v1.0.docx [Biofine] Reactor Information [Biofine] Site Layout	Required to be assessed	Maturity & Quality
c5	Facility has monitoring, reporting, and LCA capabilities or tangible plans	Passed			<i>Passed if required sub-criteria are met</i>	
c5.1	<i>Protocol for biomass and biochar record keeping is prepared</i>	Assessed	Representative samples will be collected from each batch of dried biochar produced, either once per shift or every 20 metric tons, whichever occurs first. Chain of custody procedures will be enforced, with all samples logged in the LIMS (Laboratory Information Management System).	[Biofine] Biochar Testing Protocol	Required to be assessed	Maturity & Quality
c5.2	<i>Protocol for dry mass determination of biochar is prepared</i>	Assessed	The dry mass of the biochar will be determined with direct measurements on a calibrated scale immediately following production. Moisture content will be measured via lab testing of random samples. Dry mass determination needs to be refined further into a detailed operations procedure.	[Biofine] Comprehensive Monitoring, Reporting, and Verification (MRV) Plan [Biofine] Biochar Testing Protocol	Required to be assessed	Maturity & Quality
c5.3	<i>Protocol for biochar sampling and laboratory analysis is prepared (permanence and environmental quality)</i>	Assessed	The Supplier has provided the outlines of their biochar sampling and analysis program. The plan includes a list of parameters to measure for biochar sampling and laboratory analysis, with sampling point, frequency, and amount, as well as testing methods and parameters. It must be further refined and turned into actual protocol that can be followed (i.e., step-by-step operating procedures).	[Biofine] Biochar Testing Protocol	Required to be assessed	Maturity & Quality
c5.4	<i>Monitoring and reporting plan of facility emissions is prepared</i>	Assessed	A third-party emissions test will be conducted at commissioning/startup to measure air and water emissions, including: CH ₄ , N ₂ O, SO _x , NO _x , PM, VOCs, and CO. However, the monitoring plan must be expanded to include a more comprehensive evaluation of the biochar project's supply chain emissions before being converted into more precise operating procedures.	[Biofine] Comprehensive Monitoring, Reporting, and Verification (MRV) Plan	Required to be assessed	Maturity & Quality
c5.5	<i>An LCA model specific to the facility's operation is prepared</i>	Assessed	A preliminary LCA model has been prepared by an official LCA partner recognized by Puro.earth. High-level activity boundaries have been defined, along with preliminary estimates of key monitoring parameters, resulting in initial estimates of project emissions. Planning phase estimations emission result with a net removal value of 2.15 t CO ₂ per tonne biochar. Overall, the LCA model is expected to align with the requirements of the Methodology; however further refinement is still needed.	Biofine Puro Facility Audit LCA_June_2025	Not required	Maturity & Quality

c6	Facility has likely co-benefits and positive SDG impacts	Passed			<i>Passed if required sub-criteria are met</i>	
c6.1	<i>Facility-specific co-benefits have been identified</i>	Assessed	Biofine aims to develop a long-term monitoring system and collaborate with researchers to ensure optimal soil health outcomes.	Biofine] Project Description v1.0.docx [Biofine] SDG Reporting v1.1	Required to be assessed	Maturity & Quality
c6.2	<i>Facility-specific SDG targets or indicators have been identified</i>	Assessed	Currently, Biofine does not intend to pursue any additional SDGs.	[Biofine] SDG Reporting v1.1	Required to be assessed	Maturity & Quality
c7	Facility team has access to relevant knowledge and skills	Passed			<i>Passed if required sub-criteria are met</i>	
c7.1	<i>Relating to biomass sourcing, handling, processing</i>	Assessed	The team has experience operating an industrial biomass processing plant and has experience in sourcing, handling, and processing biomass.	[Biofine] Team Bios and Technical Descriptions	Not required	Maturity & Quality
c7.2	<i>Relating to thermochemical processes</i>	Assessed	The team has experience in managing chemical and biochemical engineering processes and is understood to have additional expertise in thermochemical processes.	[Biofine] Team Bios and Technical Descriptions	Not required	Maturity & Quality
c7.3	<i>Relating to biochar use</i>	Assessed	The team is developing their biochar capacity as this venture is new to their current operations.	[Biofine] Team Bios and Technical Descriptions	Not required	Maturity & Quality
c7.4	<i>Relating to monitoring and carbon accounting</i>	Assessed	The team has experienced individuals conducting carbon foot printing and monitoring activities for their current operations. As this venture is new to their current operations, Voluntary Carbon Market monitoring is being developed.	[Biofine] Team Bios and Technical Descriptions	Not required	Maturity & Quality
c8	Environmental and social safeguards	Passed			<i>Passed if required sub-criteria are met</i>	
c8.1	<i>Stakeholder consultations have been planned or conducted</i>	Assessed	Between March 2023 and August 2024, Biofine participated in a series of public meetings, and addressed feedback directly during meetings. The meetings were accessible through both options for in-person attendance and virtual participation via Zoom. No material modifications to the project design or scope were required. The company will continue to participate in Town Council meetings to provide updates.	[Biofine] Puro Stakeholder Engagement Report	Required to be assessed	Maturity & Quality
c8.2	<i>Regulation applicable to facility has been identified</i>	Assessed	Permitting rules (Chapter 115) include stack testing for VOCs, particulate matter (PM), and carbon monoxide (CO) to ensure anticipated minimal emissions to air.	[Biofine] Environmental Evaluation Report	Required to be assessed	Maturity & Quality
c8.3	<i>Procedures to acquire relevant permits have been identified, started, or completed</i>	Assessed	Biofine primary product is a 100% renewable, drop-in heating fuel, and they are launching an additional biochar product line that will leverage ligneous biomass wastes from the primary production process and allow for durable carbon removal. Permit identified and applied for: Maine Dept of Environmental Protection Permit	[Biofine] Maine Dept of Environmental Protection Permit	Required to be assessed	Maturity & Quality