Preliminary Assessment Public Summary

This *Preliminary Assessment Public Summary*, prepared by Puro.earth, contains general information about the CO_2 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 CO_2 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	Lapwing Energy Ltd
Company address	Carr Rd, Doncaster, DN10 4SN, United Kingdom
Business ID	09537639
KYC status	Completed
CO_2 Removal Project	
Methodology	**Biochar, Edition 2022, Version 3**
Production Facility name	Reverse Coal
Facility registration date	02 January 2025
Production Facility ID	395968
Production Facility location	Carr Rd, Doncaster, DN10 4SN, United Kingdom
Host Country of removal	United Kingdom
Has this facility been registered in another registry?	☒No ☐Yes, additional information:
Preliminary Assessment Details	
Date of assessment	21-07-2025
Status of assessment	Final
Conclusion of assessment	Passed

2. Non-Technical Project Summary*

Reverse Coal is an innovative land use approach that tackles the dual challenges of climate change and food security on some of the UK's most fertile farmland – drained lowland peat. These soils are crucial for growing food, yet they release disproportionately large amounts of greenhouse gases when farmed compared to regular soils. Reverse Coal rethinks this problem by turning it into an opportunity.

Reverse Coal rewets and restores lowland peat, growing fast growing woody biomass that absorbs carbon dioxide from the atmosphere. This biomass is then turned into biochar via pyrolysis. The biochar is then either used in agricultural, construction and environmental applications or buried beneath the soil in Lapwing's patented Reverse Coal repository, locking away carbon for greater permanence.

Renewable energy generated on site is used in existing agricultural operations to further decarbonise the food production system and support UK food security. The Reverse Coal model is not just about carbon removal; it also supports biodiversity, water quality, and long-term land productivity.

*Filled by the Supplier. Between 150-200 words
The definition of CO_2 Removal Supplier and Production Facility can be found in the Puro Standard.

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 CO_2 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 CO_2 Removal Supplier must undergo a third-party audit before issuing CO_2 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	Four types of biomass feedstocks have been identified that are compatible with the EBC positive list: woody biomass from short rotation plantations (AG-03), perennial energy crops (AG-02), manures (AB-02), and tree, vine and shrub pruning residues (AG-04). Primary biomass feedstock is expected to be willow woodchip (AG-02 and AG-03).	Biomass types and origins list.xlsx; Puro Project Description.docx; 2156 Lapwing Energy Limited .xls.pdf; Invoice_***INV1212_from_***.pdf	Required to be passed	Technical eligibility
C1.2	*Biomass feedstock sustainability and chain-of-custody can be demonstrated, if applicable*	Passed	The CO2 Removal Supplier has stated its commitment to work with local growers and land managers to obtain residues from conservation work. Additionally, biomass suppliers are vetted to	Puro Environmental and Social Safeguard.docx; Puro Project Description.docx	Required to be passed	Technical eligibility

			ensure compliance with sustainability standards, including traceability, minimal transportation footprint, and compatibility with land restoration goals. Therefore, it is expected that biomass feedstock sustainability and chain-of-custody can be demonstrated.			
c1.3	*Bioenergy leakage related to feedstock use is minimal*	Assessed	The biomass feedstock (primarily willow woodchips) is understood to be sourced from biomass that is purposefully grown for energy production. Therefore, there is a risk of bioenergy leakage. However, the supplier is also producing electricity from the thermal energy produced during pyrolysis and potentially mitigating potential indirect emissions. *Under the upcoming Biochar Methodology – Edition 2025, bioenergy leakage risks will need to be assessed more rigorously and may not be assumed to be mitigated.*	Biomass types and origins list.xlsx; Puro Project Description.docx; Puro Environmental and Social Safeguard.docx;	Required to be assessed	Technical eligibility
c1.4	*Land use change related to feedstock use is minimal*	Assessed	The baseline land use is declared to be farming of organic vegetables on drained lowland peat. The project activity intends on restoring the peatlands by growing biomass in the peatlands for biochar production. Farming activities are expected to shift to controlled agricultural environments. While the restoration activities are anticipated to have positive impacts on the peatland ecosystem, *under the upcoming Biochar Methodology – Edition 2025, land use change will need to be assessed more rigorously.*	Puro Project Description.docx; Puro Additionality v1.9.docx	Required to be assessed	Technical eligibility
c1.5	*Sourcing of biomass is secured (e.g. letters of intent, contracts)*	Assessed	The CO_2 Removal Supplier has identified biomass suppliers and provided invoices for previous biomass purchases, but letters of intent or contracts securing future biomass supply have not been provided.	2156 Lapwing Energy Limited .xls.pdf; Invoice_***INV1212_from_***.pdf	Not required	Maturity & Quality
c2	**Planned biochar production equipment is technically sound**	**Passed**			*Passed if required sub-criteria are met*	
c2.1	*Several options of reactor design have been identified*	Passed	The Anergy HP870 Kiln without modifications has been identified as a suitable pyrolysis reactor to produce biochar and energy.	Biochar production equipment questionnaire.xlsx	Required to be passed	Technical eligibility
c2.2	*Reactor design has been decided, contracted, or purchased*	Assessed	The Anergy HP870 Kiln has been selected and has been manufactured. At the time of this assessment the reactor was not yet operational.	Biochar production equipment questionnaire.xlsx	Required to be assessed	Maturity & Quality
c2.3	*Reactor design is vetted, regarding production of biochar with H/C ratio below 0.7*	Passed	Pyrolysis temperatures are expected to be between 700-900°C, with residence times between 15-35 minutes. The selected equipment and feedstock types are deemed possible to produce biochar with an H/C_{org} below 0.7, which will need to be confirmed by laboratory analysis.	Biochar production equipment questionnaire.xlsx; T2927-0-12 (Rev C) Process Specification.pdf	Required to be passed	Technical eligibility
c2.4	*Reactor design is vetted, regarding risk for CH_4 emissions*	Passed	Pyrolysis gases are combusted at 500°C and 850°C within the combustion chambers (gas engine for energy generation and thermal oxidizer, respectively), with a residence time of 2 seconds in	T2927-0-12 (Rev C) Process Specification.pdf; Biochar	Required to be passed	Technical eligibility

			excess oxygen conditions. Automatic control of excess oxygen enhances combustion efficiency. If operated according to standard procedures, the risk of CH_4 emissions is anticipated to be minimal.	production equipment questionnaire.xlsx		
c2.5	*Reactor design is vetted, regarding air pollutant emissions in line with local regulation*	Passed	The facility has been granted with an operational permit that defines emissions limits for carbon monoxide, particulate matter, NO_x, total volatile organic compounds and smoke. The monitoring standard and frequency for each parameter are prescribed and are required to be monitored and tested as per the permit conditions.	Biochar production equipment questionnaire.xlsx	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 pyrolysis equipment does not condense pyrolysis oils and is not expected to generate significant quantities of liquid waste streams. Process water will be tested to determine whether it can be recirculated. Depending on the outcome of the process water testing, additional disposal pathways have been identified that are not expected to result in negative environmental impacts.	T2927-0-12 (Rev C) Process Specification.pdf; Biochar production equipment questionnaire.xlsx; Environmental Evaluation Report.docx; Lapwing Energy Permit 2024 Final.pdf	Required to be passed	Technical eligibility
c2.7	*Facility is co-producing bioenergy (e.g. heat, power) for internal use*	Assessed	Part of the thermal energy generated from combustion of pyrolysis oil and gas is used to sustain the pyrolysis.	Biochar production equipment questionnaire.xlsx	Required to be assessed	Maturity & Quality
c2.8	*Facility is co-producing bioenergy (e.g. heat, power, fuel) for external use*	Assessed	Excess syngas is channeled to a gas engine for combustion and electricity generation. The renewable electricity generated from biomass pyrolysis is intended to displace fossil energy use and support clean energy access for local agricultural operations	Biochar production equipment questionnaire.xlsx; Puro Project Description.docx; Puro Additionality v1.9.docx	Required to be assessed	Maturity & Quality
c3	**Biochar planned end-use(s) is(are) eligible**	**Passed**			*Passed if required sub-criteria are met*	
c3.1	*Biochar end-uses are eligible*	Passed	The supplier has described multiple biochar uses. The expected use case is burial of biochar, an eligible use of the biochar, provided that the biochar is mixed with the soil or other mineral constituents when it is buried.	Reverse Coal Concept Introduction Mar 2025 v0.1.pdf	Required to be passed	Technical eligibility
c3.2	*Plans of biochar end-uses are tangible*	Assessed	While the project intends on making the biochar available for multiple end use cases, the most likely use case is burial. Further details must still be provided to substantiate the project development plans.	Reverse Coal Concept Introduction Mar 2025 v0.1.pdf	Required to be assessed	Maturity & Quality
c3.3	*Biochar environmental quality thresholds are known for the identified end-uses*	Assessed	The supplier has not indicated awareness of environmental quality thresholds in the evidence provided. However, the laboratory identified can test the required environmental quality parameters.	Calibration evidence.docx	Required to be assessed	Maturity & Quality
c4	**Additionality is demonstrated**	**Passed**			*Passed if required sub-criteria are met*	
c4.1	*Carbon storage additionality to baseline*	Passed	Without the project activity, biochar would not be produced under the proposed baseline or alternative scenarios. The project activity will result in CO2 removals that would otherwise not have occurred.	Puro Additionality v1.9.docx	Required to be passed	Technical eligibility
c4.2	*Financial additionality of facility*	Passed	The Supplier has demonstrated with a cash flow model that the production of biochar without CORC revenue is unviable. Despite	Puro Additionality v1.9.docx; B4 Calculation	Required to be passed	Technical eligibility

			the sales of biochar, heat, electricity and CO_2, the sale of CORCs is integral to the profitable running of the project and the payback of the initial investment.			
c4.3	*Regulatory additionality*	Passed	The project is not mandated by existing regional laws, regulations, or other binding obligations.	Puro Additionality v1.9.docx	Required to be passed	Technical eligibility
c4.4	*Production equipment is newly built (i.e. not an existing facility or a retrofit of existing facility)*	Assessed	The production equipment was manufactured in 2025 and will be newly built for the project.	Biochar production equipment questionnaire.xlsx	Required to be assessed	Maturity & Quality
c5	**Facility has monitoring, reporting, and LCA capabilities or tangible plans**	**Passed**			*Passed if required sub-criteria are met*	
c5.1	*Protocol for biomass and biochar record keeping is prepared*	Assessed	All data are recorded in a digital logbook, which is maintained for monitoring, reporting and verification purposes. This includes data related to quantification and safety.	Calibration evidence.docx; Puro Project Description.docx	Required to be assessed	Maturity & Quality
c5.2	*Protocol for dry mass determination of biochar is prepared*	Assessed	A protocol for the dry mass determination of biochar has been prepared. The protocol includes weighing, moisture measurements and calculation.	Calibration evidence.docx	Required to be assessed	Maturity & Quality
c5.3	*Protocol for biochar sampling and laboratory analysis is prepared (permanence and environmental quality)*	Assessed	A protocol for sampling and laboratory analysis of biochar has been prepared. The protocol includes the sampling frequency and procedure. The laboratory identified can conduct tests for both permanence and environmental quality parameters.	Calibration evidence.docx	Required to be assessed	Maturity & Quality
c5.4	*Monitoring and reporting plan of facility emissions is prepared*	Assessed	The monitoring and reporting plan of the facility is defined at a high level. Further details must be provided to describe the monitoring and reporting of supply chain emissions resulting from facility operations.	Puro Project Description.docx	Required to be assessed	Maturity & Quality
c5.5	*An LCA model specific to the facility's operation is prepared*	Assessed	The CO_2 supplier is in the process of preparing the LCA model, which currently includes inventory data and emissions factors applicable to the biomass sourcing stage.	Puro Project Description.docx; Puro_LCA_Lapwing_v2025_04 version4.2 (with carbon stored)	Not required	Maturity & Quality
c6	**Facility has likely co-benefits and positive SDG impacts**	**Passed**			*Passed if required sub-criteria are met*	
c6.1	*Facility-specific co-benefits have been identified*	Assessed	The project activity aims to restore lowland peatlands drained for agricultural purposes. Restoration through short rotation coppicing and biomass production and rewetting of the lowland peat will contribute to the restoration activity. Furthermore, the restoration of the peatlands is expected to result in emission reductions. This is supported by the research and development of controlled agricultural environments to further reduce pressure on the lowland peat ecosystems. In addition, the facility aims to displace fossil fuel-based energy usage in nearby farm operations to support rural energy self-sufficiency.	Puro Project Description.docx; Reverse Coal Concept Introduction Mar 2025 v0.1.pdf; Puro SDG Report Template	Required to be assessed	Maturity & Quality

c6.2	*Facility-specific SDG targets or indicators have been identified*	Assessed	The supplier has declared that they intend on being certified against SDG Target 7.2 – Increase in renewable energy and SDG Target 9.4 – Decarbonization of industry. Detailed evidence is required to enable the verification of the project's impact and contribution towards the SDG targets identified.	Puro Project Description.docx; Puro SDG Report Template.docx	Required to be assessed	Maturity & Quality
c7	**Facility team has access to relevant knowledge and skills**	**Passed**			*Passed if required sub-criteria are met*	
c7.1	*Relating to biomass sourcing, handling, processing*	Assessed	While no specific evidence was provided to describe team access to relevant skills and knowledge, it has been noted that the CO_2 Removal Supplier has formed partnerships with other institutions and organizations that include industry partners and research collaborators (agricultural consultants, engineers and researchers) with shared interests in climate, agriculture, and energy innovation.	Reverse Coal Concept Introduction Mar 2025 v0.1.pdf; Puro Project Description.docx	Not required	Maturity & Quality
c7.2	*Relating to thermochemical processes*				Not required	Maturity & Quality
c7.3	*Relating to biochar use*				Not required	Maturity & Quality
c7.4	*Relating to monitoring and carbon accounting*				Not required	Maturity & Quality
c8	**Environmental and social safeguards**	**Passed**			*Passed if required sub-criteria are met*	
c8.1	*Stakeholder consultations have been planned or conducted*	Assessed	Stakeholder consultations have been conducted since 2022 in the form of online meetings and public consultations. Key stakeholders have been identified and their concerns and queries related to environmental and visual impacts were addressed. Future dissemination events have been planned.	Puro Stakeholder Engagement Report.docx; Puro Project Description.docx	Required to be assessed	Maturity & Quality
c8.2	*Regulation applicable to facility has been identified*	Assessed	The Pollution Prevention Control Act (1999) and the Medium Combustion Plant Directive (MCPD) were identified as the applicable regulation.	Lapwing Energy Permit 2024 Final.pdf; 240522_Application for Variation BDC (Final)_.pdf; Biochar production equipment questionnaire.xlsx	Required to be assessed	Maturity & Quality
c8.3	*Procedures to acquire relevant permits have been identified, started, or completed*	Assessed	A permit was obtained in 2023 and a variation to the permit was completed in 2024 under the Pollution Prevention and Control Act (1999) as per Environmental Permitting (England and Wales) Regulations (2016). The threshold thermal input of the pyrolysis reactor is below the threshold of the MCPD and the facility was exempt from any permitting needs under this directive.	Lapwing Energy Permit 2024 Final.pdf; 240522_Application for Variation BDC (Final)_.pdf	Required to be assessed	Maturity & Quality