Preliminary Assessment Public Summary

This is a *Preliminary Assessment Public Summary* prepared by Puro.earth, which contains general information about the CO2 Removal Supplier, a non-technical summary of the project, and a table containing details about the criteria assessed. The CO2 Removal Supplier has received an extended Preliminary Assessment Report that includes additional remarks and recommendations for the continuation of the certification journey.

1. Supplier and project information

CO_2 Removal Supplier	
Company name	Onnu Ltd
Company address	3 Brickfields Business Park Old Stowmarket Road, Woolpit, Bury St Edmunds, United Kingdom, IP30 9QS
Business ID	13656501
KYC status	Completed (2022-10-27)
CO_2 Removal Project	
Methodology	**Biochar, Edition 2022, Version 3**
Production Facility name	Onnu Green Hub Facility 1
Facility registration date	2023-08-31
Production Facility ID	466210
Production Facility location	Marlbrook, Leominster HR6 0PE, United Kingdom
Host Country of removal	United Kingdom
Has this facility been registered in another registry?	☒No ☐Yes, additional information:
Assessment details	
Date of assessment	2024-09-18
Status of assessment	Final
Conclusion of assessment	Passed

2. Non-technical project summary*

Onnu Green Hub 1 is a UK-based pyrolysis project converting problematic waste biomass into biochar and green energy while sequestering carbon. Located in Herefordshire, it targets environmentally harmful biomass like green waste, arboreal waste. Current disposal methods for green and arboricultural waste, such as landfills and composting, emit significant methane and CO2, contributing to pollution. Seasonal surges in green waste further strain composting facilities, leading to contamination and inefficiencies. Additionally, waste biomass applied directly to land causes polluted run-offs, threatening ecosystems like the river Wye.
Onnu, in collaboration with engineering firm Woodtek, has developed a scalable pyrolysis machine, the C1000, which converts large quantities of waste biomass into biochar, a stable, carbon-rich material that sequesters carbon. The process also generates syngas, which is combusted to produce green energy. An advanced emissions scrubber with Continuous Emissions Monitoring System (CEMS) ensures no harmful gases are released. The fully automated system features a user-friendly HMI for efficient operation.
Biochar produced from the process enhances soil health by improving water and nutrient retention, supporting regenerative agriculture. Surplus heat energy generated is converted into green electricity, powering data centres for gen-AI tasks.

*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.**

Overall evaluation: Preliminary Assessment is **passed.**

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	Feedstocks include: AB-02 manures (poultry litter); S-05: General Landscaping residues; S-04 Biomass from nature conservation; S-03 Root stocks; S-01 Foliage; R-01 Urban green cuttings; Ag-04 Tree, vine and shrub pruning; F-01 Bark; F-02 Wood chips only from mechanically treated wood (pure firewood); and F-03 Wood, wood residues from mechanical processing (waste wood A1). These biomass types are compatible with the EBC positive list.	Facility_Audit_4_Biomass types and origins.xslx;	Required to be passed	Technical eligibility

c1.2	*Biomass feedstock sustainability and chain-of-custody can be demonstrated, if applicable*	Passed	The supplier has identified feedstock sources and adequate ways of demonstrating feedstock sustainability (actual evidence will need to be supplied for the audit). For agricultural residues, ONNU will ensure that 30% of the biomass is left on field to avoid decreasing soil health and crop levels. Arboricultural waste will be sourced as landscape management and urban green residues. Forest biomass will only be sourced from suppliers that are FSC certified.	Facility_Audit_4_Biomass types and origins.xslx Output_Audit_1B_Sustainability Certificates of Biomass.docx Output_Audit_1A_Records of biomass used.docx	Required to be passed	Technical eligibility
c1.3	*Bioenergy leakage related to feedstock use is minimal*	Assessed	There are alternative uses for woodchips and manure, some of which could entail energy production (e.g. woodchip combustion, manure anaerobic digestion). Here, the pyrolysis technology selected also produces thermal energy. Bioenergy leakage is deemed minimal.	Facility_Audit_2_Puro additionality qs v1.8.docx Facility_Audit_5B_Biochar prod eq designs and perf.docx	Required to be assessed	Technical eligibility
c1.4	*Land use change related to feedstock use is minimal*	Assessed	The feedstocks selected and their sourcing approach are deemed to have minimal to no effects on land use change.	Facility_Audit_4_Biomass types and origins.xslx;	Required to be assessed	Technical eligibility
c1.5	*Sourcing of biomass is secured (e.g. letters of intent, contracts)*	Not required	Specific feedstock sources have been identified, but no information was provided on whether the sourcing has been secured yet.	No information provided.	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	PyroUnity quad C1000 system produced by Woodtek Engineering will be used.	Facility_Audit_5B_Biochar prod eq designs and perf.docx	Required to be passed	Technical eligibility
c2.2	*Reactor design has been decided, contracted, or purchased*	Assessed	The pyrolysis equipment will be fabricated new for this project. The reactor design has been decided, but not yet installed. It is planned to be installed, but the reactor has not yet been contracted or purchased.	Facility_Audit_5B_Biochar prod eq designs and perf.docx Facility_Audit_5C_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 500-800°C, with residence times of 10-15 minutes, which will vary depending on the feedstock properties. Onnu will test its biochar from Eurofins, an EBC-accredited biochar laboratory testing service provider. The equipment and feedstock selected are deemed	Facility_Audit_7D_Protocol applied for biochar freq.docx Facility_Audit_5C_Biochar production equipment questionnaire.xlsx	Required to be passed	Technical eligibility

			possible to produce biochar with H/C below 0.7, which will be confirmed by laboratory analyses.			
c2.4	*Reactor design is vetted, regarding risk for CH_4 emissions*	Passed	The pyrolysis gases are expected to be combusted at temperatures between 800-1000°C, for at least 2 seconds, with multiple measures to control air flow and its turbulence in primary and secondary combustion areas. The process is therefore expected to result in negligible CH_4 emissions.	Facility_Audit_5B_Biochar prod eq designs and perf.docx Facility_Audit_5C_Biochar production equipment questionnaire.xlsx	Required to be passed	Technical eligibility
c2.5	*Reactor design is vetted, regarding air pollutant emissions in line with local regulation*	Passed	Wet scrubbing of flue gases will be used, which is deemed important for processing of manure. The manufacturer has demonstrated with other units compliance with regulation in the United Kingdom. Here, monitoring requirements are still being defined with local authorities but are likely to include NOx and CO.	Facility_Audit_5B_Biochar prod eq designs and perf.docx Facility_Audit_5C_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	Water used for biochar quenching is used for the scrubber to filter flue gases, reducing wastewater quantities. No oils are condensed, and the gas is combusted with energy recovery. Hence, generation of waste during operations is deemed minimal.	Facility_Audit_5C_Biochar production equipment questionnaire.xlsx Facility_Audit_5B_Biochar prod eq designs and perf.docx	Required to be passed	Technical eligibility
c2.7	*Facility is co-producing bioenergy (e.g. heat, power) for internal use*	Assessed	Energy is recovered during the pyrolysis process. Thermal energy is used to maintain the pyrolysis process, as well as to generate additional electricity. Hot exhaust gases flow through the Heat Exchangers, capturing the energy in hot water. This hot water flows to the Organic Rankine Cycle machine, converting the excess heat into electricity which is then used to operate fans, conveyors and augers.	Facility_Audit_5B_Biochar prod eq designs and perf.docx Facility_Audit_5C_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 energy is planned to be provided to local IT hubs and tech centers.	Additional_info_c6_Co-benefits and Positive SDG Impacts.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 biochar produced will be used for land application and will be sold in a variety of forms including use as a	Facility_Audit_6AB&D_Biochar End Use Types.docx	Required to be passed	Technical eligibility

			soil improver, fertilizer mix, soil mix, compost mix, and pure biochar. The intended end uses are eligible.			
c3.2	*Plans of biochar end-uses are tangible*	Assessed	Evidence demonstrating that the end-uses are tangible is provided as pictures of the products and their application.	Facility_Audit_6AB&D_Biochar End Use Types.docx	Required to be assessed	Maturity & Quality
c3.3	*Biochar environmental quality thresholds are known for the identified end-uses*	Assessed	Tests have been conducted by Onnu to demonstrate the environmental quality of their biochar. The comparable biochar produced has received EBC certification, and the laboratory test indicates that it meets the EBC environmental quality requirements. Onnu is aware that these values may vary for the biochar produced.	Output_Audit_2_Evidence_EBC certification for Woodtek's biochar.pdf Output_Audit_2_Evidence_PL & whole tree biochar lab test.pdf Output_Audit_2_Evidence_Poultry litter biochar lab test.pdf Output_Audit_2B&C_Biochar elemental and env q analysis.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	The baseline and alternative scenarios would not result in carbon storage, neither anthropogenic nor natural. Therefore, the carbon storage is deemed additional to the baseline.	Facility_Audit_2_Puro additionality qs v1.8.docx	Required to be passed	Technical eligibility
c4.2	*Financial additionality of facility*	Passed	The supplier has demonstrated with a cash flow model that managing the production of biochar without CORC revenue is unviable. The sale of carbon credits is integral to the profitable running of the project and the payback of the initial internal investment funds.	Facility_Audit_2_Puro additionality qs v1.8.docx, CONFIDENTIAL Facility_Audit_2_Financial Model.xlsx	Required to be passed	Technical eligibility
c4.3	*Regulatory additionality*	Passed	The supplier confirms that the activity is not required by existing laws, regulations, and other binding obligations.	Facility_Audit_2_Puro additionality qs v1.8.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 pyrolysis equipment will be fabricated new for this project.	Facility_Audit_5B_Biochar prod eq designs and perf.docx	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	Onnu Greenhub facility has provided a plan to monitor and report its day-to-day activities. The plan needs to be converted into actual operating procedures.	Additional_Info_c5_Monitoring and reporting plan.docx	Required to be assessed	Maturity & Quality

c5.2	*Protocol for dry mass determination of biochar is prepared*	Assessed	Onnu Greenhub facility has prepared a procedure to determine the dry mass of biochar, which is based on the volume, density and moisture content of the produced biochar. The multiplicity of feedstock processed by this facility shall be a point of attention in the monitoring procedures.	Facility_Audit_7B_Protocol applied to calc the dm of biochar	Required to be assessed	Maturity & Quality
c5.3	*Protocol for biochar sampling and laboratory analysis is prepared (permanence and environmental quality)*	Assessed	Onnu Greenhub will follow the EBC (2012-2023) 'European Biochar Certificate - Guidelines for a Sustainable Production of Biochar' sampling protocols. Carbon Standards International (CSI), Frick, Switzerland (http://european-biochar.org). Version 10.3 from 5th Apr 2022. Onnu will test its biochar from Eurofins, an EBC-accredited biochar laboratory testing service provider, under its basic EBC testing package.	Facility_Audit_7D_Protocol applied for biochar freq.docx	Required to be assessed	Maturity & Quality
c5.4	*Monitoring and reporting plan of facility emissions is prepared*	Assessed	A monitoring plan has been prepared. It identifies the components required to calculate the biochar project's supply chain emissions. The plan needs to be converted into actual operating procedures.	Additional_Info_c5_Monitoring and reporting plan.docx	Required to be assessed	Maturity & Quality
c5.5	*An LCA model specific to the facility's operation is prepared*	Not required	An LCA was not included in the submission, but the supplier is preparing it.	No information provided.	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's co-benefits include reducing nutrient leaching and ammonia emissions, production of green electricity, job creation, sustainable economy, waste recycling, reduction of eutrophication risks.	Additional_Info_c6_Co-benefits and Positive SDG Impacts.docx	Required to be assessed	Maturity & Quality
c6.2	*Facility-specific SDG targets or indicators have been identified*	Assessed	Positive impacts on SGDs include SDG 3, 7, 8, 9, 10, 13, and 14.	Additional_Info_c6_Co-benefits and Positive SDG Impacts.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	The head of Biomass Sourcing has proven experience in this field.	Additional_Info_c7_Facility Team.docx	Not required	Maturity & Quality
c7.2	*Relating to thermochemical processes*	Assessed	The Head of Engineering has over a decade of experience in thermochemical processes	Additional_Info_c7_Facility Team.docx	Not required	Maturity & Quality
c7.3	*Relating to biochar use*	Assessed	The Head of Engineering is proficient in the production and application of biochar.	Additional_Info_c7_Facility Team.docx	Not required	Maturity & Quality
c7.4	*Relating to monitoring and carbon accounting*	Assessed	The Head of Carbon team has experience in project management, supported by a sustainability specialist.	Additional_Info_c7_Facility Team.docx	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 engagement has already been conducted, including locals near to the facility, suppliers, NGOs, and foundations.	Facility_Audit_3B_Stakeholder Engagement Report.docx	Required to be assessed	Maturity & Quality
c8.2	*Regulation applicable to facility has been identified*	Assessed	Onnu Greenhub has identified the UK government guidelines and permits relevant to the biochar facility activities, products and biomass feedstock sources.	Facility_Audit_3C_Environmental permits and studies.docx	Required to be assessed	Maturity & Quality
c8.3	*Procedures to acquire relevant permits have been identified, started, or completed*	Assessed	Specialist consultants have been commissioned to prepare reports for the permitting process. As the planning application progresses, Onnu will liaise with the local authority to ensure all the necessary permits are obtained before the project goes live.	Facility_Audit_3C_Environmental permits and studies.docx	Required to be assessed	Maturity & Quality