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Audit Report 2024

In accordance with the following requirements:

Puro.earth - Biochar Methodology

Novocarbo GmbH
59555 Lippstadt
Operator's No.: PE-70401.001

Contact details operator

Name and address

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Contact person(s)

Herr Caspar von Ziegner

Audit visit details

Date
11.07.2024

Duration
1 h 0 m

Persons present including their function
GROSS Cimberley, Carbon Removal Manager
REINKE Benjamin, Project Manager
Philipp Seitz, bio.inspecta AG, Auditor

	very good						not satisfactory
Clarity of documentation	☐	☐	☐	☒	☐	☐	☐
Audit visit preparation:	☐	☐	☐	☒	☐	☐	☐

O.K | Corrective action required | Not verified | Not relevant

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				1	**Audit Description**
☒	☐	☐	☐	1.01	Audited Standard: *Puro.earth CO2 Removal Marketplace General Rules 3.1 – Biochar Methodology (Annex A)*
☒	☐	☐	☐	1.02	Type of Audit: *Output Audit*
☒	☐	☐	☐	1.03	Auditing Body: *bio.inspecta AG, Ackerstrasse 117, CH-5070 Frick* *www.bio-inspecta.ch*
☒	☐	☐	☐	1.04	Audit order assigned to an impartial auditor, free from any conflicts of interest, capable and qualified to complete this audit according to Puro Standard.
☒	☐	☐	☐	1.05	Audit ID: *PE-70401.001*
☒	☐	☐	☐	1.06	Audit Date: *08.07.24*
☒	☐	☐	☐	1.07	Production Facility Location: *Beckumer Str. 87, 59555 Lippstadt*
☒	☐	☐	☐	1.08	Production period: *01.01.23 - 09.04.2024*
☒	☐	☐	☐	1.09	Audit could be finished within the scheduled time frame
				2	**Standing Data Confirmation**

O.K | Corrective action required | Not verified | Not relevant

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				2	**Standing Data Confirmation**
☒	☐	☐	☐	2.01	The standing data has been collected from Puro and checked for consistency against other evidence. (GL Ref.1.2.5.) *Trade registry available; location evidenced; removal method eligible; crediting period encompasses 01.01.23 - 09.04.2024 which corresponds to most of the first production batch ba-de-30-4-1 (19.10.22 - 18.10.23) and the first two months of ba-de-30-4-3 (17.02.24 - 16.02.25). No production during batch ba-de-30-4-2 (19.10.23 - 19.01.24); no public support!*
				3	**Evidence Confirmation**
☒	☐	☐	☐	3.01	All necessary evidence has been provided to the auditor by the Production facility and has been used to complete the compliance checklist. (GL Ref. 5.) *Proof of product quality: (1) EUROFINS laboratory analysis AR-22-FR-025149-01 (13.06.22) for ba-de-30-4-1; (2) EUROFINS analysis AR-24-FR-018373-01 (25.03.24) for ba-de-30-4-3 (no production during ba-de-30-4-2); proof of origin and sustainability of biomass feedstock available; proof of production: output volume measured through weighing and determination of water content; life cycle assessment provided; relevant properties determined via accredited laboratory analyses; representative sampling ensured via EBC sampler accreditation; environmental regulations respected. Biochar use: sales documentation show that no incineration happend. Proof of no double counting: Written declaration of buyer available, Carbon Credit Withdrawal Right issued, thereby transferring the right to generate carbon credits from the carbon content of the biochar.*
				4	**Eligibility Checklist**
☒	☐	☐	☐	4.01	Biochar is used in applications other than energy. (GL Ref. 1.1.1.) *Written declaration of buyers available stating that the said volumes will not be combusted (attached).*
☒	☐	☐	☐	4.02	Biochar is produced from sustainable forest or waste biomass raw materials (consult positive list of biomasses). (GL Ref. 1.1.2) *Renewed and updated FSC and SURE-EU Certificate attached for the ba-de-30-5-2 and ba-de-30-6-1. The SURE certificate did not expire on 25th of January 2024 but is valid until the 20th of December 2024.*

O.K | Corrective action required | Not verified | Not relevant

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				4	**Eligibility Checklist**
☒	☐	☐	☐	4.04	Pyrolysis reactor input fuel for heating is not a fossil fuel. Unless only used for ignition/pre heating or in a mobile unit and the emissions are fully included in the LCA. The use of waste heat from other industrial processess (eg. Biodigesters, cement production) is permitted. (GL Ref. 1.1.4.) *No external energy sources required other than LPG gas for ignition (start-up energy). Included in the LCA. Rule of thumb: 12h per system start with a 450 kW start burner—natural gas or liquid gas as starting gas.*
☒	☐	☐	☐	4.05	Pyrolysis gases are combusted or recovered. Bio-oil and pyrolysis gases can be stored for later use as renewable energy or materials. (GL Ref. 1.1.5.) *The excess gases (Syngases) produced in the pyrolysis are recovered, combusted and converted into heat. They are assumed to cover the full heating requirement for the pyrolysation and drying. Excess heat from this is modelled as a non-valuable by-product and are allocated 0% of the emissions.*
☒	☐	☐	☐	4.06	The molar H/Corg ratio is less than 0.7. *The molar H/Corg ratio significantly below 0.7 according to analytical reference reports for both ba-de-30-4-1 & ba-de-30-4-3 batches.*
☒	☐	☐	☐	4.07	The biochar produced meets any product quality requirements existing in the jurisdiction where biochar is used and for the specific applications considered (GL Ref 1.1.7). *Biochar meets highest quality requirements (AgroOrganic certified against EBC).*
☒	☐	☐	☐	4.08	Evidence of safe handling and transport is provided and adequate for the production facility. (GL Ref. 1.1.8.) *Moisture between 20 - 35% (average dry matter 73,63%) confirmed through moisture measurements of each individual big bag (tendency towards increasing water level observed).*
				5	**LCA Checklist**

O.K Corrective action required Not verified Not relevant

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				5	**LCA Checklist**
☒	☐	☐	☐	5.01	LCA complete and shows: carbon footprint of the biomass production and supply , emissions from the biochar production process , carbon footprint of the biochar end use - cradle to grave. (GL Ref. 1.1.3) *The studied system is a cradle-to-grave within a 100-year time boundary. Infrastructure is included. A1 No activities as the waste is procured burden-free; A2 Transport of the collected feedstock to the drying and pyrolysation site; A3 All materials, fuels, energy, and direct emissions for pyrolyzing the feedstock into biochar; A4 Transporting the biochar to the field where it will be applied; B1 Fuel for spreading the biochar and the carbon leakage that occur within 100 years from application.*
☒	☐	☐	☐	5.02	The CO2 Removal Supplier provides a life cycle assessment (LCA) for biochar activity including disaggregated information on the emissions arising at different stages. The system boundary is set cradle-to-grave and includes emissions from production and supply of the biomass, from biomass conversion to biochar, and from biochar distribution and use. (GL Ref. 3.1) *LCA provided by CHM Analytics. The studied system is a cradle-to-grave* *within a 100-year time boundary. Infrastructure is included.*
☒	☐	☐	☐	5.04	The default baseline emission scenario for the project activity feedstock is zero, which is a conservative assumption since it is not taking into account methane emissions derived from decay of manure or combustion of waste biomass. If a non-zero baseline presented, needs to be accepted by Puro.earth *Combustion of waste biomass is taken into account. Decay of biomass must not be taken into account because of short handling window.*
☒	☐	☐	☐	5.03	Life cycle assessment (LCA) follows ISO standard, WRI GHG protocol or similar method. (GL Ref. 3.2) *LCA follows ISO 14040:2006, ISO 14044:2006 and ISO 14067:2018.*
				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**

O.K Corrective action required Not verified Not relevant

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				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**
☒	☐	☐	☐	6.01	Evidence of Production Facility eligibility under the general rules of Puro Standard. (GL Ref. 1.2.1) *The produced biochar is not used for energy purposes. Biochar produced during the period has been marketed and sold as soil amendment (§1.1.1).* *The feedstock consists exclusively of wood chips (§1.1.4.).* *Feedstock supply for the wood chips is well documented and PEFC sustainably certified (§1.1.2). The facility is EBC-certified (§1.1.7).* *All process emissions have been calculated in the LCA using the cradle-to-grave approach. The following emissions have been accounted for: transport of wood chips to the production site, the manufacturing of the biochar on site, transportation of the biochar, and use of the biochar (§1.1.3).* *Pyrolysis gases are captured and combusted within the reactor to maintain the carbonisation process (§1.1.5).* *The remaining gases are combusted and exhausted. The exhaust emissions have been analysed and quantified (§1.2.4).* *The produced biochar has a high, stable carbon content. The latest lab analysis AR-24-FR-018373-01 by Eurofins (25.03.24) and reference analysis for ba-de-30-4-3 demonstrated an organic carbon content of 91.7% in the dry state, which corresponds to the gross capture of 3.36 kg CO2/kg; whereas lab analysis AR-22-FR-025149-01 (13.06.22) and reference analysis for ba-de-30-4-1 demonstrated an organic carbon content of 73.4% in the dry state, which corresponds to the gross capture of 2.611 kg CO2/kg; (§5.3.3).* *The produced biochar has a H/Corg molar ratio of 0.29 (Eurofins, 2024), well below the 0.7 threshold (§1.1.6).* *Novo Carbo has implemented appropriate measures to ensure the safe storage and transport of the biochar, including quenching of the biochar. They can provide a material safety data sheet for transport and storage. (§1.1.8).* *The potential for methane emissions from stockpiling of wet feedstock onsite and at the supplier has been considered in accordance with the criteria of the EBC (2020).* *There are no emissions from feedstock storage. The potential for fugitive release of syngas from pyrolysis is considered negligible.*
☒	☐	☐	☐	6.02	The Production Facility demonstrate Environmental and Social Safeguards. (GL Ref. 1.2.2.) *Environmental and Social Safeguards submitted.*

O.K Corrective action required Not verified Not relevant

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				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**
☒	☐	☐	☐	6.03	CO2 Removal Supplier shall be able to demonstrate additionality, meaning that the project must convincingly demonstrate that the CO2 removals are a result of carbon finance. Even with substantial non-carbon finance support, projects can be additional if investment is required, risk is present, and/or human capital must be developed. To demonstrate additionality, CO2 removal Supplier must provide full project financials and counterfactual analysis based on Baselines that shall be project-specific, conservative and periodically updated. Suppliers must also show that the project is not required by existing laws, regulations, or other binding obligations. (GL Ref. 1.2.3) *Additionality requirements fulfilled. Additionality statement attached to the validation order.*
☒	☐	☐	☐	6.04	The Production Facility's documentation system is accurate and reliable (GL Ref. 1.2.4) *Each big bag of biochar is weighed and recorded with sequential numbers. Moisture measured for each big bag.*
☒	☐	☐	☐	6.05	The quantity of the biochar produced and sold is quantified and documented in a reliable manner (GL Ref. 1.2.4) *Underlying the LCA is a standardized average moisture content of 20% which underscores the actual average moisture content of 26,37% (73.63% DM) determined through individual moisture measurements of each big bag, thereby leading to excessive dry biochar volumes.*
☒	☐	☐	☐	6.06	Relevant meters are in place and they are calibrated (GL Ref. 1.2.4) *Raw data submitted*
☒	☐	☐	☐	6.07	The emissions from the cultivating, harvesting and transporting of the biomass are estimated and calculated in a reliable manner (GL Ref 1.2.4) *The waste material proceeds from saw mills. After processing in the saw mill, waste wood is not shaped to fit quality specifications of a PX1500.*

O.K | Corrective action required | Not verified | Not relevant

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				6	**Production Facility Checklist (Desktop and Verbal Confirmation).**
☒	☐	☐	☐	6.08	The energy use of the Production Facility can be quantified and the emissions from the process calculated (GL Ref. 1.2.4) *Raw data submitted*
☒	☐	☐	☐	6.09	The auditor goes through the Quantification of CO2 Removal requirements with the CO2 Removal Supplier, so that the Supplier is able to calculate the CO2 Removal independently in its Output Report *Raw data submitted*
				7	**Calculation Checklist**
☒	☐	☐	☐	7.01	Qbiochar = Quantity of biochar produced and sold to end user. (dry char) (GL Ref. 4.2.) *Each big bag of biochar is weighed and recorded with sequential numbers. Average moisture content of 26,37% (73.63% DM) determined through individual moisture measurements of each big bag.*
☒	☐	☐	☐	7.02	FpTHTs = c + m x H/Corg (GL Ref. 4.2.) *Provided in the LCI at given soil temperature and time horizon = 0.86.*
☒	☐	☐	☐	7.03	C Biochar = carbon content of biochar (GL Ref. 4.2.) *The produced biochar has a high, stable carbon content. The latest lab analysis AR-24-FR-018373-01 by Eurofins (25.03.24) and reference analysis for ba-de-30-4-3 demonstrated an organic carbon content of 91.7% in the dry state, which corresponds to the gross capture of 3.36 kg CO2/kg; whereas lab analysis AR-22-FR-025149-01 (13.06.22) and reference analysis for ba-de-30-4-1 demonstrated an organic carbon content of 73.4% in the dry state, which corresponds to the gross capture of 2.611 kg CO2/kg.*

O.K | Corrective action required | Not verified | Not relevant

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				7	Calculation Checklist
☒	☐	☐	☐	7.04	Estored = biochar carbon storage = Qbiochar x Cbiocharorg x FpTHTs x 44/12 (GL Ref. 4.2.) *The laboratory tests show that the biochar has a H/Corg ratio of <0.30, indicating a good level of stability. Using the combination of H/Corg ratio and an average soil temperature of 15ºC, it has been determined that 86% of biochar is durable at 100 years. A 14% buffer has therefore been factored into the carbon removal calculation per the Puro.Earth methodology for biochar.*
☒	☐	☐	☐	7.05	Ebiomass = LCA emissions of production and supply of biomass (GL Ref. 4.3.) *The calculation shows that 8.46 tonnes of CO2e emissions are caused by the wood chips used to produce the biochar during the 2023 validation period. The allocated emissions amount to 55 kg CO2e/tonne of dry biochar. The calculation shows that 3.4 tonnes of CO2e emissions are caused by the wood chips used to produce the biochar during the 2024 validation period. The allocated emissions amount to 51,8 kg CO2e/tonne of dry biochar.*
☒	☐	☐	☐	7.06	Eproduction = LCA emissions from biochar manufacturing (GL Ref. 4.4) *In total, the allocated emissions of greenhouse gases related to the manufacturing of biochar amount to 1.169 kg CO2e per tonne of dry biochar during the 2023 validation period.* *In total, the allocated emissions of greenhouse gases related to the manufacturing of biochar amount to 273,5 kg CO2e per tonne of dry biochar during the 2024 validation period.*
☒	☐	☐	☐	7.07	Euse = LCA emissions of the use of biochar, including distribution up to the point of final use (GL Ref 4.5) *The biochar application emissions are estimated to be 327,7 kg CO2e per tonne of dry biochar during the 2023 validation period.* *The biochar application emissions are estimated to be 221,6 kg CO2e per tonne of dry biochar during the 2024 validation period.*
☒	☐	☐	☐	7.08	CORCs = Estored - Ebiomass - Eproduction - Euse *CORCs (2023 Validation period): 162,050* *CORCs (2024 Validation period): 155,397*

O.K | Corrective action required | Not verified | Not relevant

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				7	**Calculation Checklist**
☒	☐	☐	☐	7.09	Quantity of CORCs (in evidence). *1,058 tCO2 / t (dry) – Batch ba-de-30-4-1 (27.01.23 - 07.03.23)* *2,365 tCO2 / t (dry) – Batch ba-de-30-4-3 (17.02.24 - 31.05.24)*
☒	☐	☐	☐	7.10	Confirm consistency. *Comment: The values indicated in the calculatory paths for emission measuremen are traceable to their source backed by raw data, and therefore exhaustive for validators to quantify CO2 removal requirements.*
				9	**Overall conclusion**
☒	☐	☐	☐	9.01	Overall conclusion: *LCA calculation for the validation period for the validation period 2023 (27.01.23 - 07.03.23) and for the validation period 2024 (17.02.24 - 31.05.24) is expected to provide a credible and faithful account of output volumes and emissions, and thus of declared carbon dioxide removals eligible for CORCs as stated in the Output statement, provided that calculatory paths become fully traceable to their source and backed by raw data.*

Auditor’s evaluation and recommendation

Non-compliance	Corrective action	Deadline
Puro.earth - Biochar Methodology		
None		

The Right to be Heard

The undersigned has reviewed the outcome of the audit documented in this report and confirms the completeness and accuracy of the information provided in the audit and the content of this report.

He/ she has taken note of the non-conformities, measures, deadlines and sanctions described in this report.
The undersigned has the option of submitting a counter-notification in writing to bio.inspecta AG within three working days of receipt of this report. If no reply is received within this period, the contents of this report shall be deemed to be acknowledged.

Frick, 25.09.2024	Lippstadt, ...
bio.inspecta AG / q.inspecta GmbH International Department	Novocarbo GmbH
	.....
Philipp Seitz	name, first name.....
Auditor	function.....