

Baseline and Additionality Assessment

The baseline and additionality assessment is a requirement for eligibility under the Puro Standard.

The assessment is made by the CO₂ Removal Supplier and verified by the independent 3rd party auditor. The assessment made in this document will be publicly available in the Puro Registry.

The Puro Standard only certifies durable carbon removals from the atmosphere that are net-negative and does not certify emissions reductions or avoidance. The CORCs (Carbon dioxide removal certificates), issued therefore represent a net carbon removal (1 tCO₂eq. net) from the atmosphere to a durable storage of minimum 100 years, from which are subtracted any supply-chain emissions from the project, any re-emissions over the guaranteed storage time, and any baseline removals taking place in a baseline scenarios.

The CO₂ Removal Supplier must in this assessment:

- **Define** and quantify all reasonable **baseline alternatives** to the proposed project activity to remove carbon with carbon financing. A baseline is a scenario that reasonably represents the natural and anthropogenic carbon removals to a permanent storage (storage durability over 100 years) in the absence of the carbon removal activity proposed by the CO₂ Removal Supplier. Although anthropogenic emissions may take place in the baseline scenarios, these emissions do not constitute a reference point for the quantification of CORCs (only the baseline removals do).
- Demonstrate **carbon additionality to the baseline**, meaning that the project must convincingly demonstrate that it is resulting to higher volumes of carbon removals than the likely baseline alternatives (question A1.).
- Demonstrate **regulatory additionality**, meaning that the project is not required by existing laws, regulations, or other binding obligations (question A2.).
- Demonstrate **financial additionality**, meaning that the CO₂ removals achieved are a result of carbon finance and that the project activity would not be economically viable without the carbon finance. The project activity can have substantial other non-carbon income sources, if the carbon finance through CORCs is significant for the economic viability of the project. To demonstrate financial additionality, CO₂ removal Supplier must provide the responses in this form and must be able to provide full project financials for verification.

Reference documents: [Puro Standard general Rules v3.0](#), rule 2.1.3 and [Additionality Assessment requirements](#)

Activity name	Activity description	Removals to storage (100+ yr) due to project activity (human activity)	Natural removals to storage (100+ yr)
Baseline scenario 1: Wood sent to landfill	Wood from landscape management, to maintain forest land open and ensure the safety of power installations managed by PG&E, are brought to local landfills and left to rot.	-	None
Project activity: Biochar Production from Slash residue	<i>Takachar operates with various feedstocks across different geographies (multiple "facilities"). In California and Canada they primarily work with forest residues that are sustainable harvested for thinning and forest maintenance. In all instances, biochar is not monetized and thus all projects rely on carbon credit revenues to exist, regardless of feedstock or capacity.</i>	500 t/yr for the first year, 1,250 t/yr thereafter (slash, California and Canada)	-

A1. Does the project lead to higher volumes of carbon removal than the baseline?	Yes / No
In the baseline scenario, wood from landscape management, to maintain forest land open and ensure the safety of power installations managed by PG&E, are dropped off at local landfills and are left to rot or burned to consolidate waste. Instead of burning or wasting biomass, each small scale Takachar unit can produce up to a tonne of biochar a day, leading to about 1-2 tons of CO ₂ removal per equipment per day. Larger units can process up to 10 tons of biochar a day.	Yes

A2. Is the project required by existing laws, regulations, or other binding obligations?	Yes / No
No. Most woody residues are left to rot or set on fire.	No

A3. Is the project first-of-its-kind?	Yes / No
This project is a first-of-its-kind due to the typical practices of landscape management and end-of-life scenarios for wood residues in this region, which are never pyrolyzed. With Takachar's mobile biochar production equipment, biochar can be made directly at the landfill sites, avoiding extra biomass transportation from the baseline scenario. In some cases, biomass may be used for energy purposes, but this doesn't include the production of biochar and so this can be considered a FOAK facility.	Yes

A4. Is the project dependent on carbon finance?	Yes / No
Yes, biochar sales consist of 0-15% of the project's overall revenue. Some biochar has been given away for trials while other biochar has been sold for cost to be able to claim carbon removal. Taking away carbon revenues will make this project not financially viable given up to 100% of revenues come from carbon finance.	Yes

A5. Does the project need a large investment to achieve carbon removal?	Yes / No
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Takachar's equipment is a major investment for the local communities it operates in. The alternative to Takachar's equipment is essentially free, so budgets are limited for waste disposal.	Yes
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A6. If investment is needed, is/was carbon finance considered when the investment decision is/was made?	Yes / No
Yes, carbon credits provide 75-90% of the revenue from project operators. The operators' business model is not feasible without carbon credits as a result. Takachar would not be able to sell equipment without carbon credits because this is the main business model for Takachar customers.	Yes

Some projects may demonstrate additionality through simple cost analysis: this is applicable for projects where ex-ante investment analysis is not applicable, because a large investment is not needed. Example of such project could be charcoal producers starting to produce biochar for soil applications using existing equipment with minor adaptations.

Financial Additionality – large investment is not needed (Answer to A5 is “no”)	Project response
Please describe adaptations needed and the related cost items and include evidence in attachment.	
Please summarize the simple cost analysis here and provide additional calculation spreadsheet in attachment. All formulas used in the spreadsheet shall be readable to the verifier and all relevant cells shall be viewable and unprotected. Mark confidential when needed.	

If large investment is needed, CO₂ Removal Suppliers can be guided by the CDM Methodological Tool 27 of the UNFCCC Clean Development Mechanism [“Investment Analysis”](#) to demonstrate financial additionality.

Financial Additionality – large investment is needed (Answer to A5 is “yes”)	Project response														
Please show your calculations to determine the benchmark rate for either equity IRR or WACC, whichever you are using. Please include documentation of how the rate is suitable for the technology and region.	IRR: Returns the internal rate of return for a series of cash flows represented by the numbers in values. These cash flows do not have to be even, as they would be for an annuity. However, the cash flows must occur at regular intervals, such as monthly or annually. The internal rate of return is the interest rate received for an investment consisting of payments (negative values) and income (positive values) that occur at regular periods. Takachar uses the IRR calculation built in Microsoft Excel, looking at operating revenue for 10 years of the project. Please see further documentation: https://support.microsoft.com/en-us/office/irr-function-64925eaa-9988-495b-b290-3ad0c163c1bc?ns=MACEXCEL&version=90 WACC Calculation <table border="1"> <thead> <tr> <th>Input</th><th>Value</th></tr> </thead> <tbody> <tr> <td>Cost of Equity</td><td>14%</td></tr> <tr> <td>Cost of Debt</td><td>6%</td></tr> <tr> <td>Proportion of Equity</td><td>60%</td></tr> <tr> <td>Proportion of Debt</td><td>40%</td></tr> <tr> <td>Corporate Tax Rate</td><td>25%</td></tr> <tr> <td>WACC</td><td>10%</td></tr> </tbody> </table>	Input	Value	Cost of Equity	14%	Cost of Debt	6%	Proportion of Equity	60%	Proportion of Debt	40%	Corporate Tax Rate	25%	WACC	10%
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Please state how CORC revenues change the expected IRR or NPV of the project.	Takachar IRR with carbon finance (40% capacity): 3% Takachar IRR with carbon finance (100% capacity): 478% Takachar IRR without carbon finance (40% capacity): NA (all negative free cash flow) Takachar IRR without carbon finance (100% capacity): NA (all negative free cash flow)																		
Please conduct a sensitivity analysis in relation to the investment analysis and summarize the results here.	With carbon credits, operating at 100% capacity the payback period is 1 year. With carbon credits, operating at 40% capacity the payback period is 8 years. Without carbon credits, operating at 100% capacity the payback period is more than 20 years. Most sensitive parameters Biochar to CO2e multiple Operational capacity FTE labour Output/input yield Carbon credit price Biomass cost Biochar price																		
Please provide full calculation spreadsheet file as an attachment. All formulas used in the spreadsheet shall be readable to the verifier and all relevant cells shall be viewable and unprotected. Mark confidential when needed.	CORC's are about 75-90% of project operator revenue depending on biochar prices. Results below are for operating at 40% capacity for the first year of issuance. <table><tr><td>Revenue from biochar sales-year 1</td><td>\$/year</td><td>27936,0</td></tr><tr><td>Revenue from carbon credit sales-year 1</td><td>\$/year</td><td>75427,2</td></tr><tr><td>Revenue from tipping fees-year 1</td><td>\$/year</td><td>0,0</td></tr><tr><td>Revenue from local incentives-year 1</td><td>\$/year</td><td>0,0</td></tr><tr><td>Revenue (savings) from waste heat utilization-year 1</td><td>\$/year</td><td>4480,3</td></tr><tr><td>Number of carbon removal credits generated</td><td>credits/year</td><td>503</td></tr></table>	Revenue from biochar sales-year 1	\$/year	27936,0	Revenue from carbon credit sales-year 1	\$/year	75427,2	Revenue from tipping fees-year 1	\$/year	0,0	Revenue from local incentives-year 1	\$/year	0,0	Revenue (savings) from waste heat utilization-year 1	\$/year	4480,3	Number of carbon removal credits generated	credits/year	503
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I hereby declare that all information provided is truthful and precise to the best of my knowledge.

 Recoverable Signature

X Kevin Kung

November 4, 2024; Vancouver, Canada: Signed by: S-1-12-1-2544616491-1188923032-1247431816-2548788569/51070a5d-7bc2-4a75-ace6-880072b28ae
Kevin Kung, Chief Technology Officer, Takachar (Himalayan Sustainable Energy Solutions)