

# Baseline and Additionality Assessment

The baseline and additionality assessment is a requirement for eligibility under the Puro Standard. The assessment is made by the CO<sub>2</sub> Removal Supplier and verified by the independent 3<sup>rd</sup> 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 tCO<sub>2</sub>eq. 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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, CO<sub>2</sub> 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)
<p><b>Baseline:</b>  <i>Forest Wildfire Reduction Landscape Management (no biochar facility)</i></p>	<p>Although forest fires are a natural part of the forest ecosystem, forests in the Western USA, including Oregon, have for a long time suffered from insufficient forest management, where dead biomass, shrubs and saplings are allowed to grow and crowd the forest floor. As a result, and in the occurrence of a fire ignition, this undergrowth acts as kindling and fuel to feed and create large-scale, high-temperature, severe wildfires, leading to destruction of large areas of forests. This phenomenon is exacerbated by climate change induced high air temperatures, and extended drought situations, that create conditions for mega forest fires, that are now approaching a national crisis in the US and elsewhere.</p> <p>To remediate this condition that leads to extreme forest fires, modern forest management focuses on removing this undergrowth through controlled burning (prescribed fire and fuel treatments), or a wildfire reduction treatment, where the undergrowth is systematically harvested and either burned in piles, left to decay, or used for sawmill furnaces as fuel for thermal energy production. This historical background is a significant reason for the location of RFL’s pyrolysis system in John Day, as the town is surrounded by the 1.7-million-acre Malheur National Forest. This forest has been identified as one of 23 ‘priority landscapes’ nationwide under US Forest Service Collaborate Forest Landscape Restoration Program. Wildfire reduction treatments take place in the forest, following Forest Service Fire Management plans for the Malheur National Forest. This includes thinning the number of younger and smaller trees and</p>	<p><b>None</b></p>	<p><b>None</b></p> <p>The landscape management activities (forest thinning, prescribed burns, etc.) do remove some carbon storage from the ecosystem. The carbon losses from the management activities tend to be counter-balanced by increased carbon storage due to improved forest productivity that occurs. Studies have shown that the long-term carbon balance of forests in the US Northwest is near zero for periods exceeding 50 years (Mitchell et al. 2009).</p>

	<p>promoting growth of mature fire-resilient tree species, such as ponderosa pines. The bulk of the harvested material is non-commercial grade dead or living biomass, less than 7” diameter. However, the volumes of slash generated from the restoration projects is considerable, and disposal of the biomass may cause various problems, especially from the incineration of the slash piles in the forests.</p>		
<p><b>Alternative scenario 1:</b> <i>Torrefaction high-carbon pellet facility</i></p>	<p>The Restoration Fuels facility in John Day was originally constructed in 2020 to produce biofuels from biomass collected from the wildfire reduction treatments in the neighbouring Malheur National Forest. The facility was intended to use torrefaction processes to produce high-carbon pellets for use as a coal replacement at Portland General Electric’s Boardman Power Plant and other coal generation facilities in Japan.</p> <p>Following the construction of the Restoration Fuels facility in 2020 the Boardman Power Plant closed, eliminating the primary market that Restoration Fuels had planned to serve. In addition, the COVID pandemic significantly impacted global logistics which resulted in much higher shipping costs to serve foreign markets like Japan. The combination of the Boardman Power Plant closure and the COVID-related shipping cost increases resulted in the need to seek an alternative product (biochar) and markets for the Restoration Fuels facility.</p>	<p><b>None</b></p> <p>The original design of the Restoration Fuels facility was to produce biofuels that would be combusted. An LCA was commissioned by Restoration Fuels for the original biofuels project that estimated 38.4 MT CO<sub>2e</sub> would be avoided for every MT of feedstock processed into biofuels. This avoidance of CO<sub>2e</sub> was due to the use of the biofuel as a replacement for coal. <i>While CO<sub>2e</sub> emissions were avoided from the initial Restoration Fuels facility, no carbon removals would have occurred in that scenario.</i></p>	<p><b>None</b></p>
<p><b>Project activity:</b> <i>Restoration Fuels Biochar Project</i></p>	<p>The Restoration Fuels biochar production pyrolysis facility in John Day Oregon was originally designed as a torrefaction biofuels production facility. The facility was upgraded, refitted, and expanded for</p>	<p><b>Some</b></p> <p>The pyrolysis process of the re-designed Restoration Fuels biochar production facility</p>	<p><b>None</b></p>

	<p>biochar generation operation over 2021 – 2022 time period, and has been generating biochar since early 2023. After a period of commissioning the measurement of biochar generation commenced on September 1, 2023, which is considered the start date for the calculation of CORCs claimed for this project.</p>	<p>will result in a permanent removal of carbon. An LCA study performed for this project predicts the total carbon removal will be 11,437 MT CO<sub>2e</sub> from the processing of 32,727 MT of feedstock.</p>	
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A1. Does the project lead to higher volumes of carbon removal than the baseline?	Yes / No
<p>The baseline scenario (wildfire reduction landscape management activities) assumes that no biochar facility is constructed. In this scenario the wildfire reduction landscape management activities are performed which result in a zero long-term carbon balance for the managed forests.</p> <p>The project scenario utilizes pyrolysis technology to convert portions of the biomass generated from the wildfire reduction landscape management activities into long-term carbon removals.</p> <p><b>The net increase in carbon removal from the project scenario is 11,437 metric tons of CO<sub>2e</sub>.</b></p>	<p>Yes</p>

A2. Is the project required by existing laws, regulations, or other binding obligations ?	Yes / No
<p>The project is not required by existing laws, regulations, or other binding obligations.</p>	<p>No</p>

A3. Is the project first-of-its-kind?	Yes / No
<p>It is believed that the following attributes of this project make it first-of-its-kind:</p> <ol style="list-style-type: none"> <li>1. The project is a conversion of a biofuels torrefaction facility to a biochar pyrolysis facility</li> <li>2. The project utilizes biomass feedstock from the US Forest Service wildfire reduction landscape management program</li> </ol>	<p>Yes</p>

A4. Is the project dependent on carbon finance?	Yes / No
The decision made by Restoration Fuels to convert the original torrefaction facility to a biochar pyrolysis facility was entirely based on carbon revenues. If the biochar facility does not generate carbon revenues it will be deemed economically unsustainable and will be shut down.	Yes

A5. Does the project need a large investment to achieve carbon removal ?	Yes / No
	No

A6. If investment is needed, is/was carbon finance considered when the investment decision is/was made?	Yes / No
The opportunity to access carbon finance was the driving factor in conversion of the facility to produce biochar. Without the additional revenue from the sale of carbon removal credits, the high cost of feedstock from forest restoration treatments and biochar production would not be economically justified.	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.

<b>Financial Additionality – large investment is not needed (Answer to A5 is “no”)</b>	<b>Project response</b>
<p><b>Please describe adaptations needed and the related cost items and include evidence in attachment.</b></p>	<p>The facility was originally designed to process waste woody biomass at approximately 350C to produce a torrefied wood fuel. To produce biochar meeting the requirements as a carbon removal credit, the operating temperature within the pyrolysis system need to be increased to approximately 500C. There are two main investments needed to accomplish this.</p> <p>For the physical plant, a limited number of physical modifications needed to be done to accommodate the higher temperature. The main investment was in the replacement of fans that are rated for the higher temperatures.</p> <p>The other area of investment is on the operations. When producing the lower temperature torrefied wood fuel, the yield was approximately 70%. Meaning for every 1 dry ton of waste woody biomass that was utilized, 0.7 tons of finished product was produced. When producing biochar, the yield is approximately 30%, so for every physical ton of biochar produced, it requires 3 tons of woody biomass. The cost to procure, handle and process the woody biomass into the Restoration Fuels process is approximately \$90 per ton. Thus, the cost of raw material inputs increased from Approximately \$129/ton to ~\$300/ton.</p>
<p><b>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.</b></p>	<p>Below is a simple cost analysis based on an annual projection for the facility. A copy of this simplified financial model has been uploaded. Additional financial details can be provided upon request.</p>

		<b>Tons Produced</b>	9,500
		<b>Sales Realization</b>	\$ 700.00
			<u><b>Raw Materials</b></u>
		<b>Total Raw Materials Cost per Ton</b>	\$ 297.50
			<u><b>Direct Labor</b></u>
		<b>Total Direct Labor Cost per Ton</b>	\$ 145.26
			<u><b>Variable Costs</b></u>
		<b>Total Variable Cost per Ton</b>	\$ 104.04
			<u><b>Fixed Costs</b></u>
		<b>Total Fixed Cost per Ton</b>	\$ 53.36
			<u><b>General &amp; Administrative</b></u>
		<b>Total G&amp;A Cost per Ton</b>	\$ 50.72
		<b>Fully Loaded Cost per Ton</b>	\$ 650.89

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.	
Please state how CORC revenues change the expected IRR or NPV of the project.	

<p>Please conduct a sensitivity analysis in relation to the investment analysis and summarize the results here.</p>	
<p>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.</p>	

I hereby declare that all information provided is truthful and precise to the best of my knowledge.

  
X

November 28, 2023  
Matt Krumenauer, CEO  
Restoration Fuels, LLC