

Puro Standard

PRODUCTION OUTPUT AUDIT

STATEMENT

Statement No:
DNV-2024-ASR-C717583

Issuance date:
19.8.2024

Production Facility Audit Statement validity: 5 years
1.12.2023 – 30.11.2028

DNV Business Assurance Finland Oy Ab has verified, in accordance with Puro Standard General Rules (Version 3.1 published 1.6.2023), the CO₂ removal achieved by the organization:

Climeworks AG



The result of the output audit is reported in the document entitled "PURO OUTPUT AUDIT REPORT" dated 19.8.2024 detailing the activities carried out at the following sites:

Orca (Nordurvelli 4, 816 Ölfus), operated by Climeworks (project applicant), inclusive of the transport and storage infrastructure operation subcontracted from Carbfix hf.

Facility ID: 643002406801001425

VERIFICATION OPINION

Based on the verification process, DNV states that the organization was found to have defined and maintained procedures relevant for production of CO₂ removal according to the method: Geologically Stored Carbon (with Direct Air Capture). Based on this statement the Organization is found compliant with Puro standard requirements.

Verification opinion: **POSITIVE**

OUTPUT AUDIT

Audited Output production period: 1.3.2024 – 30.6.2024

Reports and data files for the quantification of CO₂ removal have been produced and updated in a reliable way to assess the CO₂ removal achieved by Geologically Stored Carbon with Direct Air capture.

Detailed removals

CO₂ captured (C captured): 560.39 tn CO₂eq.

CO₂ losses (C loss¹): 0.16 tn CO₂eq.

¹ See PURO output report Climeworks GSC Mar-Jun24 for further explanation.

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CO₂ stored (C stored): 560.23 tn CO₂eq.

Project Emissions (E project): 131.20 tn CO₂eq.

CO₂ removal eligible for CORCs: 429.03 tn CO₂eq.

Verification Objective

The objective of this verification is to assess compliance to the below reported verification criteria. The verification results are reported in the document entitled "PURO OUTPUT AUDIT REPORT" dated 19.8.2024 relative to Climeworks AG.

Verification Scope

Scope of verification

- Output for the period of 1.3.2024 – 30.6.2024 for CO₂ removal method: Geologically stored Carbon with Direct Air Capture

Verified areas

- Production output of Geologically Stored Carbon for the period of 1.3.2024 – 30.6.2024

Level of Assurance

The verification was conducted by DNV with a reasonable level of assurance. An audit is based on verification of a sample of available information. Consequently, there is an element of uncertainty reflected in the audit findings. An absence of nonconformities does not mean that they do not exist in audited and/or other areas. Prior to awarding or renewing certification this report was also subject to an independent DNV internal review which may have affected the report content and conclusions.

Verification Criteria

Puro Standard General Rules (Version 3.1 published 1.6.2023)

Geologically Stored Carbon Methodology Edition 2021, V1.1

DNV Business Assurance Finland Oy Ab

X

Auditor

X

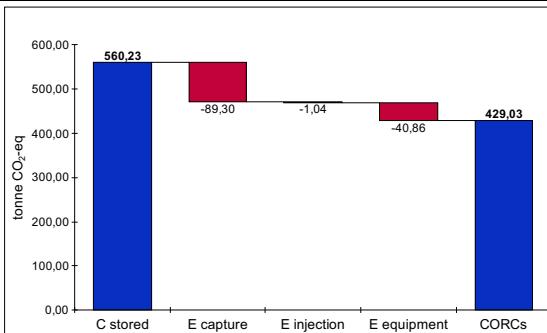
Reviewer

The contents of this sheet are meant to be public available in the Puro registry. The information provided here must reflect the audited reporting period and result in the same final numbers as audited. Certain confidential information can be either aggregated or hidden, in which case an explanation must be provided.

Reporting period & Facility	
Reporting period start	1.Mar.24
Reporting period end	30.Jun.24
Facility name	Orca, Hellisheiði

Contributions		Total over period, tonne CO ₂ -eq	Source / Clarification / Footnote
Level 1	Level 2		
C stored	C captured	-560,39	A
C stored	C loss	0,16	A
E capture	Energy capture	55,45	B
E capture	Sorbent	26,98	C
E capture	Water	6,87	D
E injection	Energy storage	1,04	E
E equipment	Injection + transport eq	5,82	F
E equipment	DAC project equipment	35,04	G
	CORCs	429,03	
CORC factor (net removed / gross stored)		0,77	
Carbon stored (deducting losses)		-560,23	
Grey emissions / loss to LCA		131,2	

Contributions	Total over period, tonne CO ₂ -eq
Level 1	
C stored	560,23
E capture	-89,30
E injection	-1,04
E equipment	-40,86
CORCs	429,03



Space below can be used to provide further contextual information and data sources, as relevant via the Footnote table

Instructions: in any of the tables above, in the column "Source / Clarification / Footnote" insert one or several footnotes ID (e.g. A, B, C, D ...). In the table below, provide the footnote ID and text explanation as needed

This information will be added to the public disclosure, where relevant e.g. near the CORC figure or table, possibly as bullet points. Only formatting change may be performed by Puro.

>>FootnoteTableStart<<

Footnote ID	Topic	Public clarification
A	CO ₂ Captured	The figures reporting the capture, release and storage of CO ₂ are provided monthly by Climeworks' partner, Carbfix. Climeworks and Carbfix co-developed the world's first full-chain verification methodology dedicated to carbon dioxide removal via DAC and underground mineralization storage. Following ISO 14064-2, this methodology has been validated by DNV, an independent quality and assurance leader. In conducting one of their onsite audits, DNV concluded that Climeworks and Carbfix measured net capture accurately, avoided any chance of double counting and were transparent and accountable to the verification process.
A	CO ₂ Released	
B	Energy capture	Thermal and electrical energy use in mWh is based on monthly invoices from the energy provider, ON. The energy source is Hellisheiði geothermal plant with an emission factor based on a 2019 LCA specific to that plant and their double flash geothermal technology. Emission factors for thermal and electrical energy for Orca are calculated on an exergy-based allocation. This allocation system is compliant with the World Resource Institute and GHG Protocol on Combined Heat and Power and it is highly recommended and widely used in LCA studies of the geothermal sector.
C	Sorbent	Climeworks uses a portfolio of sorbents at its plant at Orca. For each sorbent, Climeworks has commissioned ISO 14040 cradle-to-gate and gate-to-grave LCAs and the weighted average of the sorbents' emission factors is used in the verification process.
D	Freshwater pumping	This figure represents the electrical energy associated with pumping freshwater and is based on monthly invoices from the energy provider, ON.
E	Energy injection	This figure represents the electrical energy associated with injecting CO ₂ and is based on monthly invoices from the energy provider, ON.
F	Equipment injection	Climeworks and its partner, Carbfix, commissioned an external cradle-to-gate and gate-to-grave LCA for the Injection and Transport System of captured CO ₂ . This LCA includes raw materials acquisition, pre-processing, construction, transport, and end-of-life of all materials. Excluding ramp-up and phase-down periods, these emissions are amortized monthly.
G	Equipment DAC project	Weighted average of steel, concrete and other ancillary materials used in plant construction. As Orca is a first of a kind plant, a generous contingency for repairs and maintenance has been included. Excluding ramp-up and phase-down periods, these emissions are amortized monthly.