Review Report

June 12, 2026

Report Number: CF-2026-05-21278845

Critical Review of a Life Cycle Assessment Study for fossil-based and CCU-based EVA copolymer- commissioned by ON Running

Commissioner:

ON AG
Förrlibuckstr. 190
8005, Zürich

Practitioner:

Carbon Minds GmbH
Eupener Str. 165
50933 Köln

Final Documents after Review Process:

Report:
- *Comperative_LCA_for_ON_Running_CM_final_delivery.pdf, (sent 26.05.2026)*
- *Comperative_LCA_for_ON_Running_CM_final_delivery.docx, (sent 26.05.2026)*

Calculation:
- *2R_TUV_EVA_Copolymer_Cut-off_Approach.xlsx, (sent 21.05.2026)*
- *2R_TUV_EVA_Copolymer_Credit_Approach.xlsx (sent 20.05.2026)*
- *1R_TUV_EVA_Copolymer_Fossil.xlsx (13.05.2026)*

Review Meetings/ calls:
- *10.04.2026*
- *29.04.2026*
- *06.05.2026*
- *13.05.2026*
- *19.05.2026*
- *22.05.2026*

All correspondence exchanged during the review process, as well as the practitioner's responses, can be accessed in the respective project documentation.

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Amtsgericht Köln HRB 56171
Ust.-Id-Nr.: DE 814653989

Project:	Life Cycle Assessment Report of fossil-based and CCU-based EVA copolymer
Commissioner:	ON AG Förrlibuckstr. 190 8005, Zürich
Practitioner:	Carbon Minds GmbH Eupener Str. 165 50933 Köln
Contact Person/s:	Anna Ossolinska-Baldach and Kaccnny Carvalho (Practitioner)
Date of Creation:	June 12, 2026
Evaluated Potential Environmental Impacts:	All EF 3.1 LCIA-categories and detailed analyses for climate change according to ISO 14067:2018 based on IPCC 2021
Critical Review Responsible(s): Internal peer review:	TÜV Rheinland Energy & Environment GmbH (TREE) Jocelyn Sobiech (Sustainability Expert); Project Lead Florian Schmitt (Sustainability Expert); Team Member Ran Tao (Sustainability Expert)
Applied Standards	- ISO 14040:2006+ A1:2020 - ISO 14044:2006+ A1:2018+A2:2020 - ISO 14071:2024
System Boundary:	cradle-to-gate
Product System:	fossil-based and CCU-based EVA copolymer
Functional Unit:	Production of 1 kg of unpacked EVA copolymer at the production site gate
Reference Year/ Period:	2025
Study Report:	Comparative Life Cycle Assessment (LCA) of Fossil-Based and CCU-Based EVA Copolymer
Reviewed Results:	See Annex

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1. General Information and Background of the Study

TÜV Rheinland Energy & Environment GmbH (TREE) was commissioned by ON AG to carry out the critical review and verification of "Comparative Life Cycle Assessment (LCA) of Fossil-Based and CCU-Based EVA Copolymer".

The study considers the following functional unit:

Production of 1 kg of unpacked EVA copolymer at the production site gate

The calculation and reporting were performed by Anna Ossolinska-Baldach, Kaccnny Carvalho and Oskar Vögler (Carbon Minds GmbH) as practitioners for ON AG.

To strengthen the validity of the results and interpretations, a critical review and verification was carried out. This has been done in accordance with the international standard ISO 14071:2024 by checking the requirements ISO 14040:2006+A1:2020, ISO 14044:2006+A1:2017+A2:2020 and the general information provided in Together for Sustainability - The Product Carbon Footprint Guideline for the Chemical Industry, Version 3.0-December 2024 (TfS-Guideline). Because the international standard does not specify whether the review is carried out concomitantly or a posteriori, both embodiments are in accordance with the standard. The reviewer was commissioned after the completion of the study (a posteriori). The study is a a proof-of-concept calculation and was prepared ex ante for a potential process pathway.

Preliminary reports, calculations and insights in the lifecycle inventory were delivered in April 2026. The critical review resulted in 63 comments of a general, technical and editorial nature, which were communicated to the client on 23rd of April 2026. Open questions were discussed during different meetings from April to May 2026 and exchange via email in the same timeframe. The practitioner of the study has integrated the comments afterwards and provided a revised final report on 26th of May 2026.

The aim of the critical review is to check the reliability, transparency, relevance and representativeness of the methods and data used in this Product Carbon Footprint (PCF) study. TÜV Rheinland's conclusions presume that the information and data provided by Client is accurate. The review process was performed by Ms. Jocelyn Sobiech and Mr. Florian Schmitt.

2. Standards and Criteria

The review is carried out according to the international standard ISO 14071:2024 by checking the requirements ISO 14040:2006+A1:2020, ISO 14044:2006+A1:2017+A2:2020 and general information of TfS-Guideline v3.0. The critical review shall ensure that:

- „the methods used to carry out the LCA are consistent with this international standard,
- the methods used to carry out the LCA are scientifically and technically valid,
- the data used are appropriate and reasonable in relation to the goal of the study,
- the interpretations reflect the limitations identified and the goal of the study, and
- the study report is transparent and consistent."

3. Results of the Critical Review

3.1 Objective and Use of the Study

The aim of the study is to assess the potential environmental impacts associated with the production of fossil based and carbon capture and utilization (CCU)-based production routes for ethylene vinyl acetate (EVA) copolymer at the production site gate. The study evaluates alternative feedstock pathways under harmonized methodological assumptions within an attributional modeling framework. In this case, the results might be used for external communication with customers and/or interested experts (e.g. at conferences, press releases).

To make comprehensive statements regarding the potential environmental impacts of the products, the reviewer recommends calculating and presenting further relevant environmental impact categories in the future. It should also be noted that no comparative statements on overall environmental performance can be made based on only one impact category. Furthermore, when comparing different products, it is always important to ensure that e.g. the used data quality, the calculation procedures and allocation approaches applied are equivalent. The present study is not intended to be used for comparative assertions with non-Client systems to be disclosed to the public. As this is a proof-of-concept study, the reviewers recommend using primary activity data from the manufacturing processes for a more accurate assessment. For the present proof of concept, qualified literature data were used for the calculation.

3.2 Used Methods in this Study

The assessment following the requirements of ISO 14040:2006+A1:2020, ISO 14044:2006+A1:2017+A2:2020 and is based on TfS-Guideline v3.0 requirements. In the calculation of the LCA, all relevant environmental impacts from "cradle to gate" were considered using the LCIA methodology EF 3.1 with IPCC AR6 characterization factors.

The selected impact categories follow the requirements of international standards ISO 14040:2006+A1:2020, ISO 14044:2006+A1:2017+A2:2020. In addition, they are in line with the defined goal and scope of the study.

The life cycle calculation approach was partially applied in the present LCA study, as all relevant production-related impacts, including upstream processes (cradle to gate) were considered. Consequently, distribution, use phase and end-of-life processes were not included in the scope. The methodological framework is scientifically justified and reflects the current state of the art.

For the foreground system allocation hierarchy is applied as proposed by the by ISO 14040:2006 + A1:2020, ISO 14044:2006 + A1:2017 + A2:2020, and the TfS PCF Guideline, Version 3.0. For the calculation of the CCU-based product, both the scenario applying the cut-off approach and the credit approach as a second scenario were considered, discussed, and compared. Both scenarios are specified in the TfS Guideline as possible approaches with specific requirements and therefore represent the state of the art.

Additionally, other allocation methods may be applied in the secondary datasets (background system) of the generic databases used. These datasets utilize allocation methods such as allocation by mass, energy content, economic value, or mole ratio. More details can be found in the respective dataset description. The allocation methods used for co-product allocation in this study are state of the art and appropriate for the respective processes.

3.3 Used Data

For the present study, 2025 is used as the reference year. The foreground data used for the assessment are mainly sourced from literature, as no primary data from the production processes are currently available. Only a general production concept and possible locations are known. For the background data, secondary data from Carbon Minds database , Ecoinvent and other industry associations such as Plastics Europe, were used. Secondary data were selected to be as up-to-date as possible. Altogether the data quality is assumed to be fair/ suitable. It can be assumed that these data are appropriate. Nonetheless, a quality check in form of a factory inspection was not performed. To ensure data traceability, the calculations and documentation were explained to the reviewer in detail. Thus, the data collection process was checked by the reviewer. All data seem to be conclusive in itself as well as in relation to the objective of the study.

The data review (audit based on sampling) considered the following aspects:

- Review of data collection methods used,
- Verification of the input data of the LCA study (e.g. weights, materials, fuel and energy consumption, emissions, etc.) and
- Review of the software model and the generic data sets used.

The correct assignment of characterization factors as well as the correctness of individual data sets are the responsibility of the database provider, e.g. Sphera and was not checked by TÜV Rheinland. Furthermore, the assessment did not include a verification of the company's internal control mechanisms, such as internal quality assurance routines, self-monitoring activities or the accuracy of the self-measured or self-reported foreground data provided by the client.

3.4 Transparency and Consistency of the Study

It was noted by the reviewer that the study report follows the requirements of ISO 14040:2006+A1:2020, ISO 14044:2006+A1:2017+A2:2020. These standards provide a framework for presenting an LCA study in a clear and understandable way. The final study report is coherent, understandable, and clear. The results were presented in a consistent, complete, and transparent manner. Both the tabular and the graphical representations of results are clear and comprehensible. The explanations concerning assumptions and results are sufficient. Furthermore, conclusions and recommendations are included, which outline the most important influence factors in a reasonable and transparent way.

If the study report, or individual parts of the LCA study, are to be published, a comprehensive presentation of the methodology, assumptions, limitations, and results is recommended. Since this project is considered an ex-ante study and addresses the specific case of CCU-based products, the reviewers strongly recommend that all assumptions, limitations, and distinctions between the CCU-based calculation scenarios be communicated in a transparent and plausible manner. Furthermore, no general statements should be made regarding comparisons with other production processes or products, in particular products not belonging to the client.

4. Summary of the Critical Review

The present study is on behalf of On AG (*Förrlibuckstrasse 190; 8005 Zürich; Switzerland*) and was commissioned by practitioners Ms. Anna Ossolinska-Baldach and Ms. Kaccnny Carvalho (Carbon Minds GmbH; *Eupener Str. 165; 50933 Köln; Germany*).
The critical review process was performed by Ms. Jocelyn Sobiech and Mr. Florian Schmitt (TÜV Rheinland Energy & Environment GmbH) after completion of the study.

The independent critical review is carried out in accordance with the international standards:

- ISO 14040:2006 + A1:2020
- ISO 14044:2006 + A1:2018 + A2:2020.
- ISO 14071:2024

The critical review covered the following study:

Life Cycle Assessment Report
of fossil-based and CCU-based EVA copolymer

The study presents information about the global warming potential (GWP) based on IPCC 2021 AR6, and about environmental impact categories using EF 3.1 method, for 1 kg of EVA copolymer at the factory gate (unpacked). The study is intended to assess the feasibility of using CCU in EVA production. The LCA study covers life cycle phases from the production of raw materials, their transportation and their transformation into EVA copolymer up to the factory gate (cradle-to-gate). The results are summarized and presented in a comprehensive study report.

It was determined that the data used and the calculation of greenhouse gas (GHG) emissions, expressed as CO_2 equivalents, are scientifically robust and aligned with the state of the art. The assessed samples of input data and environmental information were found to be plausible. The presentation of results is clear and comprehensible. All steps of the study were carried out in accordance with the referenced standards and are scientifically justified. Results and data are consistent. Necessary recommendations for the report were discussed during the review.

This review report states that

the calculation has been conducted and critically reviewed
in accordance with the applicable standards for Life Cycle Assessment.

Literature

ISO 14040:2006 + A1:2020: International Organisation for Standardisation (ISO):
Environmental management – Life cycle assessment – Principles and framework, Beuth Verlag, Berlin, 2006

ISO 14044:2006 + A1:2017 + A2:2020: International Organisation for Standardisation (ISO):
Environmental management – Life cycle assessment – Requirements and guidelines, Beuth Verlag, Berlin, 2006

ISO 14067:2018
Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification

Together for Sustainability PCF Guideline: 2024
The Product Carbon Footprint Guideline for the Chemical Industry, Specification for product Carbon Footprint and Corporate Scope 3.1 Emission Accounting and Reporting, Version 3.0 - December 2024

ISO 14071:2024
Environmental management — Life cycle assessment — Critical review processes and reviewer competencies

Cologne, 12th of June 2026

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Annex: Reviewed Results

1.1 Pathway 1: fossil-based EVA copolymer

The environmental impacts of 1 kg of fossil-based EVA copolymer production at the production site for ON Running are listed in Table .

Table 2. Life Cycle Impact Assessment (EF3.1) and compliant with ISO 14067 based on the IPCC 2021, for Pathway 1 (Fossil-based). FU: Production of 1 kg of unpacked EVA copolymer at the production site gate.

Environmental impact method	Environmental impact category	Indicator	Results	Unit
EF v3.1	acidification	accumulated exceedance (AE)	1.24E-02	mol H+-Eq
EF v3.1	climate change: total	global warming potential (GWP100)	3.12	kg CO_2eq
EF v3.1	climate change: biogenic	global warming potential (GWP100)	8.63E-04	kg CO_2eq
EF v3.1	climate change: fossil	global warming potential (GWP100)	3.12	kg CO_2eq
EF v3.1	climate change: land use and land use change	global warming potential (GWP100)	1.08E-03	kg CO_2eq
EF v3.1	ecotoxicity: freshwater	comparative toxic unit for ecosystems (CTUe)	11.80	CTUe
EF v3.1	ecotoxicity: freshwater, inorganics	comparative toxic unit for ecosystems (CTUe)	11.44	CTUe
EF v3.1	ecotoxicity: freshwater, organics	comparative toxic unit for ecosystems (CTUe)	0.36	CTUe
EF v3.1	eutrophication: freshwater	fraction of nutrients reaching freshwater end compartment (P)	76.07	kg P-Eq
EF v3.1	resource use, fossils	abiotic depletion potential (ADP): fossil fuels	6.68E-04	MJ, net calorific value
EF v3.1	eutrophication: marine	fraction of nutrients reaching marine end compartment (N)	2.41E-03	kg N-Eq
EF v3.1	eutrophication: terrestrial	accumulated exceedance (AE)	2.46E-02	mol N-Eq
EF v3.1	human toxicity: carcinogenic	comparative toxic unit for human (CTUh)	6.27E-10	CTUh
EF v3.1	human toxicity: carcinogenic, inorganics	comparative toxic unit for human (CTUh)	2.22E-10	CTUh
EF v3.1	human toxicity: carcinogenic, organics	comparative toxic unit for human (CTUh)	4.05E-10	CTUh
EF v3.1	human toxicity: non-carcinogenic	comparative toxic unit for human (CTUh)	1.09E-08	CTUh
EF v3.1	human toxicity: non-carcinogenic, inorganics	comparative toxic unit for human (CTUh)	9.97E-09	CTUh

EF v3.1	human toxicity: non-carcinogenic, organics	comparative toxic unit for human (CTUh)	8.96E-10	CTUh
EF v3.1	ionising radiation: human health	human exposure efficiency relative to u235	1.76E-01	kBq U235-Eq
EF v3.1	land use	soil quality index	6.14	dimensionless
EF v3.1	resource use, minerals and metals	abiotic depletion potential (ADP): elements (ultimate reserves)	2.37E-06	kg Sb-Eq
EF v3.1	ozone depletion	ozone depletion potential (ODP)	8.58E-08	kg CFC-11-Eq
EF v3.1	particulate matter formation	impact on human health	1.03E-07	disease incidence
EF v3.1	photochemical oxidant formation: human health	tropospheric ozone concentration increase	1.31E-02	kg NMVOC-Eq
EF v3.1	water use	user deprivation potential (deprivation-weighted water consumption)	0.31	m3 world Eq deprived

1.2 Pathway 2a: CCU-based EVA copolymer (credit Approach)

The environmental impacts of 1 kg CCU-based EVA copolymer production, at the production site for ON Running, following the Credit Approach, are listed in Table 3.

Table 3. Life Cycle Impact Assessment (EF3.1) and compliant with ISO 14067, based on the IPCC 2021, for Pathway 2a (Credit Approach). FU: Production of 1 kg of unpacked EVA copolymer at the production site gate.

Environmental impact method	Environmental impact category	Indicator	Results	Unit
EF v3.1	acidification	accumulated exceedance (AE)	1.83E-02	mol H+-Eq
EF v3.1	climate change: total	global warming potential (GWP100)	0.4997	kg CO_2eq
EF v3.1	climate change: biogenic	global warming potential (GWP100)	1.99E-03	kg CO_2eq
EF v3.1	climate change: fossil	global warming potential (GWP100)	0.494	kg CO_2eq
EF v3.1	climate change: land use and land use change	global warming potential (GWP100)	3.20E-03	kg CO_2eq
EF v3.1	ecotoxicity: freshwater	comparative toxic unit for ecosystems (CTUe)	1.00E+04	CTUe
EF v3.1	ecotoxicity: freshwater, inorganics	comparative toxic unit for ecosystems (CTUe)	27.2	CTUe
EF v3.1	ecotoxicity: freshwater, organics	comparative toxic unit for ecosystems (CTUe)	9.99E+03	CTUe

EF v3.1	eutrophication: freshwater	fraction of nutrients reaching freshwater end compartment (P)	40.8	kg P-Eq
EF v3.1	resource use, fossils	abiotic depletion potential (ADP): fossil fuels	1.05E-03	MJ, net calorific value
EF v3.1	eutrophication: marine	fraction of nutrients reaching marine end compartment (N)	2.81E-03	kg N-Eq
EF v3.1	eutrophication: terrestrial	accumulated exceedance (AE)	3.05E-02	mol N-Eq
EF v3.1	human toxicity: carcinogenic	comparative toxic unit for human (CTUh)	5.00E-06	CTUh
EF v3.1	human toxicity: carcinogenic, inorganics	comparative toxic unit for human (CTUh)	2.27E-08	CTUh
EF v3.1	human toxicity: carcinogenic, organics	comparative toxic unit for human (CTUh)	4.98E-06	CTUh
EF v3.1	human toxicity: non-carcinogenic	comparative toxic unit for human (CTUh)	1.41E-05	CTUh
EF v3.1	human toxicity: non-carcinogenic, inorganics	comparative toxic unit for human (CTUh)	1.42E-06	CTUh
EF v3.1	human toxicity: non-carcinogenic, organics	comparative toxic unit for human (CTUh)	1.26E-05	CTUh
EF v3.1	ionising radiation: human health	human exposure efficiency relative to u235	9.82	kBq U235-Eq
EF v3.1	land use	soil quality index	12.5	dimensionless
EF v3.1	resource use, minerals and metals	abiotic depletion potential (ADP): elements (ultimate reserves)	1.11E-04	kg Sb-Eq
EF v3.1	ozone depletion	ozone depletion potential (ODP)	4.99E-06	kg CFC-11-Eq
EF v3.1	particulate matter formation	impact on human health	1.39E-07	disease incidence
EF v3.1	photochemical oxidant formation: human health	tropospheric ozone concentration increase	1.33E-02	kg NMVOC-Eq
EF v3.1	water use	user deprivation potential (deprivation-weighted water consumption)	0.661	m3 world Eq deprived

1.3 Pathway 2b: CCU-based EVA copolymer (Cut-off Approach)

The environmental impacts of 1 kg CCU-based EVA copolymer production, at the production site for ON Running, following the Cut-off Approach, are listed in Table 4.

Table 4. Life Cycle Impact Assessment (EF3.1) and compliant with ISO 14067, based on the IPCC 2021, for Pathway 2b (Cut-off Approach). FU: Production of 1 kg of unpacked EVA copolymer at the production site gate.

Environmental impact method	Environmental impact category	Indicator	Results	Unit
EF v3.1	acidification	accumulated exceedance (AE)	1.83E-02	mol H+-Eq
EF v3.1	climate change: total	global warming potential (GWP100)	4.32	kg CO_2eq
EF v3.1	climate change: biogenic	global warming potential (GWP100)	1.99E-03	kg CO_2eq
EF v3.1	climate change: fossil	global warming potential (GWP100)	4.32	kg CO_2eq
EF v3.1	climate change: land use and land use change	global warming potential (GWP100)	3.20E-03	kg CO_2eq
EF v3.1	ecotoxicity: freshwater	comparative toxic unit for ecosystems (CTUe)	1.00E+04	CTUe
EF v3.1	ecotoxicity: freshwater, inorganics	comparative toxic unit for ecosystems (CTUe)	27.2	CTUe
EF v3.1	ecotoxicity: freshwater, organics	comparative toxic unit for ecosystems (CTUe)	9.99E+03	CTUe
EF v3.1	eutrophication: freshwater	fraction of nutrients reaching freshwater end compartment (P)	40.8	kg P-Eq
EF v3.1	resource use, fossils	abiotic depletion potential (ADP): fossil fuels	1.05E-03	MJ, net calorific value
EF v3.1	eutrophication: marine	fraction of nutrients reaching marine end compartment (N)	2.81E-03	kg N-Eq
EF v3.1	eutrophication: terrestrial	accumulated exceedance (AE)	3.05E-02	mol N-Eq
EF v3.1	human toxicity: carcinogenic	comparative toxic unit for human (CTUh)	5.00E-06	CTUh
EF v3.1	human toxicity: carcinogenic, inorganics	comparative toxic unit for human (CTUh)	2.27E-08	CTUh
EF v3.1	human toxicity: carcinogenic, organics	comparative toxic unit for human (CTUh)	4.98E-06	CTUh
EF v3.1	human toxicity: non-carcinogenic	comparative toxic unit for human (CTUh)	1.41E-05	CTUh
EF v3.1	human toxicity: non-carcinogenic, inorganics	comparative toxic unit for human (CTUh)	1.42E-06	CTUh

EF v3.1	human toxicity: non-carcinogenic, organics	comparative toxic unit for human (CTUh)	1.26E-05	CTUh
EF v3.1	ionising radiation: human health	human exposure efficiency relative to u235	9.82	kBq U235-Eq
EF v3.1	land use	soil quality index	12.5	dimensionless
EF v3.1	resource use, minerals and metals	abiotic depletion potential (ADP): elements (ultimate reserves)	1.11E-04	kg Sb-Eq
EF v3.1	ozone depletion	ozone depletion potential (ODP)	4.99E-06	kg CFC-11-Eq
EF v3.1	particulate matter formation	impact on human health	1.39E-07	disease incidence
EF v3.1	photochemical oxidant formation: human health	tropospheric ozone concentration increase	1.33E-02	kg NMVOC-Eq
EF v3.1	water use	user deprivation potential (deprivation-weighted water consumption)	0.661	m3 world Eq deprived