

Accounting for real decarbonisation of tech supply chains

Strengthening scope 3 and product carbon footprint rules



Accounting for real decarbonisation of tech supply chains

Strengthening scope 3 and product carbon footprint rules

Authors

Silke Mooldijk
Eve Fraser

Design

Polina Korneeva

Editing

Laeticia (Hyunju) Ock
Lena Stüdeli

Communications

Louise Bammel

Disclaimer

The views and assumptions expressed in this report represent the views of the authors and not necessarily those of the funder.

Citation

NewClimate Institute (2026). Accounting for real decarbonisation of tech supply chains: Strengthening scope 3 and product carbon footprint rules. Available at: <https://newclimate.org/resources/publications/accounting-for-real-decarbonisation-of-tech-supply-chains>

This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/) for non-commercial use.

Summary

We are at a pivotal moment for strengthening value chain and product-level greenhouse gas accounting rules. The GHG Protocol is revising its scope 3 guidance and developing a new actions and market instruments standard, while the GHG Protocol and ISO are jointly developing a product-level accounting standard.

Strong accounting rules are highly relevant for big tech companies because much of their climate footprint is electricity-related and sensitive to how renewable electricity is accounted for. Driven by AI and data centre growth, tech sector emissions are rising rapidly. About half of big tech companies' emissions stem from data centre electricity consumption, while the other half comes from supplier manufacturing, mainly semi-conductors. Phasing out fossil fuel dependence and expanding renewable electricity access are critical levers for decarbonising their upstream value chains.

It is common malpractice among big tech companies to use market-accounting for their upstream, and sometimes downstream, value chain emissions. Although current GHG Protocol accounting guidelines require companies to report location-based scope 3 emissions, the big five – Amazon, Apple, Google, Meta and Microsoft – use EACs and market-based accounting. This creates transparency and integrity concerns, as their scope 3 emissions reductions may only exist on paper but not in reality.

At the same time, location-based accounting alone does not adequately incentivise high-quality renewable procurement in the supply chain. Companies that help suppliers secure long-term PPAs for new renewable electricity projects may report the same location-based emissions as companies that rely on standalone RECs, even though their contribution to scaling renewable energy in manufacturing regions is very different.

The limitations of location-based accounting expose the need for additional metrics that better capture tech companies' progress on climate action in their supply chains. This includes market-based accounting paired with hourly matching for electricity-related emissions. Unlike annual matching, hourly matching can create stronger incentives for investment in renewable electricity, storage and other solutions for around-the-clock grid decarbonisation. In addition, transition-specific alignment targets should be introduced to capture concrete supply chain decarbonisation efforts.

The upcoming ISO and GHG Protocol product-level accounting standard should make hourly matching of locally generated and deliverable electricity a core requirement. Product-level emissions disclosure is becoming increasingly important for procurement and regulatory compliance, including under emerging EU frameworks. The forthcoming ISO-GHG Protocol product-level accounting standard should require companies to use grid emission factors as the default for electricity-related emissions. Companies should only be allowed to claim lower emission values where electricity is matched on an hourly basis with renewable electricity from new PPAs on the same grid.

Abbreviations

CBAM	Carbon Border Adjustment Mechanism
EAC	Environmental Attribute Certificate
EU	European Union
GHG Protocol	Greenhouse Gas Protocol
ISO	International Organization for Standardization
PCF	Product Carbon Footprint
PPA	Power Purchase Agreement
REC	Renewable Electricity Certificate
SBTi	Science Based Targets initiative

01

A pivotal moment for value chain and product-level accounting rules

This is a critical moment in time for strengthening value chain accounting rules.

The Greenhouse Gas Protocol (GHG Protocol) currently requires companies to report location-based scope 3 emissions (GHG Protocol, 2013) but is preparing updated guidelines for scope 3 and a new 'Actions and Market Instruments' Standard, which will open for public consultation in the second half of 2027 (GHG Protocol, 2026b). In addition, the GHG Protocol and International Organization for Standardization (ISO) are jointly developing a product level accounting standard (GHG Protocol, 2026c), while the Science-Based Targets initiative (SBTi) plans to start developing sectoral guidance on the back of its newly released Corporate Net Zero Standard v2.0 (SBTi, 2026b). The development and revision of these various standards provide a key opportunity to strengthen accounting rules for scope 3 and products in a way that incentivises companies to invest in high-quality renewable electricity in supply chains, which would support grid decarbonisation in key manufacturing regions.

Yet, these various standard-setting initiatives are under enormous pressure to allow for accounting practices that enable companies to reduce their emissions on paper, but not necessarily in reality. Companies participate in ISO and GHG Protocol working groups, influencing the direction of travel and outcomes of these processes (GHG Protocol, 2026d). With 2030 approaching rapidly and many companies still far from achieving their own emissions reduction targets, they are increasingly exploring mechanisms that allow them to report progress even when underlying emissions remain largely unchanged. This raises concerns about the emergence of accounting frameworks that prioritise flexibility over environmental integrity, enabling companies to demonstrate compliance without undertaking the operational changes required for genuine decarbonisation. Experience with standalone renewable electricity certificates (RECs) and carbon offset credits shows that, when presented with flexible accounting options, many companies tend to prioritise cheap credits over actual emission reductions (Bjørn et al., 2022, 2025; Kaupa, 2025).

The GHG Protocol proposes a multi-statement reporting framework as an alternative to a single GHG inventory (GHG Protocol, 2026a). Current corporate GHG Protocol accounting rules prescribe that companies must report on location-based emissions for scope 1 and 3 and must report both location- and market-based emissions for scope 2 (GHG Protocol, 2013, 2015). However, the GHG Protocol is considering adding additional ledgers for corporate GHG emissions accounting. Its Actions and Market Instruments white paper outlined four possible ledgers for a multi-statement reporting structure (GHG Protocol, 2026a):

- | | |
|-----------|---|
| 01 | Physical GHG inventory (i.e., location-based) |
| 02 | Market-based GHG inventory |
| 03 | GHG impact statement (i.e., consequential accounting) |
| 04 | Non-GHG indicators |

Product-level accounting may also evolve to include various reporting ledgers.

Companies are increasingly turning to product-level accounting to track emission reductions. Tech companies, for instance, mention that they are developing product carbon footprints (PCF) and are asking their suppliers for product-level emissions data (Microsoft, 2025a, p. 24; Apple, 2026, p. 100). We expect that the multi-ledger approach for organisation-wide GHG inventories may affect the new product-level accounting standard, which the ISO and the GHG Protocol are jointly developing.

In this discussion paper, we outline the limitations of current scope 3 accounting rules and argue for complementing location-based scope 3 accounting with non-GHG indicators and market-based accounting paired with hourly matching of renewable electricity. The paper informs ongoing discussions at the GHG Protocol and ISO, as well as anticipated discussions at the SBTi, drawing on examples from the tech sector. → **Section 02** outlines the relevance of scope 3 and PCF accounting for big tech companies. → **Section 03** discusses limitations of existing scope 3 guidance, while → **Section 04** comes up with concrete recommendations for how to strengthen both organisation-wide scope 3 accounting rules and product carbon footprint rules. Finally, → **Section 05** makes concrete recommendations for the GHG Protocol's Action and Market Instruments Standard and the joint ISO-GHG Protocol product-level accounting standard.

02

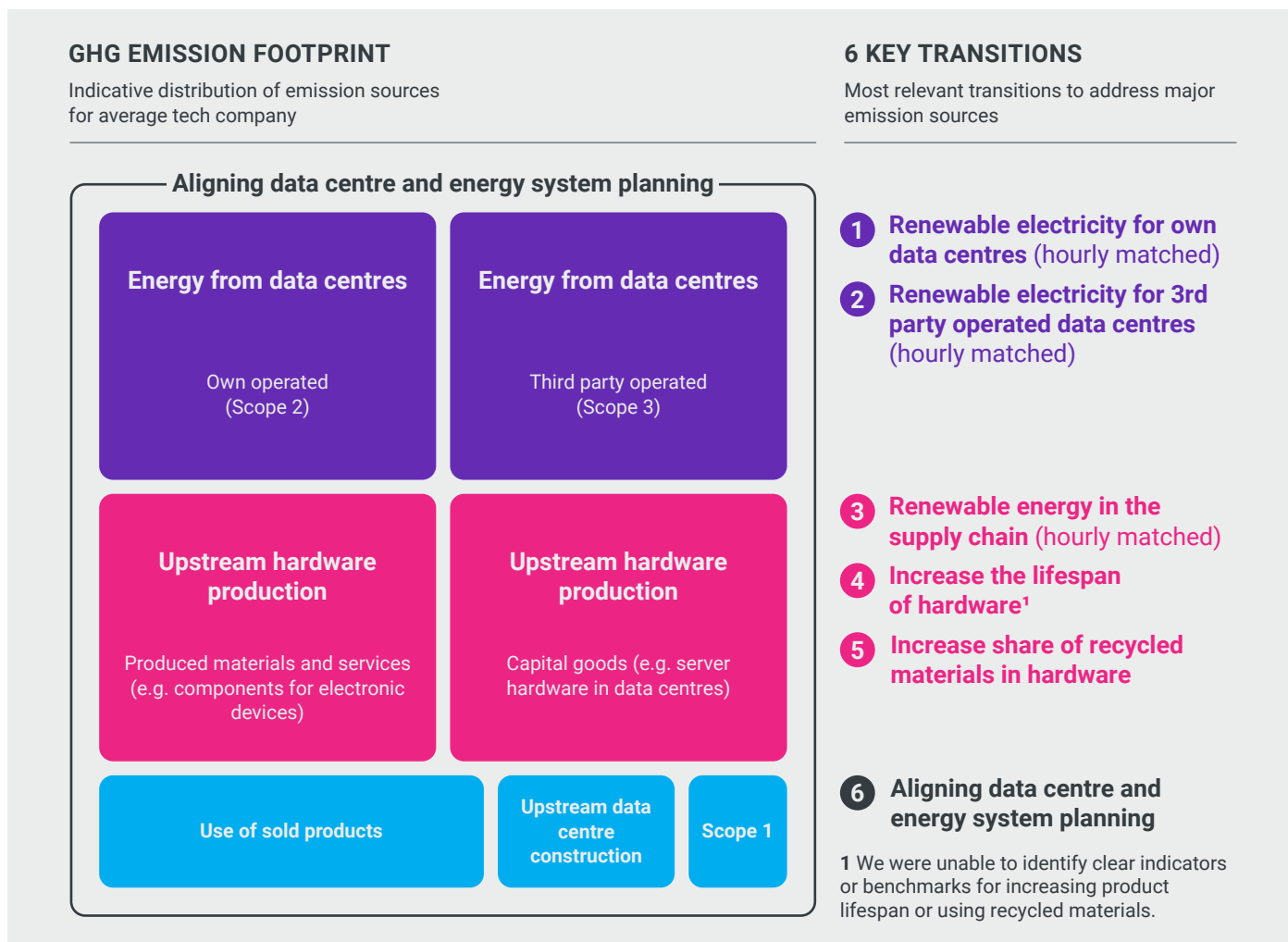
Relevance of scope 3 and PCF accounting for big tech companies

Due to AI and increased data centre use, tech companies' emissions are increasing rapidly (NewClimate Institute, 2025a). About half of these emissions come from data centre electricity consumption and should be addressed through switching to hourly matching of renewable electricity (Gagnon and Brown, 2025; NewClimate Institute, 2025a; Riepin et al., 2025), as well as more policy planning on data centre construction and AI use (**see → Figure 1**). The other half of these emissions originate in the supply chain, with semiconductor production accounting for the majority of emissions (Gupta et al., 2020). Electricity accounts for most of the energy use in the wafer manufacturing, front-end fabrication and assembly, test and packaging (SEMI et al., 2023). Phasing out fossil fuel dependence and switching to renewable electricity are thus critical levers in decarbonising tech companies' upstream value chains.

Figure 1

Emission hotspots in tech companies' GHG inventory

Adapted from NewClimate Institute (2025b)



03

Limitations of current scope 3 accounting rules

Although current GHG Protocol accounting guidelines only allow market-based accounting for scope 2 emissions, it is common malpractice among big tech companies to use market-accounting for their upstream, and sometimes downstream, value chain emissions. Amazon, Apple, Google and Microsoft use market-based accounting methods to calculate and report their value chain emissions (Amazon, 2025, p. 50; Microsoft, 2025a, p. 12; Alphabet, 2026, p. 82; Apple, 2026, p. 101). While Apple's location-based scope 3 data is available in an annex to its sustainability report (App, 2026, p. 103), we could not identify any location-based scope 3 data for the other three companies. Accordingly, it remains unclear to what extent Amazon, Google and Microsoft purchase Environmental Attribute Certificates (EACs) for their supply chain, and what type of EACs they source (e.g. RECs) to cover suppliers' electricity consumption, RECs to cover consumers' electricity consumption when using products, sustainable aviation fuels for upstream transportation). Meta reports to use EACs towards electricity used during data centre construction (scope 3, category 1) and third-party energy use associated with upstream leased assets (scope 3, category 8) but does not report to use EACs to cover electricity consumption in the production process of hardware for data centres (Meta, 2025, p. 17).

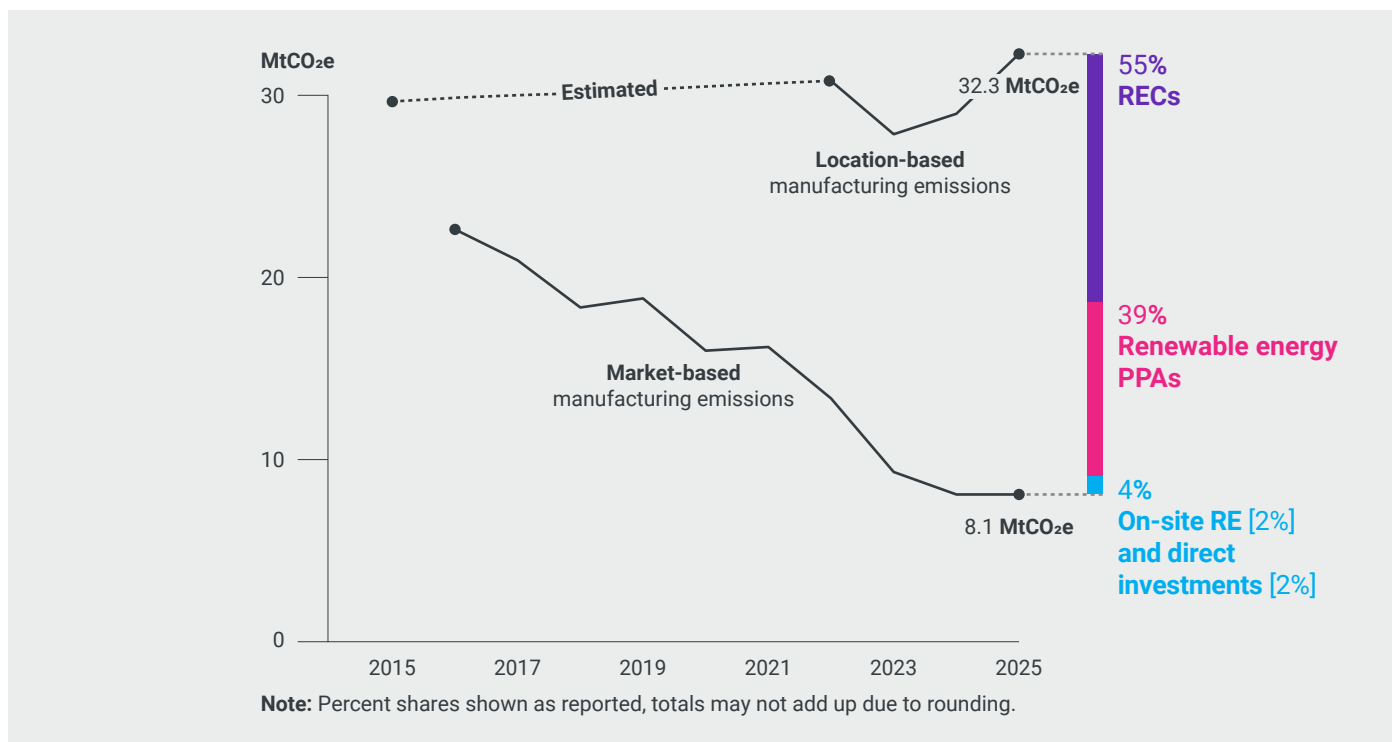
The reduction in supply chain emissions that tech companies claim may only exist on paper. Apple reports that emissions from manufacturing were just over 8 Mt CO₂e in 2025 (Apple, 2026, p. 76) and that a total of 26 Mt CO₂e was avoided through supplier clean energy (Apple, 2026, p. 11). In an annex to its 2026 environmental progress report, Apple reports that location-based emissions from manufacturing amounted to 32 Mt CO₂e in 2025 (Apple, 2026, p. 103). Claiming that manufacturing emissions were 26 Mt CO₂e lower due to standalone RECs and Power Purchase Agreements (PPAs) is likely overstating the emissions reduction potential of those procurement mechanisms. A range of research on scope 2 accounting finds that annual matching of renewable electricity does very little to increase renewable capacity, whereas hourly matching can drive grid decarbonisation (Xu et al., 2024). This is because annual matching guidelines incentivise companies to almost solely invest in the lowest-cost renewable electricity resource options, crowding out projects that would also have been built without a market for RECs (Langer et al., 2024). In addition, annual matching leads to a temporal mismatch between renewable electricity supply and demand (Riepin and Brown, 2024). For instance, companies signing a PPA for solar power still need to rely on carbon-intensive grids in hours where solar electricity generation is low. Consequently, annual matching does not fully eliminate companies' dependence on fossil-power electricity. Hourly matching of renewable electricity, by contrast, can drive real grid decarbonisation, because corporate off-takers, energy utilities and project developers have strong incentives to invest in a more diverse portfolio of renewable generation and storage systems (Gagnon and Brown, 2025; NewClimate Institute, 2025a; Riepin et al., 2025).

Figure 2

Apple's location-based and market-based manufacturing emissions (upstream scope 3)

Based on Apple's Environmental Progress Reports 2016-2026

Location-based accounting for scope 3 does not create meaningful incentives for tech companies to invest in renewable energy for their suppliers. Although location-based accounting comes as close as possible to capturing the actual climate impact of a company's activities, it cannot fully capture corporate decarbonisation efforts. High-integrity renewable electricity procurement options, such as PPAs for new renewable installations located on the same grid, are an important transition tool for decarbonising tech supply chains. However, individual PPAs have little to no significant impact on the average grid emissions factor. As a result, if companies are required to report only location-based emissions in their supply chains, a company that provides its suppliers with low-quality RECs and a company that helps a large share of its suppliers secure PPAs would report identical location-based emissions – despite their very different levels of supply chain action.



This misalignment is clear in the case of Apple (see → **Figure 2**). If Apple were to report only location-based emissions for scope 3, its leadership in expanding high quality renewable electricity in the supply chain through financial support, capacity building and policy advocacy would be invisible. In 2025, almost 40% of the claimed renewable electricity used by suppliers came from PPAs (Apple, 2026, p. 26). Although standalone RECs still account for just over half of renewable electricity consumption in the supply chain, Apple states that it sees this as an interim solution (Apple, 2026, p. 26). Indeed, compared to 2023, the share of PPAs increased substantially while the share of RECs declined (Apple, 2024, 2025, 2026).

04

Closing the gap: strong accounting rules for GHG inventories and product carbon footprints

4.1 Hourly matching and sector-specific targets for organisation-wide GHG inventories

The limitations of location-based accounting expose the need for additional metrics that can better capture how tech companies progress on climate action in their supply chains, including market-based accounting paired with hourly matching for electricity-related emissions (ledger 2 with additional criteria). This would also align with the direction of travel for scope 2 accounting. The SBTi's Corporate Net-Zero Standard v2.0 now requires large electricity consumers to report the share of electricity they match hourly (SBTi, 2026a) and offers optional recognition for companies that set scope 2 targets based on hourly matching (SBTi, 2026a). The ongoing GHG Protocol scope 2 revision appears to be moving in the same direction, signalling that hourly matching is becoming an expected component of credible electricity accounting. This shift is supported by a growing body of scientific evidence that highlights the limitations of annual matching and the benefits of more granular approaches (Langer et al., 2024; Xu et al., 2024; Riepin et al., 2025; Scholta and Blaschke, 2025). Matching electricity consumption with renewable generation on an annual basis does not lead to significant new renewable capacity or the storage needed to support a fully decarbonised grid. This is because project developers tend to invest in the lowest-cost available renewable energy resource options, crowding out projects that would have been built without a market for RECs (Langer et al., 2024). Hourly matching, by contrast, creates a much stronger signal for investment in renewable electricity around the clock, as well as storage systems, which is supporting deeper and faster grid decarbonisation.

Another option for separate accounting metrics in scope 3 are transition-specific alignment targets (ledger 4) (NewClimate Institute, 2025b). These are particularly relevant as an interim accounting method for companies with small suppliers or suppliers in regions with limited renewable electricity supply, where hourly matching of renewable electricity is not realistic in the near term. Transition-specific alignment targets set clear expectations for tech companies and their suppliers alike and are one of three options for setting scope 3 targets under the new SBTi Corporate Net Zero Standard v2.0 (SBTi, 2026a). Possible transition-specific alignment targets for tech supply chains include:

- Requiring that a defined share of suppliers sign long-term PPAs for renewable electricity in the regions where they operate by 2030 (and later target years).
- Requiring that a certain percentage of suppliers adopt hourly matching for at least a certain share of their electricity consumption by 2030 (and later target years).

- Committing to a certain proportion of supplier electricity demand covered by new and long-term PPAs for renewable electricity by 2030 (or later target years).

Importantly, these additional metrics should not replace but complement location-based accounting, which remains essential for measuring the actual emissions associated with production. Taken together, location-based accounting and other metrics allow tech companies to report both the real world emissions occurring across their supply chains and the structural progress they and their suppliers are making towards decarbonising electricity consumption.

Transition-specific alignment targets would not be a big departure from the renewable electricity sourcing requirements that some big tech companies already have in place for their suppliers. Microsoft, for instance, provides detailed guidance on what procurement constructs count towards its supplier carbon-free energy sourcing requirements, including on-site installations, PPAs with a direct connection between the installation and the company's facilities and long-term project-specific contracts the suppliers have entered as the original off-taker (Microsoft, 2025b). This transparency is a good development, but the requirements could be further strengthened to include hourly matching requirements.

4.2 Hourly matching for PCF accounting

Product Carbon Footprints (PCFs) enable companies to quantify the emissions associated with individual products they buy or sell, providing more granularity than organisation-wide inventories. Beyond informing supplier selection and procurement decisions, PCF data is increasingly required for regulatory compliance, including the European Union's (EU) Digital Product Passport mandated under the Ecodesign for Sustainable Products Regulation (EU Council, 2024) and the EU Carbon Border Adjustment Mechanism (CBAM) (European Parliament and Council of the European Union, 2023). As product level disclosure becomes a central regulatory tool, the accuracy and integrity of electricity related emissions within PCFs, particularly for electricity intensive tech manufacturing, are becoming increasingly important.

The ISO and GHG Protocol's jointly developed product-level GHG accounting standard (GHG Protocol, 2026c), expected to become the leading framework for PCF accounting, should make hourly matching of locally generated and deliverable electricity a core requirement with grid emission factors used as the default. Without such a requirement, companies could claim renewable electricity that is not actually available at the time their products are manufactured, leading to product-level footprints that understate real-world emissions. Embedding hourly matching into the standard would ensure that any use of lower-carbon electricity factors reflects verifiable, time-aligned consumption, strengthening the environmental integrity of PCF disclosures and reducing the risk of inflated decarbonisation claims. This would also align product-level accounting with emerging best practice in corporate electricity accounting, where hourly matching is increasingly recognised as essential for credible claims and for driving investment in clean, local and dispatchable generation.

05 Recommendations

5.1 Recommendations for the GHG Protocol actions and market instruments standard

- **Location-based accounting (ledger 1) should remain the primary reference point for corporate scope 3 GHG accounting.** Despite the limitations of location-based accounting, as outlined in → **Section 03**, this accounting approach offers the best insights into the actual emissions impact of corporate activities. For the most accurate estimate of a company's value chain emissions, the emissions factors to calculate location-based emissions (ledger 1) should be more granular than national grids if the data are available.
- **Location-based accounting should be combined with mandatory reporting on non-GHG transition indicators (ledger 4).** These indicators are the most tangible tool to assess corporate decarbonisation efforts (see also NewClimate (2026)).
- **Market-based accounting (ledger 2) paired with hourly matching of renewable electricity should be a complementary ledger.** This is particularly important for large tech companies and other firms with high electricity consumption in their supply chains.

5.2 Recommendations for the ISO-GHG Protocol product-level accounting standard

- **Location-based emissions from energy use should be the primary reference point for PCF accounting (corresponding to ledger 1).** Companies should be required to use grid factors as the default to calculate product carbon footprints. Where the data is available, these grid factors should be more granular than national grids.
- **Companies should be allowed to claim lower emissions values only if electricity comes from new PPAs on the local grid and if electricity is matched on an hourly basis** (corresponding to ledger 2 with additional criteria).

References

A

Alphabet (2026) 2026 Environmental Report. Alphabet Inc. Available at: <https://sustainability.google/reports/google-2026-environmental-report/> (Accessed: 6 July 2026)

Amazon (2025) 2024 Amazon Sustainability Report. Amazon. Available at: <https://sustainability.aboutamazon.com/2024-amazon-sustainability-report.pdf> (Accessed: 6 July 2026)

Apple (2024) Environmental Progress Report. Available at: https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2024.pdf (Accessed: 27 August 2024)

Apple (2025) Environmental Progress Report (covering fiscal year 2024). Apple Inc. Available at: https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2025.pdf (Accessed: 20 June 2025)

Apple (2026) Environmental Progress Report 2026. Apple Inc. Available at: https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2026.pdf (Accessed: 29 June 2026)

B

Bjørn, A., Lloyd, S.M., Brander, M. and Matthews, H.D. (2022) 'Renewable energy certificates threaten the integrity of corporate science-based targets', *Nature Climate Change*, 12, pp. 539–546. doi:<https://doi.org/10.1038/s41558-022-01379-5>

Bjørn, A., Friis Lund, J. and Brander, M. (2025) 'Up to half of companies would be behind on their climate targets under stricter scope 2 accounting rules', *Environmental Research Letters*, 20. doi:10.1088/1748-9326/ada45a

E

EU Council (2024) Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC (Text with EEA relevance). Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32024R1781&qid=1719580391746>

European Parliament and Council of the European Union (2023) Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism (Text with EEA relevance). Available at: <http://data.europa.eu/eli/reg/2023/956/oj> (Accessed: 23 June 2026)

G

Gagnon, P. and Brown, M. (2025) 'Impacts From Procuring Clean Electricity Under Different Inventory Accounting Methods'. Rochester, NY: Social Science Research Network. doi:10.2139/ssrn.5447204

GHG Protocol (2013) Corporate Value Chain (Scope 3) Accounting and Reporting Standard. Available at: <https://ghgprotocol.org/corporate-value-chain-scope-3-standard> (Accessed: 7 May 2026)

GHG Protocol (2015) GHG Protocol Scope 2 Guidance: An amendment to the GHG Protocol Corporate Standard. World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). Available at: https://ghgprotocol.org/sites/default/files/Scope2_ExecSum_Final.pdf

GHG Protocol (2026a) Actions and Market Instruments: Phase 1 Progress Update White Paper. GHG Protocol. Available at: <https://ghgprotocol.org/sites/default/files/2026-03/AMI-Phase1-WhitePaper-RFI.pdf> (Accessed: 17 May 2026)

GHG Protocol (2026b) Actions and Market Instruments Standard. Available at: <https://ghgprotocol.org/actions-and-market-instruments-standard> (Accessed: 8 July 2026)

GHG Protocol (2026c) 'ANNOUNCEMENT: ISO and GHG Protocol Finalize Joint Working Group to Develop Product-Level Accounting Standard', 9 April. Available at: <https://ghgprotocol.org/blog/announcement-iso-and-ghg-protocol-finalize-joint-working-group-develop-product-level> (Accessed: 5 July 2026)

GHG Protocol (2026d) Our Governance. Available at: <https://ghgprotocol.org/our-governance#Product%20Carbon%20Accounting> (Accessed: 5 July 2026)

Gupta, U., Kim, Y.G., Lee, S., et al. (2020) 'Chasing Carbon: The Elusive Environmental Footprint of Computing', *IEEE International Symposium on High-Performance Computer Architecture (HPCA 2021)* [Preprint]. Available at: [https://arxiv.org/abs/2005.08841](#) (Accessed: 12 July 2024)

K

Kaupa, C. (2025) 'The problem of carbon credits and offsetting in corporate climate disclosure', *European Business Law Review*, 36(4), pp. 573–600. doi:<https://doi.org/10.54648/eulr2025041>

L

Langer, L., Brander, M., Lloyd, S.M., et al. (2024) 'Does the purchase of voluntary renewable energy certificates lead to emission reductions? A review of studies quantifying the impact', *Journal of Cleaner Production*, 478, p. 143791. doi:10.1016/j.jclepro.2024.143791

M

Meta (2025) 2025 Environmental Data Index. Meta. Available at: https://sustainability.atmeta.com/wp-content/uploads/2025/10/Meta_2025-Environmental-Data-Index.pdf (Accessed: 6 June 2026)

Microsoft (2025a) 2025 Environmental Sustainability Report: Accelerating progress to 2030. Microsoft. Available at: <https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/msc/documents/presentations/CSR/2025-Microsoft-Environmental-Sustainability-Report.pdf> (Accessed: 6 July 2026)

Microsoft (2025b) Microsoft Supplier Carbon-Free Electricity Guidance. Microsoft. Available at: https://cdn-dynmedia-1.microsoft.com/is/content/microsoftcorp/microsoft/acces/documents/presentations/FY25_SCOC_CFE_Requirement_Guidance.pdf (Accessed: 6 July 2026)

N

NewClimate Institute (2025a) Corporate Climate Responsibility Monitor 2025: Assessing the transparency, integrity and progress of corporate climate strategies. Cologne & Berlin: NewClimate Institute. Available at: <https://newclimate.org/resources/publications/corporate-climate-responsibility-monitor-2025>

NewClimate Institute (2025b) Evolution of corporate climate targets. NewClimate Institute. Available at: <https://newclimate.org/resources/publications/evolution-of-corporate-climate-targets>

NewClimate Institute (2026) Market Instruments Explained - Market Instruments for Corporate Climate Accounting. Berlin and Cologne, Germany: NewClimate Institute. Available at: <https://newclimate.org/resources/publications/>

[market-instruments-explained-market-instruments-for-corporate-climate](#) (Accessed: 6 July 2026)

R

Riepin, I., Jenkins, J.D., Swezey, D. and Brown, T. (2025) '24/7 carbon-free electricity matching accelerates adoption of advanced clean energy technologies', *Joule*, 9(2). doi:10.1016/j.joule.2024.101808

Riepin, I. and Brown, T. (2024) 'On the means, costs, and system-level impacts of 24/7 carbon-free energy procurement', *Energy Strategy Reviews*, 54, p. 101488. doi:10.1016/j.esr.2024.101488

S

SBTi (2026a) SBTi Corporate Net-Zero Standard, Version 2.0. Science Based Target initiative (SBTi). Available at: <https://files.sciencebasedtargets.org/production/files/Corporate-Net-Zero-Standard-version-2.pdf?dm=1781164277> (Accessed: 11 June 2026)

SBTi (2026b) Standards and Guidance. Available at: <https://sciencebasedtargets.org/standards-and-guidance> (Accessed: 5 July 2026)

Scholta, H.F. and Blaschke, M.J. (2025) 'Temporal matching as an accounting principle for green electricity claims', *Nature Communications*, 16(1), p. 9280. doi:10.1038/s41467-025-65125-z

SEMI, Semiconductor Climate Consortium, and BCG (2023) Transparency, Ambition, and Collaboration: Advancing the Climate Agenda of the Semiconductor Value Chain. Available at: <https://discover.semi.org/rs/320-QBB-055/images/Transparency-Ambition-and-Collaboration-BCG-SEMI-SCC-20230919.pdf> (Accessed: 6 June 2026)

X

Xu, Q., Ricks, W., Manocha, A., et al. (2024) 'System-level impacts of voluntary carbon-free electricity procurement strategies', *Joule*, 8(2), pp. 374–400. doi:10.1016/j.joule.2023.12.007

**NewClimate – Institute for Climate
Policy and Global Sustainability
gGmbH**

Cologne Office
Waidmarkt 11a
50676 Cologne, Germany

Berlin Office
Schönhauser Allee 10-11
10119 Berlin, Germany

Phone: +49 221 999 83 300
Email: info@newclimate.org
Website: www.newclimate.org