

BATTERIES AND PARTS THEREOF

PRODUCT CATEGORY CLASSIFICATION: UN CPC 4641, 4642, 4643, AND HS CODE 85.

PCR REGISTRATION NUMBER TO BE ADDED BY THE SECRETARIAT

VERSION NUMBER TO BE ADDED BY THE SECRETARIAT

VALID UNTIL 20XX-YY-ZZ (TO BE ADDED BY THE SECRETARIAT)

NOTE: THIS DOCUMENT IS A PCR TEMPLATE TO BE USED IN PCR DEVELOPMENT. IT IS NOT A PCR.

DRAFT FOR OPEN
CONSULTATION

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INTRODUCTION TO OPEN CONSULTATION

This draft PCR document is available for open consultation from 2025-11-05 until 2025-12-26. Feel free to forward the draft to any other stakeholder you might think is relevant, including colleagues and other organisations.

We are interested in comments from stakeholders on:

- General
 - Alignment with PCRs available in other programmes for type III environmental declarations, industry-specific LCA guidelines or similar.
- Scope of PCR
 - Product category definition and description
 - Classification of product category using CPC codes
- Goal and scope, life cycle inventory and life cycle impact assessment
 - Functional unit/declared unit
 - System boundary
 - Allocation rules
 - Data quality requirements
 - Recommended databases for generic data
 - Impact categories and impact assessment methodology
- Additional information

Comments shall be sent directly to the PCR Moderator (contact details available in Section 1). There is a template for comments on www.environdec.com that may be used.

For questions about the PCR, please contact the PCR moderator. For general questions about the International EPD System, EPD or PCR development, please contact the Secretariat via <https://www.environdec.com/support>.

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INTRODUCTION

1.1 GENERAL

This document constitutes complementary Product Category Rules (c-PCR) developed in the framework of the International EPD System: a programme for type III environmental declarations¹ according to ISO 14025:2006, ISO 14040:2006, ISO 14044:2006, EN 50693:2019, Regulation (EU) 2023/1542 of the European Parliament², and PCR 2024:06 (the main PCR)³. Environmental Product Declarations (EPD) are voluntary documents for a company or organisation to present transparent, consistent, and verifiable information about the environmental performance of their products (goods or services).

The rules for the overall administration and operation of the programme are the General Programme Instructions (GPI), publicly available on www.environdec.com. PCRs and c-PCRs complement the GPI and the normative standards by providing specific rules and guidelines for developing an EPD for one or more specific product categories (see Figure 1). A PCR/c-PCR should enable different practitioners using the PCR/c-PCR to generate consistent results when assessing products of the same product category.

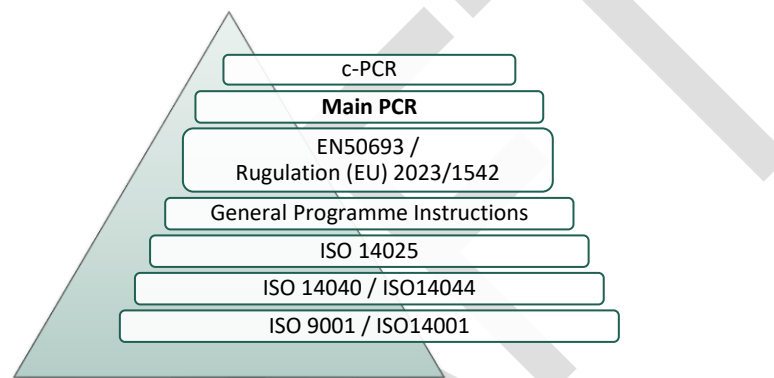


Figure 1. The hierarchy between PCRs, standards, and other documents.

The present PCR uses the following terminology:

- The term “shall” is used to indicate what is obligatory, i.e., a requirement.
- The term “should” is used to indicate a recommendation. Any deviation from a recommendation shall be justified in the EPD development process.
- The terms “may” or “can” are used to indicate an option that is permissible.

For definitions of other terms used in the document, see the GPI and normative standards.

A main PCR and its c-PCRs are valid for a pre-determined period of time to ensure that it is updated at regular intervals. The latest version of the PCR and its c-PCRs are available on www.environdec.com. Stakeholder feedback on PCRs and c-PCRs is very much encouraged. Any comments on this c-PCR may be sent directly to the PCR Moderator and/or the Secretariat during its development or during its period of validity.

Any references to this PCR shall include the PCR registration number, name, and version number.

The programme operator maintains the copyright of the PCR to ensure that it is possible to publish, update, and make it available to all organisations to develop and register EPDs. Stakeholders participating in PCR development should be acknowledged in the final document and on the website.

¹ Type III environmental declarations in the International EPD System are referred to as EPDs, Environmental Product Declarations.

² REGULATION (EU) 2023/1542 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC

³ PCR 2024:06, which is Electronic and Electric Equipment, and Electronic Components (non-Construction)

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1.2 ROLE OF THIS DOCUMENT

This document provides complementary product category rules (c-PCR) to PCR 2024:06 Electronic and electric equipment, and electronic components (non-construction), i.e. the main PCR, available at www.environdec.com. This document cannot be used by itself but shall be used together with PCR 2024:06 and the European standard EN 50693, for products within the scope of the PCR (see Section 2.2.1). It is required to use an applicable c-PCR after it has been published 90 days. It is optional to use the c-PCR if it has been published for less than 90 days.

If more than one c-PCR is applicable, the EPD owner may choose to use any of them, but it is recommended to use the one that is more specific in scope in terms of product function. An alternative is to use, and verify the EPD towards, several applicable c-PCRs, as long as there are no conflicting requirements in the c-PCRs.

If requirements in the main PCR and the c-PCR are in conflict, the requirements in the c-PCR take precedence over those in the main PCR.

See Figure 2 for an illustration on how PCR 2024:06 and this c-PCR relates to each other and the EPDs that may be based on them.

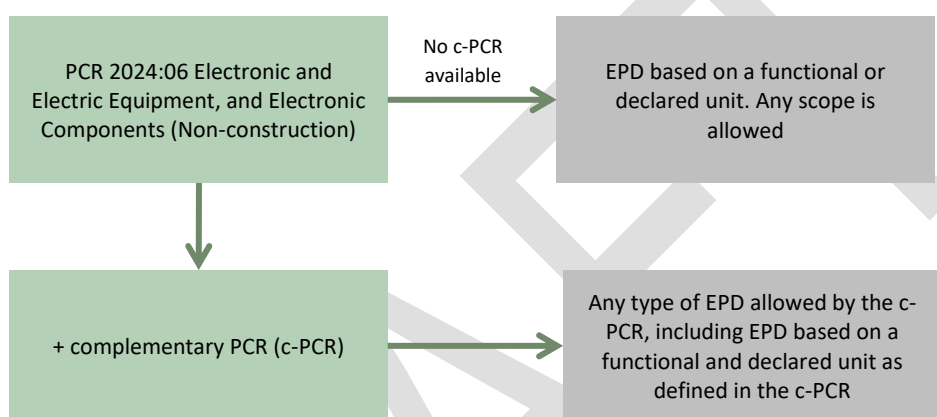


Figure 2. Overview of how PCR 2024:06 can be used directly, or together with a c-PCR, to develop an EPD. An EPD that uses a functional unit shall be based on a c-PCR. An EPD based on a declared unit can be developed without a c-PCR..

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2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	<i>Batteries and parts thereof</i>
Registration number and version:	<i>To be added by the Secretariat</i>
Programme:	 The International EPD System
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: support@environdec.com
PCR Moderator:	<i>Qian Yang, China Merchants Testing Vehicle Technology Research Institute Co., Ltd., and cjyangqian@cmhk.com</i> <i>Qinyuan Li, China Merchants Testing Vehicle Technology Research Institute Co., Ltd., and cjliyinyuan@cmhk.com</i>
PCR Committee:	<i>China Merchants Testing Vehicle Technology Research Institute Co., Ltd., IVL Swedish Environmental Research Institute, IVL Environmental Technology (Beijing) company Ltd., Contemporary Amperex Technology Co., Ltd., Geely Auto Group, FinDreams Battery Co., Ltd., Sunwoda Mobility Energy Technology Co., Ltd., SuMPO, Ramboll Group A/S, EVE Energy Co., Ltd., Jiangxi Ganfeng Battery Technology Co., Ltd., Saike REPT Power Battery System Co., Ltd., Hefei Gotion High-tech Power Energy Co., Ltd., Calb Group Co., Ltd., SVOLT Energy Technology Co., Ltd., Viridi E-Mobility Technology Co., Ltd., Microvast Power Systems Co., Ltd., China Society of Automotive Engineers, Chongqing Changan Automobile Co., Ltd., Seres Group Co., Ltd., RENAULT (Beijing) Automobile Co., Ltd. Shanghai Branch Company, NIO Co., Ltd., CICenergIGUNE, Tecnalia, ADEME, China Association of Productivity Promotion Centers, China Longyuan Power Group Corporation Limited.</i>
Publication date:	<i>To be added by the Secretariat</i> See Section 8 for a version history of the PCR.
Valid until:	<i>To be added by the Secretariat</i> The validity may change. See www.environdec.com for the latest version of the PCR and the latest information on its validity and transition periods between versions.
Development and updates:	The c-PCR has been developed following ISO 14027, including public consultation and review. The rules for the development and updating processes are described in Section 9 of the GPI. The c-PCR is valid for a pre-determined time period to ensure that it is updated at regular intervals. When the c-PCR is about to expire, the PCR Moderator shall initiate a discussion with the Secretariat on if and how to proceed with updating the c-PCR and renewing its validity. A c-PCR may be updated before it expires, based on changes in normative standards or provided significant and well-justified proposals for changes or amendments are presented. When there has been an update of the c-PCR, the new version should be used to develop EPDs. For small updates (change of third-digit version number), the previous version is normally immediately removed from the PCR library on www.environdec.com and there is no transition period. For medium updates (change of second-digit version number), the previous version of the c-PCR is valid in parallel during a transition period of at least 90 days, but not exceeding its

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	previously set validity period. For large updates (change of first-digit version number), the previous version is valid in parallel during a transition period of at least 180 days, but not exceeding its previously set validity period. In case a c-PCR is developed by a CEN Product TC, the standard will replace this c-PCR, with a transition period of at least 90 days under which both are valid. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR may be sent directly to the PCR Moderator and/or the Secretariat during its development or during its period of validity.
Standards and documents conformance:	- General Programme Instructions of the International EPD System, version 5.0.1 - PCR 2024:06 Electronic and electric equipment, and electronic components (non-construction), version 1.0.1 - EN 50693 - Regulation (EU) 2023/1542 (EU Battery Regulation) - IEC 63366 - ISO 14025:2006, ISO 14040:2006, ISO 14044:2006⁴ - ISO 15686 series (these standards are referenced regarding service life general principles and estimation)
PCR language(s):	At the time of publication, this PCR was available in English. If the PCR is available in several languages, these are available on www.environdec.com . In case of translated versions, the English version takes precedence in case of any discrepancies.

2.2 SCOPE

2.2.1 PRODUCT CATEGORY DEFINITION AND DESCRIPTION

This document provides complementary Product Category Rules (c-PCR) for the assessment of the environmental performance of battery and parts thereof and the declaration of this performance by an EPD. The product category corresponds to UN CPC⁵ 464 accumulators, primary cells and primary batteries, and parts thereof, as well as battery and parts of thereof under HS code⁶ 85 electrical machinery and equipment and parts thereof. This PCR also follows battery classification of the Regulation (EU) 2023/1542 (EU Battery Regulation)⁷. A non-exhaustive list of products falling under the scope of this c-PCR is shown in Table 1.

⁴ Some rules influencing EPD development are independent of the GPI version referred to in the PCR. For example, the latest rules on EPD verification procedures in the GPI shall be followed within 90 days of its publication. See Section 5.1 in the GPI for a description of the four categories of rules and when they shall be followed.

⁵ The UN CPC divisions can be consulted at: <https://unstats.un.org/unsd/classifications/Family/Detail/1074>.

⁶ The Harmonized System (HS) Codes can be consulted at: <https://www.trade.gov/industry-classification-systems>.

⁷ The detail could be accessed at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023R1542>.

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Table 1. Product group

UN CPC and HS code	Categories under Regulation (EU) 2023/1542	Description of Regulation (EU) 2023/1542	Product example (but not limited to)
UN CPC: 4641 Primary cells and primary batteries 4642 Electric accumulators 4643 Parts of primary cells, primary batteries and electric accumulators (including separators) HS code: 85 electrical machinery and equipment and parts thereof	Portable Battery	A battery that is sealed, weighs 5 kg or less, is not designed specifically for industrial use and is neither an electric vehicle battery, an LMT ⁸ battery, nor an SLI ⁹ battery	- Alkaline Batteries - Lithium Batteries - Coin Cell Batteries - Lead-Acid Batteries - Lithium Polymer Batteries
	Industrial Battery	General industrial battery: a battery that is specifically designed for industrial uses, intended for industrial uses after having been subject to preparation for repurposing or repurposing, or any other battery that weighs more than 5 kg and that is neither an electric vehicle battery, an LMT battery, nor an SLI battery.	- Lead-Acid Batteries - Nickel-Cadmium (Ni-Cd) Batteries - Nickel-Metal Hydride (NiMH) Batteries - Lithium Metal Batteries - Alkaline Batteries - Fuel cells
		Stationary battery energy storage system: an industrial battery with internal storage that is specifically designed to store from and deliver electric energy to the grid or store for and deliver electric energy to end-users, regardless of where and by whom the battery is being used.	- Nickel-Cadmium (Ni-Cd) Batteries - Sodium-Sulphur (NaS) Batteries - Flow Batteries
	Starting, Lighting and Ignition (SLI) Battery	A battery that is specifically designed to supply electric power for starting, lighting, or ignition and that can also be used for auxiliary or backup purposes in vehicles, other means of transport or machinery.	- Lead-Acid Batteries - Nickel-Metal Hydride (NiMH) Batteries
	Electric Vehicle (EV) Battery	A battery that is specifically designed to provide electric power for traction in hybrid or electric vehicles of category L as provided for in Regulation (EU) No 168/2013, that weighs more than 25 kg, or a battery that is specifically designed to provide electric power for traction in hybrid or electric vehicles of categories M, N or O as provided for in Regulation (EU) 2018/858.	- Lithium Iron Phosphate (LiFePO₄) Batteries - Nickel-Metal Hydride (NiMH) Batteries - Lithium Cobalt Oxide (LCO) Batteries - Lithium Manganese Oxide (LMO) Batteries - Lithium Nickel Cobalt Manganese Oxide (NCM) Batteries - Lithium Nickel Cobalt Aluminium Oxide (NCA) Batteries - Lithium Titanate (LTO) Batteries - Solid-State Batteries - Lead-Acid batteries

⁸ Light means of transport batteries⁹ Starting, lighting and ignition batteries

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UN CPC and HS code	Categories under Regulation (EU) 2023/1542	Description of Regulation (EU) 2023/1542	Product example (but not limited to)
	Light Means of Transport (LMT) Battery	A battery that is sealed, weighs 25 kg or less and is specifically designed to provide electric power for the traction of wheeled vehicles that can be powered by an electric motor alone or by a combination of motor and human power, including type-approved vehicles of category L within the meaning of Regulation (EU) No 168/2013 of the European Parliament and of the Council, and that is not an electric vehicle battery.	- Lead-Acid Batteries - Lithium Iron Phosphate (LiFePO4) Batteries - Nickel-Metal Hydride (NiMH) Batteries - Lithium Cobalt Oxide (LCO) Batteries - Lithium Manganese Oxide (LMO) Batteries - Lithium Nickel Cobalt Manganese Oxide (NCM) Batteries - Lithium Nickel Cobalt Aluminium Oxide (NCA) Batteries - Lithium Titanate (LTO) Batteries - Solid-State Batteries

In addition to the above products, this c-PCR can be used for components of the battery, including but not limited to:

- Battery cell, and components of the battery cell, such as:
 - Battery cell anode;
 - Battery cell cathode;
 - Battery cell electrolyte;
 - Battery cell housing;
- Battery module housing;
- Battery module electronics;
- Battery pack system housing;
- Battery packs electronics;
- Battery pack thermal conditioning system.

2.2.2 GEOGRAPHICAL SCOPE

This c-PCR may be used globally.

2.2.3 EPD VALIDITY

See section 2.2.3 of the main PCR (PCR 2024:06).

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3 REVIEW AND BACKGROUND INFORMATION

This c-PCR was developed in accordance with the PCR development process described in the GPI of the International EPD System, including open consultation and review.

3.1 OPEN CONSULTATION

3.1.1 VERSION 1.0.0, 20YY-MM-DD

This PCR was available for open consultation from *date* until *date*, during which any stakeholder was able to provide comments by contacting the PCR Moderator and/or the Secretariat.

Stakeholders were invited via e-mail or other means to take part in the open consultation and were encouraged to forward the invitation to other relevant stakeholders. The following stakeholders provided comments during the open consultation and agreed to be listed as contributors in the c-PCR and on www.environdec.com:

- *List of stakeholder names and affiliation (to be added after the open consultation).*

In case no stakeholders provided comments and agreed to be listed as contributors, the above sentence shall be adjusted accordingly ("No stakeholders provided comments during the open consultation and agreed to be listed as contributors in the PCR and on www.environdec.com.") and the bullet list shall be removed.

3.2 PCR REVIEW

3.2.1 VERSION 1.0.0, 20YY-MM-DD

PCR review panel:	The Technical Committee of the International EPD System. A full list of members is available on www.environdec.com . The review panel may be contacted via support@environdec.com . Members of the Technical Committee were requested to state any potential conflict of interest with the PCR Committee, and if there were conflicts of interest they were excused from the review.
Chair of the PCR review:	<i>To be added by the Secretariat</i>
Review dates:	<i>To be added by the Secretariat</i>

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this c-PCR, existing PCRs/c-PCRs and other internationally standardised methods that could potentially act as c-PCRs were considered to avoid unnecessary overlaps in scope and to ensure harmonisation with established methods of relevance for the product category. The existence of such documents was checked among the following EPD programmes and European or international standardisation bodies:

- International EPD System, www.environdec.com.
- EPD Italy
- PEP ecopassport
- Joint Research Center of European Unions
- The European Parliament and of the Council
- European Commission

Table 2 lists the identified PCRs and other standardised methods (except for the main PCR), sorted by release date from oldest to newest.

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Table 2. Existing PCRs and other internationally standardised methods that were considered to avoid overlap in scope and to ensure harmonisation with established methods.

Name of PCR/standard, including registration number	EPD programme/standardisation body	Version number/date of publication	Scope
PEFCR - Product Environmental Footprint Category Rules for High Specific Energy Rechargeable Batteries for Mobile Applications	European Commission	February 2018	CPA (European classification of products by activity) code: 27.20.23. (27. Electrical 666 equipment/20. Batteries and accumulators/23. Nickel-cadmium, nickel metal hydride, lithium-ion, lithium 667 polymer, nickel-iron and other electric accumulators)
EPDItaly 021: PCR for Energy Storage	EPD Italy	2021-03-29	CPC 464
PEP-PCR-ed4 Product Category Rules for Electrical, Electronic and HVAC-R Products	PEP ecopassport	2021-09-06	Electrical, Electronic and HVAC-R Products
Regulation (EU) 2023/1542	The European Parliament and of the Council	2023-07-28	Electric vehicle batteries, rechargeable industrial batteries and LMT batteries
Rules for the calculation of the Carbon Footprint of Electric Vehicle Batteries (CFB EV) Final draft	Joint Research Center of European Unites	2024-04-29 (Draft)	Electric vehicle batteries
Annex - Ares (2024) 3131389 (Draft act) (ANNEX to the Commission Delegated Regulation supplementing Regulation (EU) 2023/1542 of the European Parliament and of the Council by establishing the methodology for the calculation and verification of the carbon footprint of electric vehicle batteries)	European Commission	2024-05-28 (Draft)	Electric vehicle batteries
Rules for the calculation of the Carbon Footprint of Industrial Batteries without external storage (CFB-IND)	European Commission	2025-04-11	Industrial Batteries without external storage

3.4 REASONING FOR DEVELOPMENT OF THE C-PCR

This c-PCR was developed to enable publication of EPDs for the product category defined in Section 2.2.1 based on ISO 14025, ISO 14040/14044, EN 50693, the PCR 2024:06 and Regulation (EU) 2023/1542. The c-PCR enables different practitioners to generate consistent results when assessing the environmental impact of products of the same product category, and thereby it supports comparability of products within a product category.

3.5 UNDERLYING STUDIES USED FOR PCR DEVELOPMENT

The methodological choices made during the development of this c-PCR (declared/functional unit, system boundary, allocation methods, impact categories, data quality rules, etc.) were primarily based on the following underlying studies:

- Accardo, A.; Dotelli, G.; Musa, M. L.; Spessa, E(2021) Life Cycle Assessment of an NMC Battery for Application to Electric Light-Duty Commercial Vehicles and Comparison with a Sodium-Nickel-Chloride Battery. Applied Sciences.
- Agency, U. S. E. P (2013) Application of Life Cycle Assessment to Nanoscale Technology: Lithium-ion Batteries for Electric Vehicles.
- Andreasi Bassi, S., Peters, J.F., Candelaresi, D., Valente, A., Ferrara, N., Mathieux, F., Ardente, F. (2023) Rules for the calculation of the Carbon Footprint of Electric Vehicle Batteries (CFBEV) JRC Science for Policy Report.

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- Bauer, C.; Hofer, J.; Althaus, H.-J.; Del Duce, A.; Simons (2015) A. The environmental performance of current and future passenger vehicles: Life cycle assessment based on a novel scenario analysis framework. *Applied Energy*.
- Benveniste, G.; Sánchez, A.; Rallo, H.; Corchero, C.; Amante, B (2022) Comparative life cycle assessment of Li-Sulphur and Li-ion batteries for electric vehicles. *Resources, Conservation & Recycling Advances*.
- Chordia, M.; Nordelöf, A.; Ellingsen, L. A.-W (2021) Environmental life cycle implications of upscaling lithium-ion battery production. *The International Journal of Life Cycle Assessment*.
- Dai, Q.; Kelly, J. C.; Gaines, L.; Wang, M (2019) Life Cycle Analysis of Lithium-Ion Batteries for Automotive Applications. *Batterie*.
- Das J, Kleiman A, Rehman A U, Verma R, Young M H (2024) The Cobalt Supply Chain and Environmental Life Cycle Impacts of Lithium-Ion Battery Energy Storage Systems. *Sustainability*.
- Deng, Y.; Li, J.; Li, T.; Zhang, J.; Yang, F.; Yuan, C (2017) Life cycle assessment of high capacity molybdenum disulfide lithium-ion battery for electric vehicles. *Energy*.
- Deng, Y.; Ma, L.; Li, T.; Li, J.; Yuan, C (2018) Life Cycle Assessment of Silicon-Nanotube-Based Lithium Ion Battery for Electric Vehicles. *ACS Sustainable Chemistry & Engineering*.
- Dolci G, Tua C, Grosso M, Rigamonti L (2016) Life cycle assessment of consumption choices: a comparison between disposable and rechargeable household batteries. *The International Journal of Life Cycle Assessment*.
- Dunn, J. B.; Gaines, L.; Sullivan, J.; Wang, M. Q (2012) Impact of Recycling on Cradle-to-Gate Energy Consumption and Greenhouse Gas Emissions of Automotive Lithium-Ion Batteries. *Environmental Science & Technology*.
- Ellingsen L A W, Hung C R, Strømman A H (2017) Identifying key assumptions and differences in life cycle assessment studies of lithium-ion traction batteries with focus on greenhouse gas emissions. *Transportation Research Part D: Transport and Environment*.
- Erik Emilsson, Lisbeth Dahllöf (2019) Lithium-Ion Vehicle Battery Production Status 2019 on Energy Use, CO₂ Emissions, Use of Metals, Products Environmental Footprint, and Recycling IVL Swedish Environmental Research Institute.
- Andreasi Bassi, S., Ardente, F., Candelaresi, D., Eynard, U., Ferronato, N. and Peters, J. (2025) Rules for the calculation of the Carbon Footprint of Industrial Batteries without external storage (CFB-IND), European Commission: Joint Research Centre, Publications Office of the European Union, Luxembourg, <https://data.europa.eu/doi/10.2760/6346639>, JRC141282.
- Faria, R.; Marques, P.; García, R.; Moura, P.; Freire, F.; Delgado, J.; de Almeida, A. T (2014) Primary and secondary use of electric mobility batteries from a life cycle perspective. *Journal of Power Sources*.
- Giordano, A.; Fischbeck, P.; Matthews, H. S (2018) Environmental and economic comparison of diesel and battery electric delivery vans to inform city logistics fleet replacement strategies. *Transportation Research Part D: Transport and Environment*.
- Gouveia J, Mendes A, Monteiro R, Mata T, Caetano N, Martins A (2020) Life cycle assessment of a vanadium flow battery. *Energy Reports*.
- Hao, H.; Mu, Z.; Jiang, S.; Liu, Z.; Zhao, F (2017) GHG Emissions from the Production of Lithium-Ion Batteries for Electric Vehicles in China. *In Sustainability*.
- Hemmati M, Bayati N, Ebel T (2024) Life Cycle Assessment and Costing of Large-Scale Battery Energy Storage Integration in Lombok's Power Grid. *Batteries*.
- Hiremath M, Derendorf K, Vogt T (2015) Comparative life cycle assessment of battery storage systems for stationary applications. *Environmental Science & Technology*.
- Hischier R, C. M. Lehmann M, Scharnhorst W (2007) Life cycle inventories of electric and electronic equipments: production, use and disposal.
- Immendoerfer A, Tietze I, Hottenroth H, Viere T (2017) Life-cycle impacts of pumped hydropower storage and battery storage. *International Journal of Energy and Environmental Engineering*.
- Ishihara K, K. N., Terada N, Iwahori T (2002) Environmental burdens of large lithium-ion batteries developed in a Japanese national project. *Cent. Res. Inst. Electr. Power Ind.*
- Jasper F B, Späthe J, Baumann M, Peters J, Ruhland J, Weil M (2022) Life cycle assessment (LCA) of a battery home storage system based on primary data. *Journal of cleaner production*.
- Jiang, T.; Wang, H.; Jin, Q (2024) Comparison of three typical lithium-ion batteries for pure electric vehicles from the perspective of life cycle assessment. *Clean Technologies and Environmental Policy*.

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- Kallitsis, E.; Korre, A.; Kelsall, G.; Kupfersberger, M.; Nie, Z (2020) Environmental life cycle assessment of the production in China of lithium-ion batteries with nickel-cobalt-manganese cathodes utilising novel electrode chemistries. Journal of Cleaner Production.
- Kelly, J. C.; Dai, Q.; Wang, M (2020) Globally regional life cycle analysis of automotive lithium-ion nickel manganese cobalt batteries. Mitigation and Adaptation Strategies for Global Change.
- Li, B.; Gao, X.; Li, J.; Yuan, C (2014) Life Cycle Environmental Impact of High-Capacity Lithium Ion Battery with Silicon Nanowires Anode for Electric Vehicles. Environmental Science & Technology.
- Linda Ager-Wick Ellingsen, B. S. a. A. H. S (2016) The size and range effect: lifecycle greenhouse gas emissions of electric vehicles. Environmental Research Letters.
- Linda Ager-Wick Ellingsen, G. M.-B., Bhawna Singh, et, al (2013) Life Cycle Assessment of a Lithium-Ion Battery Vehicle Pack. Resources, Conservation and Recycling.
- Liu, L., 2020. Life cycle assessment of a lithium-ion battery pack for energy storage systems:-the environmental impact of a grid-connected battery energy storage system.
- Llamas-Orozco, J. A.; Meng, F.; Walker, G. S.; Abdul-Manan, A. F. N.; MacLean, H. L.; Posen, I. D.; McKechnie, J (2023) Estimating the environmental impacts of global lithium-ion battery supply chain: A temporal, geographical, and technological perspective. PNAS Nexus.
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4 LCA METHOD

This section provides rules for the LCA method used to develop an EPD for the product category as defined in Section 2.2.1. The basic rules of the LCA method are set in the main PCR (PCR 2024:06) and the Annex A of the GPI, and this section only includes additions, specifications and deviations to the rules set in the GPI. Guidance and examples of applying the LCA method are also available on www.environdec.com/methodology.

4.1 MODELLING APPROACH

See section A.1 of the GPI 5.0.1.

4.2 DECLARED/FUNCTIONAL UNIT

As per to the ISO 14040: 2006, the primary purpose of a functional unit is to provide a reference to which the inputs and outputs are related, and this reference is necessary to ensure comparability of the LCA results. Different from the declared unit, the functional unit shall define the quantification of the functions of a product.

There are a large variety of battery types, depending on battery's technical characteristics, features, applications or use environment, and so it is difficult to define a normalised functional unit in this c-PCR that cover(s) all functional and qualitative aspects of such batteries. Instead, EPDs based only on this c-PCR shall define an appropriate functional unit based on the specifications set below (Section 4.2.1), if possible. If a functional unit is not possible to define, due to the complexities in the functions of the product, or due to multiple use scenarios for a component, a declared unit can be defined instead, based on the specifications of Section 4.2.2.

Any declared or functional unit shall be clearly defined and documented in the EPD, so that it can be considered when comparing EPDs. The environmental performance results (see Section 4.9.5) shall be expressed per functional or declared unit.

4.2.1 FUNCTIONAL UNIT

When the battery has a clear application, the functional unit shall be defined with combination of the specific application. For example, when the battery is used in vehicles, then, its function is to supply electrical current at a desired voltage range. Thus, the functional unit (FU) is defined as one kWh of the total energy provided over the service life by the battery system (measured in kWh), and the priority shall be followed as below:

- For all batteries, the rules of the Annex II of Regulation (EU) 2023/1542 shall be prioritised, and:
 - For industrial batteries without external storage, the rules of the reference the Rules for the calculation of the Carbon Footprint of Industrial Batteries without external storage (CFB-IND) should be followed;
 - For electric vehicle batteries, the rules of the reference the Draft Act of Annex - Ares (2024) 3131389 should be followed;
- For batteries that do not have a clear FU in the above document, the FU shall be justify clearly in the EPD report.

For battery cells¹⁰, the functional unit shall be used and is defined as one kWh (kilowatt-hour) of the total energy provided by the battery cells over the battery's service life, measured in kWh. The total energy is obtained from the number of cycles multiplied by the amount of delivered energy over each cycle.

4.2.2 DECLARED UNIT

Only in cases a functional unit cannot be defined, a declared unit can be used. For the components of the battery (except for battery cells), the declared unit shall be one kilogram of the declared product without the product package, i.e., the environment impacts from packaging is not considered in the study.

4.2.3 TECHNICAL SPECIFICATION, LIFESPAN AND REFERENCE SERVICE LIFE (RSL)

The technical specifications and lifespan considerations for batteries are critical in defining their usability and sustainability. This c-PCR strictly follows the requirement of the PCR 2024:06. Based on instruction of the PCR, this c-PCR gives more details in this section. The operational lifespans, warranties, service life definitions, performance benchmarks, and international classifications should be applied for evaluating batteries' reference

¹⁰ According to EU2023/1542, 'battery cell' means the basic functional unit in a battery, composed of electrodes, electrolyte, container, terminals and, if applicable, separators, and containing the active materials the reaction of which generates electrical energy.

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service life (RSL). The RSL must be declared in the functional unit. When the RSL is difficult to define, the declared unit, based on the mass of the product, may be used instead. In such case, the RSL may also be declared and explained in the EPD if desired by the EPD owner.

4.2.3.1 Technical specifications of the studied product

The following technical specification of the product shall be presented in the LCA and in the EPD report, if relevant¹¹:

- Dimension (mm*mm*mm),
- Weight (g and/or kg),
- Capacity (Ah),
- Voltage (V),
- Minimum guaranteed Energy (Wh),
- RTE (%),
- Lifespan (years).

4.2.3.2 Operational lifespan and warranty rules of batteries

The years of operation for batteries are primarily determined by commercial warranties. Key rules include:

- Battery-Specific Warranties: The duration specified directly for the battery applies.
- Vehicle or Component Warranties: If no specific battery warranty exists, the vehicle or its component warranty, including the battery, applies.
- Kilometre-Based Warranties: For warranties expressed in both years and kilometres, the shorter of the two (converted into years) is used. Conversion rates are defined as:
 - 20,000 km/year for light-duty vehicle batteries;
 - 5,000 km/year for motorcycle batteries;
 - 60,000 km/year for medium- and heavy-duty vehicle batteries.
- Multiple Vehicle Usage: For batteries used in various vehicles, the shortest resulting warranty among the vehicles shall be applied.
- Warranty Validity Criteria: Only warranties ensuring at least 70% of the usable energy capacity at the start of the battery's life are considered valid. Warranties excluding essential components or imposing usage restrictions outside normal conditions are disregarded.
- Absence of Warranty: If no compliant warranty exists, a default lifespan of five years is assumed unless justified otherwise in a public study.

4.2.3.3 Service life definitions for electric vehicle (EV) batteries

The service life for batteries is primarily determined according to key rules below:

- Light-Duty EV Batteries: For light-duty EVs, the service life is defined by the distance driven until the battery reaches a State of Certified Energy (SOCE) of 70% for M1 category vehicles and 65% for N1 category vehicles. This is monitored by the Battery Management System (BMS) as per UN GTR No. 22. The standard lifespan is assumed to be 160,000 km, based on UN GTR No. 2211's minimum performance requirements.
- Motorcycle EV Batteries: For motorcycles (Category L), the battery's lifespan matches the vehicle's declared lifetime. Manufacturers must provide documentation detailing mileage expectations and end-of-life assumptions, such as SOCE thresholds.
- Medium- and Heavy-Duty EV Batteries: Medium- and heavy-duty EV batteries' service life depends on the total number of full equivalent discharge cycles (from 100% to 0% State of Charge). These cycles, along with the battery's expected lifetime, total energy throughput, and evaluation methods, must be documented in the supporting study.

¹¹ For battery and cells products, the technical specifications shall be specified in the LCA and EPD reports; for other parts of the battery that applied for EPD, e.g., the outer pack of the battery, which is a structural material of the battery, only the relevant parts of the technical specifications listed on this page shall be reported.

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- Other EV Batteries: Service life for other EV batteries aligns with Article 10, Annex IV of the Regulation (EU) 2023/1542. It reflects the expected lifetime under reference conditions, defined in terms of cycles.

4.3 SYSTEM BOUNDARY

The system boundary of the product life cycle determines the processes to be included or excluded in the assessment. The scope of this c-PCR and EPDs based on it is *cradle-to-grave* for battery and cell. For other components of the battery the boundary can be limited to *cradle-to-gate*. For the EPDs that are declared to be in line with Regulation (EU) 2023/1542, use stage shall **NOT** be included in the main result of EPD. The results in line with Regulation (EU) 2023/1542 may be declared in the additional information of the EPD.

The expression "*cradle-to-grave*" means that the following processes are included within the system boundaries, when applicable:

- Raw material extraction
- Production of components
- Manufacturing
- Transport
- Installation process
- Use of the product
- Maintenance / Repair
- De-installation process
- Waste processing for reuse, recycling, energy recovery and the final disposal (e.g., landfill)

The expression "*cradle-to-gate*" means that the following processes are included within the system boundaries, when applicable:

- Raw material extraction
- Production of components
- Manufacturing

For more details on the life cycle stages included in EPDs based on this c-PCR, see Section 4.3.1

All environmentally relevant processes should be included, so that at minimum 95% of the total energy use, mass of product content, and environmental impact is accounted for (see Section 4.5). For EPD that is to be in line with Regulation (EU) 2023/1542, a general cut-off of 1% in mass may be applied to material inputs per system component (see Figure 3 from European Commission (2024b)) and if a cut-off is applied, the mass gap shall be closed on system component level by adding the missing mass to the material input flow with the highest specific carbon footprint on the system component level concerned.

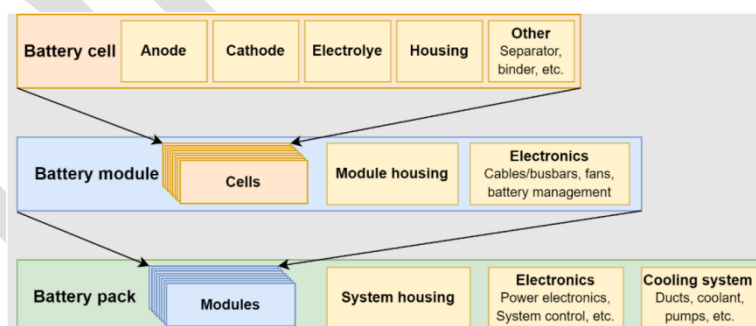


Figure 3. System components. The inner boxes depict the individual components of each product e.g., the battery cell comprises the components 'anode', 'cathode', 'electrolyte', 'housing' and 'other', while the components of the battery module are 'cells', 'housing' and 'electronics'.

4.3.1 LIFE-CYCLE STAGES AND INFORMATION MODULES

For different data quality rules and for the presentation of results, the life cycle shall be divided into four main stages:

- Manufacturing stage

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- Distribution stage
- Use stage
- End-of-life stage

Two additional life-cycle stages shall also be included, if relevant:

- Installation stage
- De-installation stage

To be noted, this is one difference between this c-PCR with the main PCR among the system boundary: the package(s) of the declared battery is NOT in the system boundary, in another word, the environmental performance of the package(s) of the battery is NOT taken into account in the LCA study. This also to align with the rules of the Regulation (EU) 2023/1542.

For the use stage, as power consumption calculations vary by battery type, a comprehensive list of calculation methods for all battery types is not possible. Calculation can be done according to national, regional, or other relevant regulations or standards. The method used shall be clearly declared in the EPD.

For the EPDs that are compliant with Regulation (EU) 2023/1542, the boundary shall be defined as, below, and the additional carbon footprint result (the impact assessment shall be done for the impact category 'Climate change' using the EF3.1 impact assessment method) shall be reported according to the life cycle stages stated by Regulation (EU) 2023/1542 in the Additional Information section at the end of the EPD report:

- Raw material acquisition and pre-processing
- Main product production
- Distribution
- End of life and recycling

Table 3 shows the relevant life cycle stages and related processes to be included when applicable, as well as the correspondence to modules A1 to C4 as per EN 15804+A2 (depends on the main PCR (PCR 2024:06)) and the life stages of Regulation (EU) 2023/1542.

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Table 3. Life cycle stages and processes to include for different EPD applications.

Life cycle stages (correspondence to the main PCR)	Processes for battery and cell (correspondence to sub-modules A1 to C4 as per EN 15804+A2, same as the main PCR)	Processes for components except for cell (correspondence to sub-modules A1 to A3 as per EN 15804+A2)	Processes for Regulation (EU) 2023/1542 for battery and cell (life cycle stages)
Manufacturing (Module A1-A3)	Material and components supply (A1)	Material and components supply (A1)	Raw material acquisition and pre-processing
	Transport (A2)	Transport (A2)	
	Manufacturing including all assembly and testing steps (A3)	Manufacturing including all assembly and testing steps (A3)	Main product production
Distribution (Module A4)	Transport from gate to site/point of sale (A4)	Not included.	Distribution
Installation (Module A5)	Installation at point of use (A5)	Not included.	Not included.
Use (Module B1-B7)	Use (B1)	Not included.	Not included.
	Maintenance (B2)	Not included.	Not included.
	Repair (optional) (B3)	Not included.	Not included.
	Reuse (optional) (B4)	Not included.	Not included.
	Refurbishment (optional) (B5)	Not included.	Not included.
	Operational energy use (B6)	Not included.	Not included.
	Operational water use (B7)	Not included.	Not included.
De-installation (Module C1-C4)	De-installation from point of use (C1)	Not included.	Not included.
End of life (Module C1-C4)	Transport (C2)	Not included.	End of life and recycling
	Waste processing (C3)	Not included.	
	Disposal (C4)	Not included.	

For details of each stage, please see section 4.3.1.1 to 4.3.1.6 of the main PCR (PCR 2024:06).

4.3.2 INFRASTRUCTURE AND CAPITAL GOODS

See section 4.3.2 of the main PCR (PCR 2024:06).

4.3.3 OTHER BOUNDARY SETTING RULES

See section 4.3.3 of the main PCR (PCR 2024:06).

4.4 CUT-OFF RULES

See section 4.5 of the main PCR (PCR 2024:06).

To be noted, this is one difference between this c-PCR with the main PCR: For EPD that is to be in line with Regulation (EU) 2023/1542, a general cut-off of 1% in mass may be applied to material inputs per system component. If a cut-off is applied, the mass gap shall be closed on system component (see *Figure 3*) level by adding the missing mass to the material input flow with the highest specific carbon footprint on the system component level concerned. The EPD shall mention if and where the cut-off of 1% in mass has been applied. This also to align with the rules of the Regulation (EU) 2023/1542.

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4.5 PROCESS FLOW DIAGRAM

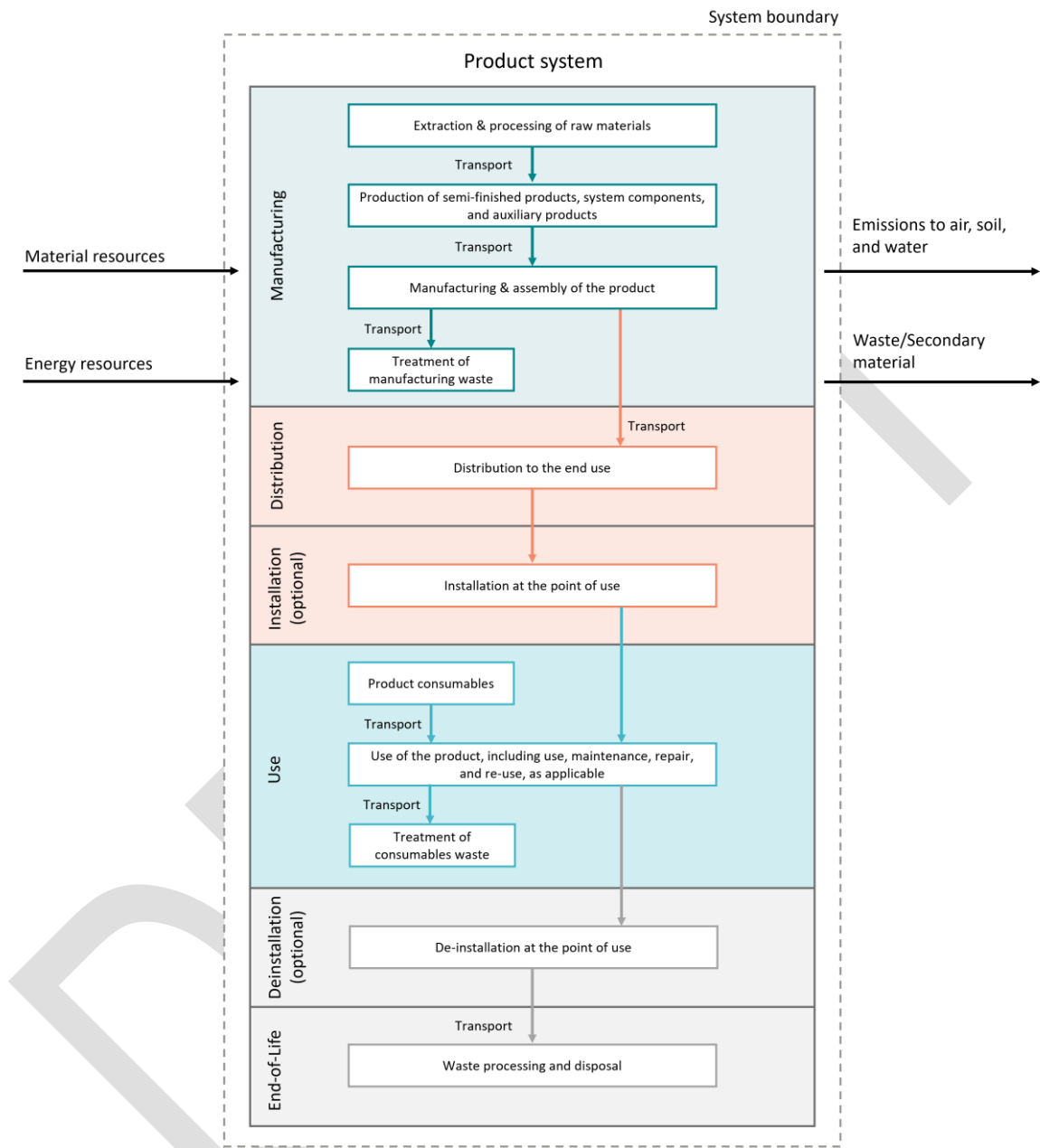


Figure 4. Process flow diagram illustrating the processes that shall be included in the product system, divided into the life-cycle stages. The illustration of processes to include may not be exhaustive.

4.6 ALLOCATION RULES

See section 4.6 of the main PCR (PCR 2024:06).

4.6.1 ALLOCATION OF CO-PRODUCTS

The following stepwise procedure shall be applied for allocation of co-products:

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1. Allocation shall be avoided, if possible, by dividing the process to be allocated into sub-processes and collecting the inventory data for each sub-process.
2. Allocation shall be based on physical properties (e.g., mass, volume) when (i) there is a relevant underlying physical relationship between the products and co-products, and (ii) the difference in revenue per mass (or per energy unit in case of electricity, heat or similar) from the products and co-products is low. A relevant underlying physical relationship exists when the amounts of inputs and outputs are changed by quantitative changes in the amounts of products or functions delivered by the system.
3. In all other cases, allocation shall be based on economic values of the products and co-products when they leave the unit process. Economic values may, for example, be the revenue generated by each product and co-product. The revenue is the price multiplied by the output. For both price and output, representative values should be identified (e.g., rolling annual averages). If economic allocation is used, a sensitivity analysis exploring the influence of the choice of economic value shall be included in the LCA report. Economic allocation shall always be applied when the price difference between at least two of the different outputs is higher than a factor of four. Such price differences shall be calculated based on a 10-year global price average for metals, ores and metal salts and 5-year global price average for all other commodities. A shorter time span may be used if evidence is provided that the global prices are not available for 10 years and 5 years, respectively.
4. All allocation factors, the approach for calculating them and the underlying data sources shall be disclosed in the EPD study. If the process has been operative for shorter time, a shorter time span of minimal one year may be used to determine revenues or process costs if duly justified in the EPD study. If shorter time spans are used for global prices, revenues, or process costs, the EPD calculation shall be updated at the latest when sixty months average values are available.

4.6.2 ALLOCATION OF WASTE

See section 4.6.2 of the main PCR (PCR 2024:06).

For EPDs that declare to be in compliance with the Regulation (EU) 2023/1542, The recycled content and the waste generated during all the life-cycle stages shall be modelled with the use of the Circular Footprint Formula (CFF) and shall be reported at the life-cycle stage where the waste management occurs. The latest available method on modelling from Regulation (EU) 2023/1542 and its calculation rules (for example, *Rules for the calculation of the Carbon Footprint of Electric Vehicle Batteries (CFBEV)*) shall be adopted.

4.6.3 ALLOCATION OF ENERGY AND AUXILIARY INPUTS OF PRODUCTION LINES

If company-specific data is collected for energy auxiliary inputs or other consumables and subdivision is not representative for the considered process, allocation of the corresponding inputs may be done. This applies if only one meter (e.g., for electricity) is available for several production lines of a plant or if a process step (e.g., dry room) processes products from different production lines.

The following hierarchy shall be used:

1. Allocation by mass (or other physical properties) that most closely represent the drivers for the corresponding input
2. Allocation using the installed capacity (or another appropriate criterion).

This approach may only be used if the production steps, production equipment, and the products themselves are similar, (e.g., battery cells with the same geometry, but different properties). The chosen method shall be reported and documented in the EPD supporting study, including the reasoning why the approach was taken. In all cases, the sum of the allocation shall equal the total energy consumption (measured).

4.6.4 ADDITIONAL ALLOCATION FOR BATTERY HOUSING IN ELECTRIC VEHICLE BATTERIES

The housing of the EV battery delivers the following functions to the battery:

- A. Holding the cells or modules;
- B. Integrating the battery cooling system and/or insulation.

In case of battery housing providing additional functions to the electric vehicle (e.g., torsional stiffness, crash resistance, etc) beyond the two main functions (A) and (B) above, then the modelling of the battery housing may be done as following (in hierarchical order) if corresponding justification is provided in the EPD supporting study:

- Physical partitioning: the components of the housing that provide one or more functions to the electric vehicle (and not contributing to functions (A) and (B) above) shall be excluded from the system boundary.

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- Virtual housing approach: when physical partitioning is not feasible, a virtual housing shall be modelled (i.e., the size of the housing shall be re-calculated according to the size of the battery and a reference thickness for each material). The virtual housing shall be modelled as:
 - The size of the housing will be re-calculated according to the size of the battery. Based on the actual Length (L), the Width (W) and the Height (H) of the battery housing, the Area of the virtual housing shall be calculated as:

$$Area = (L \cdot W) \cdot 2 + (W \cdot H) \cdot 2 + (L \cdot H) \cdot 2$$

- The materials to model the virtual housing shall be the same as used in the real housing. In addition:
 - If only one material is used in the real housing, the virtual housing shall be considered as made of such material.
 - If more than one material is used in the real housing, only those materials accounting for at least 95% of the weight of the real housing shall be considered. Those materials shall be selected in decreasing order of importance, from the material contributing most to the material contributing the least in terms of weight, until the minimum threshold of 95% is reached. Once the materials are selected, the mass of the different materials shall be normalized to 100%.
 - The "Weight" of each material in the virtual housing shall be calculated as:

$$Weight_{mati} = Area \cdot Percentage_{mati} \cdot t_{mati} \cdot \rho_{mati}$$

Where:

- Area: total area of the virtual housing, as calculated in point (a) above
- $Percentage_{mati}$: proportion of material i , as calculated in point (b)
- t_{mati} : reference thickness of material i
- ρ_{mati} : density of material i

The following reference thickness values for different materials shall be considered: aluminium (2.5 mm); steel (1.75 mm); carbon fibers based material (2.02 mm). The declarant may prove that different thickness would be more appropriate for the considered battery housing for other materials (e.g., when other innovative materials are used).

The implementation of the virtual housing approach shall be reported in detail in the EPD supporting study, including all assumptions used, with details of the model and experimental values used especially in the case of deviating from the reference thickness values above.

A battery housing is considered to provide additional functions if it contributes to the torsional stiffness and the crash resistance. In the context of the EPD and for the sake of verification, the sole torsional stiffness shall be considered to identify whether the battery housing provides additional functions or not. For this purpose, the EPD applicant shall report two values of torsional stiffness of the vehicle in the EPD supporting study: i) with battery housing and ii) without battery housing. If the torsional stiffness with battery housing is higher than the stiffness without battery housing then the battery housing is contributing to the stiffness of the vehicle and thus it can be considered as providing additional functions to the vehicle.

4.7 DATA AND DATA QUALITY RULES

See section 4.7 of the main PCR (PCR 2024:06).

4.8 OTHER LCA RULES

See Section A.6 of the GPI.

4.9 SPECIFIC RULES FOR THIS C-PCR

See Section A.7 of the GPI.

For the EPDs that are declared to be compliance with Regulation (EU) 2023/1542, further requirements in sections below shall be met. The additional carbon footprint result (the impact assessment shall be done for the impact category "Climate change" using the EF3.1 impact assessment method) with Data Quality Rating results shall be reported according to the life cycle stages stated by Regulation (EU) 2023/1542 in the Additional Information section at the end of the EPD report.

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4.9.1 DATA QUALITY REQUIREMENTS

4.9.1.1 Data collection requirements and quality requirements

The data collection and modelling for all the processes included in the main product production and the distribution life cycle stages shall be done in accordance with section 2.3.1 of Annex - Ares (2024) 3131389.

The data collection and modelling for the following processes shall be done in accordance with section 2.3.2 of Annex - Ares (2024) 3131389:

- Production of cathode active material precursors: cobalt, nickel, iron, lithium, vanadium and titanium, whether metallic or as salts;
- Production of anode active material precursors: graphite precursors, hard carbon precursors, lithium, silicon, titanium and rare earths, whether, where applicable, metallic or as salts;
- Production of electrolyte salt and precursors: LiPF₆, LiTFSI and lithium salts;
- Production of copper;
- Production of aluminium;
- Production of steel.

For the processes not listed in the first, second and third paragraphs of this section, the data collection and modelling shall be done in accordance with section 2.3.3 of Annex - Ares (2024) 3131389.

4.9.1.2 Mandatory company-specific processes

Company-specific data shall be collected in accordance with section 2.3.5 of Annex - Ares (2024) 3131389.

The manufacturer of the battery shall ensure that the company-specific data is communicated in any of the following methods:

- Suppliers provide to the manufacturer the complete LCI of the process, including elementary flows, energy consumption, input material, and the recycled content 'R1' referred to in section 2.6 of Annex - Ares (2024) 3131389;
- Suppliers provide the manufacturer with a company-specific dataset;
- Suppliers provide the complete LCI of the process, including elementary flows, energy consumption, input material, and the recycled content 'R1' referred to in section 2.6 of Annex - Ares (2024) 3131389, and the information required for the carbon footprint study (LCA study in this case) as specified in section 3.1 of Annex - Ares (2024) 3131389 to a third-party, such as a data management company, who combines the inputs from different suppliers and provides the manufacturer a company-specific dataset for different processes.

Where the manufacturer communicates the company-specific data in accordance with point (b), the manufacturer shall ensure that the notified body receives from the manufacturer's suppliers all the information specified in section 3.1.1 of Annex - Ares (2024) 3131389 when the manufacturer lodges its application for assessment by the notified body. The manufacturer shall also ensure that a market surveillance authority receives such information upon request.

Where the manufacturer communicates the company-specific data in accordance with point (c), the manufacturer shall ensure that the notified body receives from its suppliers or from the third-party all the information specified in section 3.1.1 of Annex - Ares (2024) 3131389 when the manufacturer lodges its application for assessment by the notified body. The manufacturer shall also ensure that a market surveillance authority receives such information upon request.

Company-specific datasets communicated by the suppliers to the manufacturer shall be accompanied with the information needed by the manufacturer or another of its suppliers to incorporate the dataset into its carbon footprint model and shall contain at least the following information:

- A precise description of the product for which the carbon footprint information is valid, including its origin and an unambiguous identifier;
- The total carbon footprint declared per unit of mass of the product, in kg CO₂ equivalent per kg, or per unit of energy, in kg CO₂ equivalent per kWh;
- The carbon footprint for each applicable life cycle stage listed in section 2.2.1 of Annex - Ares (2024) 3131389;
- Parameters related to the quality of the product that affect its carbon footprint, such as purity or specific capacity;
- The specific content and the carbon footprint of metals and metal salts that are targeted by the default battery cell recycling process referred to in section 2.6 of Annex - Ares (2024) 3131389, at least regarding steel, aluminium, copper, cobalt, nickel, manganese, lithium,

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graphite, silicon, titanium, vanadium, silver, gold, platinum group metals and phosphorous. If such metals and metal salts contain recycled content, the carbon footprint of E_{V_Mat} and $E_{recycled_Mat}$ as defined in section 2.6 of Annex - Ares (2024) 3131389 shall be provided.

4.9.1.3 Non-mandatory most relevant processes

If at least one secondary dataset with a Technological Representativeness ('TeR') quality rating equal to or lower than four determined in accordance with section 2.3.6 of Annex - Ares (2024) 3131389 is available in the datastock dedicated to the carbon footprint of batteries in the Life Cycle Data Network (LCDN) on the European Platform on LCA ('carbon footprint datastock') one of the following methods shall be chosen for data collection and modelling:

- The most representative secondary dataset in the carbon footprint datastock shall be used. If the dataset is a partially disaggregated, the electricity dataset or datasets connected to the core process one level down the supply chain at -1 level may be changed for the average electricity consumption mix of the country where the process is occurring, modelled in accordance with section 2.4 of Annex - Ares (2024) 3131389. Such choice shall be duly justified in the LCA report;
- A company-specific dataset with a Data Quality Rating ('DQR') equal to or lower than two. In such case, section 2.3.1 of Annex - Ares (2024) 3131389 shall apply.

If no secondary dataset with a TeR equal to or lower than four is available in the carbon footprint datastock, one of the following methods shall be chosen for data collection and modelling:

- A secondary dataset in line with the following hierarchy:
 - the most representative EF-compliant dataset available in LCDN. If the dataset is a partially disaggregated, the electricity dataset or datasets connected to the core process one level down the supply chain at -1 level may be changed for the average electricity consumption mix of the country where the process is occurring, modelled in accordance with section 2.4 of Annex - Ares (2024) 3131389. Such choice shall be duly justified in the LCA report;
 - a representative EF-compliant dataset from any other source;
 - a representative ILCD entry-level compliant dataset either from LCDN or from any other source.
- A company-specific dataset with a DQR equal to or lower than three. In such case, the methods in section 2.3.1 of Annex - Ares (2024) 3131389 shall apply.

For each process, the method selected shall be detailed in the LCA report, including any relevant assumptions and justifications such as the choice of a proxy in the case of TeR equalling four.

4.9.1.4 Other processes

If one or more secondary datasets with a TeR quality rating equal to or lower than four determined in accordance with section 2.3.6 of Annex - Ares (2024) 3131389 are available in the carbon footprint datastock, the most representative secondary dataset in the carbon footprint datastock shall be used.

If no secondary dataset with a TeR quality rating equal to or lower than four is available in the carbon footprint datastock, a secondary dataset in line with the following hierarchy shall be used:

- The most representative EF-compliant dataset available in LCDN;
- A representative EF-compliant dataset from any other source;
- A representative ILCD entry-level compliant dataset either from LCDN or from any other source.

All the secondary datasets used shall be reported in the LCA study.

4.9.1.5 Company-specific datasets

Company-specific datasets shall comply with the following requirements:

- The data format shall be compliant with the ILCD data format available in LCDN;
- The nomenclature of the elementary flows shall be aligned with the EF 3.1 reference package for the carbon footprint of batteries available in LCDN or the process datasets and product flow, the nomenclature shall be compliant with the ILCD Handbook Nomenclature and other conventions, available via the European Platform on LCA;

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- The EPD report shall include the DQR and the values of the three DQR criteria, calculated in accordance with section 2.3.6 of Annex - Ares (2024) 3131389;
- The meta-data information shall comply with the requirements for meta-data information set out in the Guide for EF-compliant datasets, available on the European Platform on LCA;
- The system boundaries of cradle-to-gate models shall not include the distribution and end of life and recycling life cycle stages and only the material input of the circular footprint formula referred to in section 2.6 of Annex - Ares (2024) 3131389 shall apply;
- In case of a LCI result dataset, the dataset shall include the LCI results and the LCIA results of the environmental performance indicators;
- In case of a LCIA result dataset, the dataset shall include the LCIA results of the environmental performance indicators.

4.9.1.6 Company-specific data

The company-specific data to be collected for the creation of company-specific datasets shall include all known inputs and outputs for the processes concerned, including:

- The following inputs:
 - material inputs that end up in the product, including minerals and metals, semi-finished materials and chemical feedstocks. If materials are used in solution state, the specific concentration shall be provided. The specific concentration data on the metal and on other elements, either concentration or specific metal content shall be provided;
 - energy that is consumed directly and indirectly in the processing plant, such as electricity, steam, thermal energy required by the process, and energy and fuels required for auxiliary activities such as transport or forklifting within the plant premises;
 - auxiliaries and any other material inputs required for the manufacturing process, such as chemicals, cleaning material, lubricants, and refrigerants;
 - transport distances and means of transport;
 - any elementary flow.
- The following outputs:
 - any material output, including wastewater;
 - any elementary flow. Emissions that are not accounted for in the corresponding energy process dataset and that are not monitored via measurements shall be estimated based on stoichiometric calculations.

Company-specific data shall be the average of one year. However, the data may be the average of a different period if the process concerned has not yet been running for a full year or exceptionally in another case justified in the LCA report.

A production process may be divided into sub-processes. The company-specific data may be collected for each process or subprocess stage separately, or for the final production as a whole. For the outputs, direct emissions and waste streams shall be recorded. For the inputs, the following parameters shall be recorded:

- Specification of the input, such as 'cobalt sulphate (CoSO₄ x7H₂O), primary, [provider], [country]'
- Unit, such as 'kg'
- Bill of material or inventory data per kg main output product, before applying the circular footprint formula ('CFF') referred to in section 2.6 of Annex - Ares (2024) 3131389
- Activity data per kg main output product of the process, after applying the CFF
- LCI
- Activity data per functional unit, after applying the CFF
- Universally Unique Identifier ('UUID')
- Dataset name
- Dataset location
- Dataset type
- Most relevant process: 'yes' or 'no'

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- -1 level adjusted to [country]
- TeR
- TiR
- GeR
- Data source, collection method or methods, and timespan
- Data collection date
- Documentation for verification

In the case of continuous or semi-continuous processes the following shall apply:

- Measurements shall be collected at the points of consumption or emission directly relative to the process considered for the battery in the scope;
- The consumption of energy and auxiliaries shall preferably be based on an individual and detailed metering system that enables to attribute the energy or auxiliary consumption of the entire production to production lines, products, and time periods. Where the energy or auxiliary consumption cannot directly be related to a specific product, for example where several products are produced in a facility while the consumption data is not available per specific product, the data shall be collected as specific as possible, such as split up into energy or auxiliary consumption for electrode manufacturing, cell assembly, cell finishing, and climatization of clean or dry rooms. Where the energy or auxiliary consumption can be directly related to a specific process, the data of such consumption shall be used. Where the consumption data is only available for several products, for example, in case of presence of individual meters for cell assembly lines and only one general meter for a dry room in which several assembly lines produce different cells, the consumption data shall be split up by allocation in accordance with section 4.6 of Annex - Ares (2024) 3131389. Where the process concerns a new facility, extension of capacity or exchange of entire production line, up to six of the initial months may be excluded from the data collection.

Where activity data for material inputs are not available for a specific cell or battery, but only available aggregated for several cell products, the cell mass balance may be used to determine the material inputs. In this case, the resulting bill of material shall include all facility-specific yields, such as manufacturing scrap and manufacturing waste rates, including entire cells at the end of line testing. The corresponding yield rates shall be provided in the LCA report.

Company-specific emission data may be based on direct measurements or be calculated combining company-specific activity data, such as litres of fuel consumption in a boiler, with related emission factors from established sources, such as a specific emission factor for combustion of that fuel. If the process concerned is covered by EU emission trading system monitoring rules, the quantification requirements as set out in Commission Implementing Regulation (EU) 2018/2066¹² shall apply for the processes and greenhouse gases covered therein. The data may be scaled, aggregated or undergo other forms of mathematical treatment in order to bring them in line with the reference flow of the process.

Process emissions of CO₂ and other greenhouse gas emissions from chemical reactions shall be quantified from the reaction stoichiometry. If acids are obtained as by-product from emission abatement, subdivision shall be applied as referred to in section 4.6 of Annex - Ares (2024) 3131389.

All data sources and mathematical treatments applied to the data shall be provided in LCA report.

A company quality management system such as in accordance with ISO 9001:2015, ISO 14001:2015 or Regulation (EC) No 1221/2009 of the European Parliament and the Council¹³, or equivalent shall be applied in order to demonstrate that all the activity data have been correctly collected and managed, and that they are representative of a yearly average or other period referred to of the process in scope.

The template in Table 4 may be used for the data collection for each of the process stages in the raw material acquisition and pre-processing life-cycle stage.

Table 4. Generic data collection template for the raw material acquisition and pre-processing life cycle stage

Material	Unit	Data	Specification
<i>Inputs</i>			
Main input (ore, matte, etc.)			Not applicable in case of company-specific mining

¹² Commission Implementing Regulation (EU) 2018/2066 of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012 (OJ L 334, 31.12.2018, p. 1, ELI: https://eur-lex.europa.eu/eli/reg_impl/2018/2066/oj)

¹³ Regulation (EC) No 1221/2009 of the European Parliament and the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC (OJ L 342, 22.12.2009, p. 1, ELI: <http://data.europa.eu/eli/reg/2009/1221/oj>)

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Electricity			In accordance with section 2.4 of Annex - Ares (2024) 3131389
Fuels for and machinery			Such as diesel, LNG or hydrogen
Fuels for (process) heat generation			Such as natural gas, coal / hydrogen
External heat supply (heat and steam respective of fuel)			If heat is sourced externally
Explosives			
Filling or structural material for production			Such as cement for backfilling
Acids			Such as sulphuric acid for acid leaching
Sulphur or H ₂ S			For on-site sulphuric acid production
Neutralizer or slagging agents			Such as lime, limestone, NaOH or MgO
Electrodes			Such as graphite electrodes
Reductants			Such as coal, charcoal or hydrogen
Chemicals			Bulk chemicals such as frother, dispersants or flocculants. Other chemicals may be aggregated and added to the major bulk chemicals.
Tyres			For specific machines at the mining stage
Technical gases			Such as nitrogen or oxygen, if purchased externally
Grinding media			Such as high strength steel balls or rods
Transport of input materials			Such as by truck, train, bark. Standard distances may be used.
Outputs			
Main product			Such as ore mined, matte, concentrated
			Ore, final metal or metal salt, graphite ore, intermediate product. Assay data to be provided for specific metal contents or concentrations of ores or minerals and intermediate products
By-products			Such as sulphuric acid or other metals or metal salts than the main product. Allocation in accordance with section 2.5 of Regulation (EU) 2023/1542
Waste rock			
CO ₂ (fossil) and other GHG emissions			Based on fuels and explosives if combustion emissions are not considered in the corresponding fuel or energy dataset, reductants, electrodes and other reactions where CO ₂ emissions occur, such as neutralization or precipitation with limestone

4.9.1.7 Data quality declaration/ratings

For the EPDs that are declared to be compliance with Regulation (EU) 2023/1542, following further requirements shall be met:

- A Data Quality Rating ('DQR') shall be calculated for the declared value of the carbon footprint in accordance with the following procedure:
 - determine the quality rating for each of the three DQR criteria of Technological Representativeness ('TeR'), Geographical Representativeness ('GeR'), Timerelated Representativeness ('TiR') for all the company-specific and secondary datasets used in the model in accordance with Table 5;
 - calculate the carbon footprint of each process by multiplying the carbon footprint of the dataset by the corresponding activity data;
 - calculate the carbon footprint contribution, expressed in percentage, of each process. The carbon footprint contribution is the ratio between the carbon footprint of the process divided by the sum of the values of all processes. In case a process has a negative carbon footprint, take the absolute value for this process rather than the negative value, including in the denominator;

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- calculate the value of each DQR criterion of the declared value of the carbon footprint as a weighted average of the quality ratings of the DQR criterion concerned, weighted by the carbon footprint contribution of each process determined in point (c);
- calculate the DQR of the declared value of the carbon footprint as the sum of the values of the three DQR criteria divided by three.
- The DQR and the values of TeR, GeR, and TiR of the carbon footprint shall be provided in the LCA report.
- The DQR of company-specific datasets shall be calculated with the following procedure:
 - determine the quality rating for each of the three DQR criteria of Technological Representativeness ('TeR'), Geographical Representativeness ('GeR'), Timerelated Representativeness ('TiR') for all the company-specific and secondary datasets used in the model of the company-specific dataset concerned in accordance with Table 5;
 - calculate the carbon footprint of each process by multiplying the carbon footprint of the dataset by the corresponding activity data;
 - calculate the carbon footprint contribution, expressed in percentage, of each process. The carbon footprint contribution is the ratio between the carbon footprint of the process divided by the sum of the values of all processes. In case a process has a negative carbon footprint, take the absolute value for this process rather than the negative value, including in the denominator;
 - calculate the value of each DQR criterion of the declared value of the carbon footprint of the company-specific dataset concerned as a weighted average of the quality ratings of the DQR criterion concerned, weighted by the carbon footprint contribution of each process determined in point (c);
 - calculate the DQR of the declared value of the carbon footprint of the company-specific dataset concerned as the sum of the values of the three DQR criteria divided by three.

Table 5. Evaluation of the DQR criteria

Quality rating	TiR _{dataset}	TeR _{dataset}	GeR _{dataset}
1	For secondary datasets used in the modelling, the reference year of the carbon footprint is within the time validity of the secondary dataset. For company-specific datasets or if the secondary dataset does not provide any information on validity, such as in the case of ILCD-compliant datasets, the reference year of the carbon footprint is equal to the reference year of the dataset.	The technology concerned is the same as the one in scope of the dataset.	The process modelled takes place in the country for which the dataset is valid.
2	For secondary datasets used in the modelling, the reference year of the carbon footprint is maximum 2 years beyond the time validity of the secondary dataset. For company-specific datasets or if the secondary dataset does not provide any information on validity, the reference year of the carbon footprint is maximum 2 years after the reference year of the dataset.	The technology concerned is included in the mix of technologies in scope of the dataset, yet with some limited differences in the production pathways.	The process modelled takes place in the geographical region for which the dataset is valid.
3	In case of secondary datasets used in the modelling, the reference year of the carbon footprint is maximum 3 years beyond the time validity of the secondary dataset. In case of company-specific datasets or if the secondary dataset does not provide any information on validity, the reference year of the carbon footprint is maximum 3 years after the reference year of the dataset.	The technology concerned is included in the dataset, with significant differences in the production pathway.	The process modelled takes place in one of the geographical regions where the dataset is valid for, such as in the case of a global dataset.

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Quality rating	TiR _{dataset}	TeR _{dataset}	GeR _{dataset}
4	In case of secondary datasets used in the modelling, the reference year of the carbon footprint is maximum 4 years beyond the time validity of the secondary dataset. In case of company-specific datasets or if the secondary dataset does not provide any information on validity, the reference year of the carbon footprint is maximum 4 years after the reference year of the dataset.	The technology concerned is similar, including in terms of systems boundaries and carbon footprint, to the modelled technologies in the dataset, meaning a technological proxy.	The process modelled takes place in a country that is not included in the geographical region or regions for which the dataset is valid, but it is estimated that there are sufficient similarities based on expert judgement.
5	In case of secondary datasets used in the modelling, the reference year of the carbon footprint is more than 4 years beyond the time validity of the secondary dataset. In case of company-specific datasets or if the secondary dataset does not provide any information on validity, the reference year of the carbon footprint is more than 4 years after the reference year of the dataset.	The technology concerned is different from those included in the scope of the dataset.	In all other cases not listed on 1-4.

If the electricity dataset or datasets connected to the core process at '–1 level' are changed for the average electricity consumption mix, the GeR of the dataset shall be calculated as follows:

$$GeR = GeR_{original} - (GeR_{original} - GeR_{modified, -1}) \cdot Contribution_{original, -1}$$

Where:

- $GeR_{original}$ is the GeR of the secondary dataset before changing the dataset describing the electricity consumption in the –1 level, in accordance with Table 5;
- $GeR_{modified, -1}$ is the GeR of the dataset describing the electricity consumption in the '–1 level' after the adjustment;
- $Contribution_{original, -1}$ is the contribution, expressed as a percentage, of the carbon footprint impact of the electricity consumption in the '–1 level' compared to the total carbon footprint of the secondary dataset.

4.9.2 LIFE CYCLE STAGES WITH ALLOCATION WITH WASTE

The description of life cycle stages in this section is based on the main PCR (PCR 2024:06). Please check the following sections with section 4.3.1 and Table 3 to get a better understanding of the life cycle stages of Regulation (EU) 2023/1542.

4.9.2.1 Product stage, modules A1-A3

The production of packaging materials, as the contribution to the overall impact has been estimated to be negligible according to the Product Environmental Footprint Category Rules (PEFCR) for batteries. Therefore packaging is excluded from the scope.

For EPDs that declare to be compliant with the Regulation (EU) 2023/1542, The recycled content and the waste generated during all the life-cycle stages shall be modelled with the use of the Circular Footprint Formula (CFF) and shall be reported at the life-cycle stage where the waste management occurs. The latest available method on modelling from Regulation (EU) 2023/1542 and its calculation rules (for example, *Rules for the calculation of the Carbon Footprint of Electric Vehicle Batteries (CFBEV)*) shall be adopted.

4.9.2.2 Distribution and installation stage, modules A4-A5

For EPDs that declare to be in compliance with the Regulation (EU) 2023/1542, installation stage is excluded from the scope.

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4.9.2.3 Use stage, modules B1-B7

For EPDs that declare to be in compliance with the Regulation (EU) 2023/1542, use stage is excluded from the scope.

4.9.2.4 End-of-life stage, modules C1-C4

For EPDs that declare to be in compliance with the Regulation (EU) 2023/1542, deinstallation stage is excluded from the scope.

For EPDs that declare to be in compliance with the Regulation (EU) 2023/1542, The recycled content and the waste generated during all the life-cycle stages shall be modelled with the use of the Circular Footprint Formula (CFF) and shall be reported at the life-cycle stage where the waste management occurs. The latest available method on modelling from Regulation (EU) 2023/1542 and its calculation rules (for example, *Rules for the calculation of the Carbon Footprint of Electric Vehicle Batteries (CFBEV)*) shall be adopted.

4.9.3 ELECTRICITY MODELLING

4.9.3.1 General guidelines

The following electricity modelling shall be used, in hierarchical order:

1. On-site generated electricity modelled according to section 4.9.3.2 if it meets the conditions set in the same section.
2. Supplier-specific electricity product modelled according to section 4.9.3.3 if the contractual instrument meets the set of minimum criteria described in sections 4.8.2.3.
3. Residual consumption mix modelled according to section 4.9.3.4 if the activity occurs in a country where it is possible to claim a supplier-specific electricity product described in point (2) of the hierarchy. The residual consumption mix shall be used also if the EPD declarant itself did not claim any supplier-specific electricity product. The residual consumption mix characterizes the unclaimed, untracked or publicly shared electricity and prevents double counting with the use of supplier-specific electricity product in the point (2) of the hierarchy.
4. Average consumption mix modelled according to section 4.9.3.5 if the activity occurs in a country where it is not possible to claim the supplier-specific electricity product described in point (2) of the hierarchy (i.e., no residual consumption mix is available). The average consumption mix reflects the total electricity mix including claimed or tracked electricity.

The use of carbon intensity factors values provided by a grid operator or certificate-issuing entity is not permitted.

NOTE: certificates for the contractual instruments could include an estimation of the carbon footprint of the electricity delivered. However, there is no guarantee that such data are EPD-compliant or following a common, uniform standard and for this reason they are not allowed for the calculation of the EPD.

The way the electricity is modelled in the EPD shall be reported in the EPD supporting study.

4.9.3.2 On-site generated electricity

The on-site generated electricity shall be claimed if the electricity is supplied to the plant from a production asset within the premises of the energy-consuming plant and if the production asset is connected to the energy-using plant by means of a direct and dedicated connection.

If the energy-consuming plant is also connected to the electricity grid and electricity is sourced from the grid in addition to on-site generation (e.g., during times of low on-site generation), all energy sourced from the grid shall be accounted and modelled following the points (2), (3), or (4) of the hierarchy described in section 4.9.3.1. The maximum amount of electricity that may be claimed in a year is the difference between the yearly total amount of energy produced and the yearly amount of energy injected in the grid. The EPD declarant shall provide evidences in the EPD supporting study of the values of on-site generated electricity considered in the EPD calculation.

If contractual instruments of any type, related to the on-site generated electricity, have been sold to a third party, then the on-site generated electricity cannot be claimed in the EPD. If such electricity is consumed in the plant, then it shall be modelled following the points (2), (3) or (4) of the hierarchy described in section 4.9.3.1.

No credit shall be modelled if the amount of electricity produced exceeds the amount consumed on-site within the defined system boundary and it is sold to, e.g., the electricity grid.

The processes that model the electricity production per energy type and country/region (e.g., production of 1 MWh solar energy in the corresponding country/region) shall be modelled as a “non-most relevant processes”, where datasets describing medium-voltage may be used for low-voltage, neglecting the conversion losses.

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4.9.3.3 Supplier-specific electricity product

The environmental integrity of the use of supplier-specific electricity products depends on ensuring that the related contractual instruments (for tracking) are reliable and unique. Without this, the EPD lacks the accuracy and consistency needed to drive claims on the electricity procurement. Therefore, the contractual instrument shall be claimed in the EPD if the respect of the following five minimum criteria is proved in the supporting study.

The processes that model the electricity production per energy type/source and country/region (e.g., production of 1 MWh solar energy in the corresponding country/region) shall be modelled as a “non-most relevant processes”, where datasets describing medium-voltage may be used for low-voltage, neglecting the conversion losses.

NOTE: the Guarantees of Origin (GO) are currently the only contractual instruments that comply with the minimum reliability criteria in the European Union. Evidences are currently missing of other extra- European instruments that meet the criteria below. Once evidences will be provided for other extra European instruments, these will be verified by the notified bodies and residual consumption mix will have to be considered for the countries where this instrument is in place.

Criterion 1 – Convey attributes

To satisfy the criterion, the contractual instrument shall:

- Convey the energy source mix and complementary attributes of the product associated with the unit of electricity produced.
- Include an explanation of the calculation method used to determine the energy source mix of the product.

Criterion 2 – Be a unique claim

To satisfy the criterion, the contractual instrument shall:

- Have mechanisms in place that ensure it is the only instrument that carries the environmental attribute claim associated with that quantity of electricity generated. An example of mechanism is to be externally-verified and audited.
- Have mechanisms in place to ensure the instrument can be claimed only once.
- Be tracked and redeemed, retired, or cancelled by or on behalf of the company (e.g., by an audit of contracts, third party certification), or handled automatically through other disclosure registries, systems, or mechanisms.
- Be associated with a quantity of generated electricity that is reported and considered for the determination of the country-specific residual consumption mix, and this unique residual consumption mix is disclosed publicly by a competent authority. Sometimes national laws and regulations may define a residual consumption mix for a geographical area that is different from the country. The EPD declarant shall report the residual consumption mix and its source in the EPD supporting study.

NOTE: If different tracking systems coexist in one country, only one residual consumption mix needs to be published for the country (or for part of the country), taking into account all the contractual instruments that have been issued in the country for the considered period.

NOTE: In the GoO instrument, States that adhere to this instrument are responsible of publishing the country residual consumption mix.

- Allow for the unambiguous identification of the technology type, age and location and capacity of the energy generation facility to which it refers.
- Refer to an energy generation facility that is located in a country with a tracking system in place that meets the minimum criteria for tracking systems specified in section below.

Criterion 3 – Be issued from a tracking system that fulfils specific criteria

To satisfy the criterion, the contractual instrument shall be issued by a tracking system that fulfils the following criteria:

- Is based on objective, non-discriminatory, and transparent criteria for the issuing certificates.
- Is a unique entity per geographical area and per type of energy production and it shall be governmentally appointed.
- Relies on accurate, reliable, and fraud-resistant mechanisms for the issuance, transfer and cancellation of certificates.
- Is independent from the verifier.
- Entrusts the issuance of certificates, as well as the supervision of their transfer and cancellation of certificates, to a legal entity or entities who are independent from the production, trade of energy, and the corresponding certificates.
- Whose activities are governed by transparent rules and procedures.
- Whose decisions may be challenged and reviewed in the context of proceedings before an independent judiciary.

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- Whose use is enforceable by national legislation for claims on the origin of consumed energy.
- Works in interaction with the authority publishing the residual consumption mix in a way that prevents double claims of renewable energy sources and other environmental attributes.

NOTE: An example for a country-specific issuing body is the Association of Issuing Bodies i.e., the organisation which governs the European Energy Certificate System.

NOTE: In some cases, the tracking systems can have different geographical boundaries than a country.

Criterion 4 – Be as close as possible to the period to which the contractual instrument is applied

To satisfy the criterion, the contractual instrument shall:

- Ensure that certificates are valid no longer than 12 months after the represented electricity was generated. This means that the certificate shall be used (hence cancelled/redeemed/retired) within 18 months after the electricity was generated.

NOTE: Each Guarantee of Origin within the European Energy Certificate System (EECS) shall be valid for twelve months after the production of the relevant energy unit. States member of the GoO instrument ensure that all guarantees of origin, which have not been cancelled, will expire at the latest 18 months after the production of the energy unit. Expired guarantees of origin are included in the calculation of the residual energy mixes.

Criterion 5 - Be sourced from the same market in which the reporting entity's electricity-consuming operations are located and to which the instrument is applied

The electricity to which the contractual instruments refer to and the company claiming the contractual instrument shall be within the same market boundaries.

The "market boundary" refers to an area in which:

- There is a physical interconnection between the point of generation and the point of consumption of renewable electricity. When interconnection happens across different grids, there shall be an entity that coordinates and tracks the exchange between such grids.
- The countries' utilities/energy suppliers recognize each other's energy source tracking instruments and have a system in place to prevent double counting of claims.

NOTE: the definition of market is based on CDP Scope 2 Technical Guidance: Accounting of Scope 2 emissions; Chapter 2.3 - "Claiming renewable electricity use: the market boundary criteria" that can be downloaded from <https://www.ircstandard.org/credibility/>.

4.9.3.4 How to model the residual consumption mix

If a secondary dataset modelling the residual consumption mix in a specific country (e.g., residual consumption mix in Estonia) is registered in the node dedicated to the EPD in the Life Cycle Network on the European Platform on LCA (LCDN¹⁴), then this dataset shall be used. Otherwise, the EPD declarant shall model its own residual consumption mix for the considered country using the following approach:

1. Use the composition of the residual consumption mix (e.g., X% of MWh produced with hydro energy, Y% of MWh produced with coal power plant). The most recent composition shall be used.
2. The background processes per energy type and country/region (e.g., production of 1MWh solar energy in the corresponding country/region) shall be modelled as a "non-most relevant processes".

If the residual consumption mix is modelled with own data, the source, the year, the geographical boundaries, the percentage from each electricity source, and the background datasets shall be provided in the EPD supporting study.

4.9.3.5 How to model the average consumption mix

The average consumption mix shall be modelled as a "non-most relevant processes", i.e., the average consumption mix shall be modelled with a secondary dataset. If the node dedicated to the EPD in the LCDN includes a dataset modelling the average consumption mix in the country, or in the region (EU) of interest, that dataset shall be used giving priority first to the country, and then to the region. Otherwise, the global electricity consumption mix registered in the node dedicated to the EPD in the LCDN shall be used.

¹⁴ Life Cycle Data Network on the European Platform on LCA (LCDN) is for nomenclature and characterisation factors compliance, which was launched in 2014. It aims to provide a globally usable infrastructure for the publication of quality assured LCA dataset (i.e. LCI datasets and LCIA method datasets) from different organizations (e.g. industry, national LCA projects, research groups, and consultants), see <https://eplca.jrc.ec.europa.eu/LCDN/index.html>.

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4.9.3.6 A single location with more than one electricity mix

If the consumed electricity comes from more than one electricity source (e.g., on-site electricity generation, supplier-specific electricity, or unspecified electricity purchased from the grid), each mix source shall be used in terms of its proportion to the total kWh of electricity consumed. For example, if a fraction of the total kWh consumed comes from a specific supplier, a supplier-specific electricity product shall be used for this amount (section 4.9.3.2).

4.9.4 INCLUDING MULTIPLE PRODUCTS IN THE SAME EPD

For the EPDs that are declared to be compliant with Regulation (EU) 2023/1542, it is not allowed to include multiple products in the same EPD. If EPDs do not declare to be compliant with Regulation (EU) 2023/1542, then it could be an EPD including multiple products in the same EPD.

4.9.5 ENVIRONMENTAL PERFORMANCE INDICATORS

See Section A.8 of the GPI.

For EPDs that declare to be in compliance with the Regulation (EU) 2023/1542, in addition to the main environmental performance results, this section may declare additional LCA results in a separate subsection. The additional carbon footprint result (the impact assessment shall be done for the impact category "Climate change" using the EF3.1 impact assessment method) shall be reported according to the life cycle stages stated by Regulation (EU) 2023/1542.

4.10 SPECIFIC RULES PER EPD TYPE

See section 4.9 of the PCR 2024:06.

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5 CONTENT AND FORMAT OF EPD

See section 5 of the main PCR (PCR 2024:06).

For Regulation (EU) 2023/1542 compatible EPDs, the following additional information shall be provided:

- The cover page shall include information about compliance with Regulation (EU) 2023/1542 and not compliant with EN 50693;
- In addition to the main environmental performance results, this section may declare additional LCA results in a separate subsection. The additional carbon footprint result (the impact assessment shall be done for the impact category “Climate change” using the EF3.1 impact assessment method) with Data Quality Rating results shall be reported according to the life cycle stages stated by Regulation (EU) 2023/1542 in the Additional Information section at the end of the EPD report.

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6 LIST OF ABBREVIATIONS

See section 6 of the main PCR (2024:06).

Adjust and amend list according to the PCR. All abbreviations used in the PCR shall be listed. The abbreviations shall be provided in alphabetical order.

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Adjust and amend list according to the PCR. Only references referred to in the PCR shall be included. Make sure any added references use the correct reference format (see above) and are listed in alphabetical order. Make sure to use the latest version of all standards referred to – be particularly careful on this in case of updates of existing PCRs.

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8 VERSION HISTORY OF PCR

This section shall include a version history and the main differences compared to earlier versions of the PCR document.

VERSION 1.0.0, 20YY-MM-DD

Add description of the PCR version, e.g. "Original version of the PCR".

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