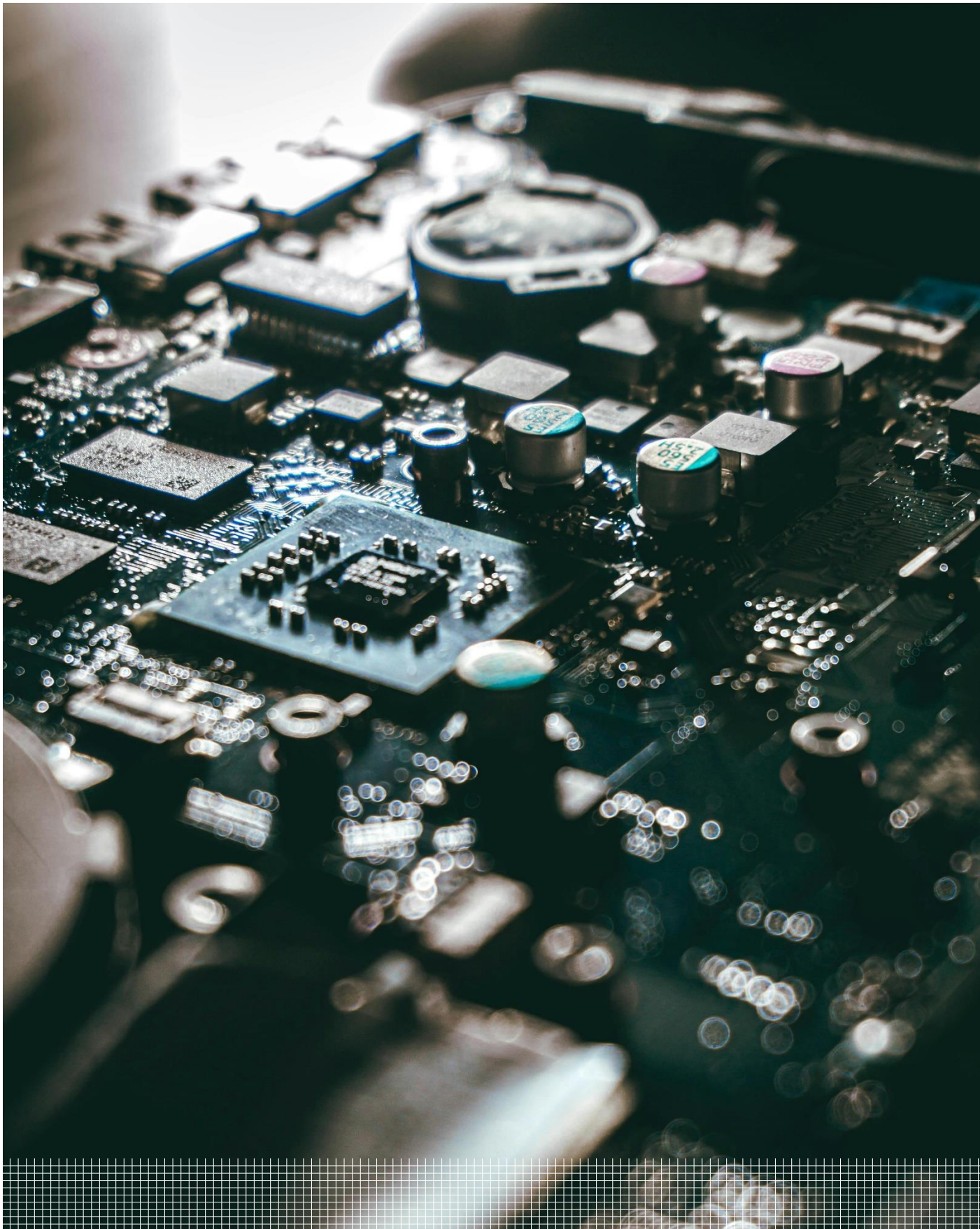
PRODUCT CATEGORY RULES (PCR)
DATE 2024-12-09

ELECTRONIC AND ELECTRIC EQUIPMENT, AND ELECTRONIC COMPONENTS (NON-CONSTRUCTION)

PCR 2024:06
VERSION 1.0.1, 2024-12-09

VALID UNTIL 2029-10-28



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1 INTRODUCTION

1.1 GENERAL

This document constitutes Product Category Rules (PCR) developed in the framework of the International EPD System: a programme for type III environmental declarations[1] according to ISO 14025:2006, ISO 14040:2006, ISO 14044:2006. 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. A PCR complements the GPI and the normative standards by providing specific rules, requirements, and guidelines for developing an EPD for one or more specific product categories (see Figure 1). A PCR should enable different practitioners using the PCR to generate consistent results when assessing products of the same product category.

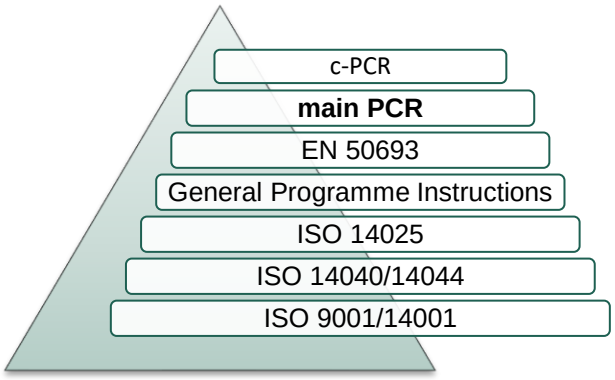

Figure 1. The hierarchy between PCRs, standards, and other documents.

Within the present PCR, the following terminology is adopted:

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

For definitions of further terms used in the document, see the normative standards.

A PCR is valid for a pre-determined period of time to ensure that it is updated at regular intervals. The latest version of the PCR is available at www.environdec.com. 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.

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

The programme operator maintains the copyright of the document 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.

1.2 ROLE OF THIS DOCUMENT AND COMPLEMENTARY PCRS

This main PCR allows for an EPD to be produced in two ways:

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

- Directly using this PCR only. Then the EPD can use a functional or a declared unit (see Section 4.1). This is allowed for any product in the scope of this PCR (see Section 2.2), unless there is an applicable complementary PCR (c-PCR).
- Using this PCR document together with an applicable c-PCR available at www.environdec.com. An EPD based on this PCR, together with such a c-PCR, shall use the functional unit prescribed by the c-PCR and may have any product scope that is allowed by the c-PCR.

See Figure 2 for an illustration of how to use this PCR.

When an EPD is created without using a c-PCR, and the rules and guidance in this main PCR are not specific enough, the methodological choices shall comply with ISO 14040 and 14044 and be explained in the EPD.

When a c-PCR exists in the International EPD System for a specific product category, such c-PCR shall be used together with this main PCR. Published c-PCRs related to this main PCR can be found at www.environdec.com.

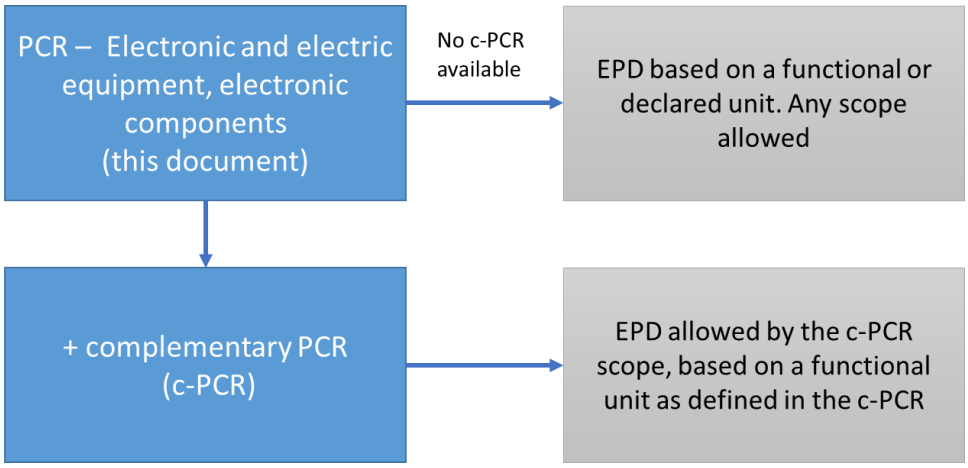

Figure 2. Overview of how this PCR document can be used directly, or together with a c-PCR, to develop an EPD.

1.3 DEVELOPMENT OF A C-PCR

A c-PCR may be developed for a specific category of electronic and electric equipment and components, e.g., servers, mobile phones, or electronic displays. A c-PCR shall be developed within the framework of the International EPD System using the normal PCR development procedure. Please contact the Secretariat for further information.

A c-PCR shall contain:

- general information, e.g., scope of the c-PCR, programme-related information, and information about its development;
- further specification of types of EPD allowed, if relevant;
- further rules and specifications regarding goal, scope, LCI and LCIA, e.g., system boundaries, functional unit (including reference service life, where relevant), requirement or guidance on product lifespan and other calculation rules, if relevant; and
- further specifications on EPD contents, e.g., environmental indicators and additional information, if relevant.

C-PCRs should maintain general alignment to standard EN 50693 and IEC 63666 (as soon as published), and shall not contravene its provisions in a way that it would invalidate EPDs, based on that c-PCR, from complying to the standards.

All c-PCRs currently available and under development are displayed at www.environdec.com.

2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	Electronic and electric equipment, and electronic components (non-construction)
Registration number and version:	2024:06, version 1.0.1
Programme:	The International EPD System
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: info@environdec.com
PCR Moderator:	Diaa Gab-Allah, United Environmental Consultants, diaa.gaballah@gmail.com
PCR Committee:	World Resources Forum, Wallbox, Minviro, Ramboll, PMI, Cic energiGune, Take Care International, Huawei, Midea
Date of publication and last revision:	2024-12-09 (version 1.0.1) See Section 8 for a version history of the PCR.
Valid until:	2029-10-28
Schedule for renewal:	The 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 version 5.0.0 of the GPI. The PCR is valid for a pre-determined time period to ensure that it is updated at regular intervals. When the PCR is about to expire, the PCR Moderator shall initiate a discussion with the Secretariat on if and how to proceed with updating the PCR and renewing its validity. A 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 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 PCR is valid in parallel during a transition period of at least 90 days, but not exceeding its 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. 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 4.0[2] ▪ EN 50693 ▪ IEC 63366 ▪ ISO 14025 and ISO 14040/14044 ▪ 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 OF PCR

2.2.1 PRODUCT CATEGORY DEFINITION AND DESCRIPTION

This document provides Product Category Rules (PCR) for the assessment of the environmental performance of Electronic and electric equipment, and electronic components[3] (non-construction), and the declaration of this performance by an EPD. The product category corresponds to UN CPC divisions 43-48 and 84, and HS code 85 Electrical machinery and equipment and parts thereof. Any electronic and electric equipment[4] that classifies as construction product[5], is excluded from the scope of this PCR.

The UN CPC divisions can be consulted on https://unstats.un.org/unsd/classifications/unsdclassifications/cpcv21.pdf.

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

Non-exhaustive list of products falling under the scope of this PCR are:

- Electric vehicle conductive charging systems, HS code 8504, or UN CPC code 461
- Power electronic converter systems and equipment, HS code 8504, or UN CPC code 461
- Electric accumulators, including separators thereof; whether or not rectangular (including square), HS code 8507
- Audio, video and IT products, UN CPC code 451, 452, 473, 476, 478
- Electrical appliances for household and similar purposes, UN CPC code 448

[2] As GPI 5.0.0 was released before this PCR was published, some rules and writings related to EPD content and LCA method in GPI 5.0.0 have been adopted. Furthermore, some rules in the latest version of the GPI apply although the rules on EPD content and LCA method in the PCR conforms with a previous version of the GPI. See Section 5.1 in GPI 5.0.0 for further details of when various types of rules apply.

[3] "Components"' means an integral assembly of interconnected elements (parts) intended to perform one or more functions in the system (Source: ISO 16024:2005). Unlike parts in a product, electronic components cannot be removed or replaced without affecting the overall function of the product. Components are intended to be incorporated into products which are not placed on the market and/or put into service as individual parts for end-users (EC 2009).

[4] "Electrical and electronic equipment" (EEE) means equipment which is dependent on electric currents or electromagnetic fields in order to work properly; equipment for the generation, transfer and measurement of such currents and fields, and designed for use with a voltage rating not exceeding 1 000 volts for alternating current and 1 500 volts for direct current (EC 2012).

[5] "'Construction product' means any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or parts thereof and the performance of which has an effect on the performance of the construction works with respect to the basic requirements for construction works" (EC 2011). Examples of construction products (non-exhaustive): thermal insulation materials, automatic doors, solar panels, and windows.

- Electricity metering equipment, UN CPC 4824
- Low-voltage switchgear and control gear assemblies, part of UN CPC 462
- Servers, part of UN CPC 452
- Electrical machines and apparatus; having individual functions, not specified, or included elsewhere in this chapter, HS code 8543

Parts and accessories of computing machines (e.g., laser printer cartridges), UN CPC 45290, are currently covered by PCR 2014:04. Upon its expiration in 2026-03-10, the present PCR will instead cover the product category.

The product categories in the below list are in general excluded. However, this PCR can be used if a product in the below list is classified as an EEE product according to applicable legislation (e.g., the WEEE directive) and there is an interest to comply with EN 50693. Where applicable, below list include PCRs or c-PCR of the International EPD System covering excluded product categories (these PCRs can be found on www.environdec.com):

- Bearings and parts thereof, UN CPC 433, covered by PCR 2023:03.
- Lifts, skip hoists, escalators and moving walkways, UN CPC 43540, covered by c-PCR-025 under PCR 2019:14 Construction products.
- Electrical motors and generators and parts thereof covered by PCR 2022:06 and PCR 2019:11, UN CPC 46112, and UN CPC 46131. However, electrical motors and generators not covered by PCR 2022:06 and PCR 2019:11 are in scope of this PCR.
- Air-conditioning machines, part of UN CPC 43912, covered by PCR 2021:02.
- Refrigerating and freezing equipment and heat pumps, except for household type equipment, covered by PCR 2019:14.
- Other special-purpose machinery and parts thereof, UN CPC 449, covered by PCR 2010:08.
- Machines for filling and packaging of liquid food, UN CPC 439211, covered by PCR 2012:18.
- Machine-tools for drilling, boring or milling of metal, UN CPC 44214, covered by PCR 2012:02.
- Machine-tools for material working by removal of material, UN CPC 44211, covered by PCR 2021:10.
- Electrical cables and wires for construction sector, UN CPC 463, UN CPC 41513, UN CPC 41533, covered by c-PCR-019 under PCR 2019:14.
- Any product classified as a construction product, for which PCR 2019:14 is applicable. Construction product here refers to “any product or kit which is produced and placed on the market for incorporation in a permanent manner in construction works or parts thereof and the performance of which has an effect on the performance of the construction works with respect to the basic requirements for construction works" (EC 2011).

2.2.2 GEOGRAPHICAL SCOPE

This PCR may be used globally.

2.2.3 EPD VALIDITY

An EPD based on this PCR shall be valid for a 5-year period starting from the date of the verification report (“approval date”), or until the EPD has been de-registered from the International EPD System.

An EPD shall be updated and re-verified during its validity if changes in technology or other circumstances have led to:

- an increase of 10% or more of any of the declared indicators of environmental impact,
- errors in the declared information, or
- significant changes to the declared product information, content declaration, or additional environmental, social, or economic information.

If such changes have occurred, but the EPD is not updated, the EPD owner shall contact the Secretariat to de-register the EPD.

3 PCR REVIEW AND BACKGROUND INFORMATION

This 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

This PCR was available for open consultation from 2023-03-23 until 2023-05-22, 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 PCR and on www.environdec.com.

- Julien Colas, Rexel
- Erik Poppe, Fraunhofer IZM
- Karsten Schischke, Fraunhofer IZM
- Anders Andrae, Huawei
- Julie Sinistore, WSP USA Inc
- Erik Cescon, Nice s.p.a.
- Violaine Ohl-Gasteau, PEP Ecopassport

3.2 PCR REVIEW

3.2.1 VERSION 1.0.0

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:	Sophie Kieselbach
Review dates:	2023-11-08 until 2024-04-26, 2024-09-18 until 2024-10-15

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs and other internationally standardized methods that could potentially function as PCRs were considered to avoid unnecessary overlaps in scope and to ensure harmonisation with established methods of relevance for the product category, when possible. The existence of such documents was checked among the following EPD programmes:

- International EPD System. www.environdec.com.
- GlobalEPD
- EPD Italy

- EPD Norway
- IBU
- PEP ecopassport®

The following standards from European or international standardization/regulatory bodies were considered:

- EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems
- EN 15804+A2 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- European Commission PEF category rules (PEFCR)

In addition, the following product specific standards are applicable to electric and electronic equipment and can be useful for the creation of EPDs or future c-PCRs:

- Power electronic converter systems and equipment, HS code 8504, or UN CPC code 461 - CENELEC standard under development in CLC TC 22X WG9
- Electrical appliances for household and similar purposes, UN CPC code 448 - IEC standard under development in IEC TC23 WG9
- Electricity metering equipment, UN CPC 4824 - IEC standard under development in IEC TC85 WG20
- Low-voltage switchgear and control gear assemblies, part of UN CPC 462 - IEC TS 63058 is published and a new revision of the standard is under development in IEC TC121 WG2

The following standards that are applicable, at least partially, to electric and electronic equipment, can be used for the creation of EPDs, but do not seek alignment or follow the rules of EN 50693:

- ETSI 203 199
- ITU-T L.1410

Standards IEC TR 62725 and IEC TR 62921 are useful sector standards for the quantification of greenhouses emissions for electric and electronic equipment, which follow the life cycle thinking principles.

While this PCR, and c-PCRs to be developed based on this PCR, share the scope with existing standards and PCRs, this PCR has been developed in accordance with version 4.0 of the General Programme Instructions of the International EPD System, and it carries a specific, yet fully conformant, reading of EN 50693 requirements. Adherence to EN 50694 is crucial for ensuring consistency, harmonization, and alignment across the electric and electronic sector.[6]

Table 1 lists identified PCRs and other standardized methods.

[6] EN 50693 requirements fully apply to this PCR even if they differ from those outlined in the GPI. Particularly, EN 50693 and this PCR differ from the GPI regarding the waste allocation method and the associated setting of system boundary, where EN 50693 and this PCR follow the point-of-substitution principle, see Section 4.6.2.

Table 1. Existing PCRs, and other internationally standardized methods, that were considered to avoid overlap in scope and to ensure harmonisation with established methods.

Name of PCR/standard	Programme/standardisation body	Registration number, version number/date of publication	Scope
EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems	CEN	Publication date: Sep 1, 2019	Electric and electronic products and systems
EN 15804:2012+A2:2019 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products	CEN	Publication date: Nov 1, 2019	Construction products
IEC 63366:2023-01 Product category rules for life cycle assessment of electrical and electronic products and systems.	CEN	Draft	Electric and electronic products and systems
PCR 2019:14 Construction products (1.2.3)	International EPD System	Publication date: June 22, 2022	Construction products
EPD – Electronic and Electrical products and systems	EPD Italy	Publication date: January 21, 2020	Electronic and Electrical products and systems
PCR Product Category Rules for Electrical, Electronic and HVAC-R Products	PEP Ecopassport®	Publication date: September 06, 2021	Electrical, Electronic and HVAC-R Products
EU – PEFCR for IT equipment (Storage)	EU Commission	Publication date: April 20, 2018	IT equipment
EU – PEFCR for High Specific Energy Rechargeable Batteries for Mobile Applications	EU Commission	Publication date: February, 2018	Rechargeable Batteries for Mobile Applications
EU – PEFCR for Uninterruptible Power Supply	EU Commission	Publication date: February 15, 2019	Uninterruptible Power Supply

The development of this PCR seeks to align with the European standard EN 50693:2019, which pertains to electric and electronic equipment. Currently, this standard is in the process of being mirrored at the IEC level through IEC 63366. By aligning with EN 50693, the PCR aims to prevent the creation of disparate rules for equivalent products. An EPD based on this PCR will be compliant to EN 50693.

Other PCRs that share the same scope, such as the PEP Ecopassport's PCR for Electrical, Electronic, and HVAC-R Products and EPD Italy's PCR for Electronic and Electrical products and systems, are also based on EN 50693 and are thus consistent with this PCR. A comparison between this PCR and existing PCRs, on the main assessment elements, is provided in Annex 2, Table 6.

Conformance to this PCR does not ensure conformance with EN 15804+A2, nor with PCR 2019:14 on construction products. Many rules in this PCR are, however, aligned with EN 15804+A2 (see Annex 2).

3.4 REASONING FOR DEVELOPMENT OF PCR

This PCR was developed to enable publication of EPDs for this product category based on ISO 14025, ISO 14040/14044 and EN 50693. The 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 PCR (declared/functional unit, system boundary, allocation methods, impact categories, data quality rules, etc.) were primarily based on the following underlying studies:

- Andersen O, Hille J, Gilpin G, Andrae ASG (2014) Life Cycle Assessment of Electronics. Proceedings of 2014 IEEE Conference of technologies for Sustainability, 24-26 July 2014, Portland, OR, USA, DOI: 10.1109/SusTech.2014.7046212.
- Bovea MD, Ibáñez-Forés V, Pérez-Belis V (2020) Repair vs. replacement: Selection of the best end-of-life scenario for small household electric and electronic equipment based on life cycle assessment. Journal of Environmental Management, Volume 254, 2020, 109679, ISSN 0301-4797, DOI: 10.1016/j.jenvman.2019.109679
- Reale F, Castellani V, Hischier R, Corrado S, Sala S (2019) Consumer Footprint - Basket of Products indicator on Household appliances, EUR 29758 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-76-05003-2, DOI:10.2760/964701, JRC116704,
- Shaukat MM, Masood H, Merah N, Al-Badour FA, Qadeer A, Afzal S (2021) Comparative Life Cycle Assessment of Two Different Models of a Home Appliance, International Journal of Sustainable Engineering, 14:6, 1658-1664, DOI: 10.1080/19397038.2021.1945162.

4 GOAL AND SCOPE, LIFE CYCLE INVENTORY AND LIFE CYCLE IMPACT ASSESSMENT

The goal of this section is to provide specific rules, requirements, and guidelines for developing an EPD for the product categories included in Section 2.2.1.

4.1 DECLARED/FUNCTIONAL UNIT

Electric and electronic equipment can have a large variety of functions, depending on its technical characteristics, features, applications or use environment, and so it is not possible to establish at the level of this main PCR one or several functional units that cover(s) all functional and qualitative aspects of such equipment or components. Instead, EPDs based only on this PCR shall define an appropriate functional unit based on the specifications set below (Section 4.1.1), 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 shall be defined instead, based on the specifications of Section 4.1.2.

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 4.8) shall be expressed per functional or declared unit.

In the creation of a c-PCR, based on this PCR, a functional unit shall be defined for the relevant product category.

4.1.1 FUNCTIONAL UNIT

The functional unit refers to the quantified performance of a product system, to be used as a reference unit. EPDs based on this PCR, and a c-PCR (if available), shall identify the function(s) applicable to the product category addressed and shall define a functional unit, if possible, by capturing the identified function(s) of the product (equipment or component) in a quantitative way.

When creating EPDs using a functional unit, or developing a c-PCR, the following aspects of the functional unit shall be specified:

- the function(s) provided to the user by the product,
- the reference or performance level(s) related to the functional unit, and
- the reference period during which the function(s) of the product are met, under reference use conditions, i.e., the reference service life (RSL).

Examples of functional units that can be applicable to electric and electronic equipment are:

- Battery – 1 kWh of delivered energy to the battery terminals for number of cycles during the RSL.
- Commercial refrigerator – the supply of 230 l of cooling space (4 ∘C) and 110 l of refrigeration space (–18 ∘C) for food storage for 10 years (the RSL) of refrigerator use.
- Desktop computer display – one desktop computer LCD display that meets the functional unit specifications:
  - Display size: 15 inches; Resolution: 1024 x 768 colour pixels; Brightness: 200 cd/m^2 with a specific RSL.

4.1.2 DECLARED UNIT

Only in cases a functional unit cannot be defined (e.g., for products in the category of power electronic converter systems and equipment), a declared unit can be used and shall be equivalent to one (1) item, one (1) assembly of items, or a product property (e.g., 1 kg or 1 m), of the equipment or component under study. The declared unit shall be specified in the EPD and shall be further detailed by the following technical properties, where relevant: item size (e.g., m or m^3), item weight (kg), specific unit of operation, rated input and where applicable, rated output. Rated input and rated output shall be defined in terms of voltage (V), frequency (Hz), current (A), and power (W). An example of the technical properties and further specifications to be detailed, for an electric device, is provided in Annex 1.

4.2 REFERENCE SERVICE LIFE AND PRODUCT LIFESPAN

The reference service life (RSL) of a product is the reference time period during which the product is in use and meets or exceeds the required performance, under reference operational and ambient conditions. The RSL is a theoretical time period to which the performance of the product is related to in a functional unit.

When an EPD is developed based on this PCR, an RSL for the product shall be defined and stated in the EPD, as part of the functional unit, as well as the properties and reference use conditions used for its estimation.

EPDs should consider the following when establishing an RSL for a product:

- The RSL should be established in accordance with any specific rules given in relevant harmonized European product standards, when available.
- The RSL of a product can be based upon empirical, probabilistic, statistical, or scientific data and shall always consider the intended use.
- The data needed to determine the RSL can be based on testing of a particular property, or set of properties, directly linked to the durability of the product (e.g., abrasion, fatigue, wear and tear, impact tests), or it can be based on direct data, collected from the use environment, or indirect data from products of similar type and function.
- The RSL of a product may depend on the service lives of its individual components and may be determined by the component with the lowest service life. This also depends on whether the single components of the product are replaceable or repairable. If the declared product is built into another product without being removable or replaceable, the service life of the other product should be considered when defining the RSL of the declared product.

The product lifespan, on the other hand, is the average time for which the product has been designed or proven to last, or the average time for which the product has been shown to be in use. The product lifespan is typically expressed in units such as years or operating hours. Note that the product lifespan is not necessarily identical or related to guarantee time whether legally binding or offered voluntary. Also, note that the product lifespan is not necessarily the same as the RSL of the product category. For example, a PCR may specify the RSL of product category to be 10 years (e.g., because that is a typical technical lifespan for that product category), and the functional unit is to fulfil a certain function over that RSL. If a product then has a (proven) technical lifespan of 5 years, two such products are needed to fulfil the functional unit. Likewise, if a product has a (proven) technical lifespan of 20 years, only half such a product is needed to fulfil the functional unit.

In the development of a c-PCR, a specific RSL for the product category shall be provided as part of the definition of the functional unit, if relevant. The c-PCR shall also include requirements or guidance on how to set the product lifespan.

A c-PCR may set a fixed product lifespan, equal to the RSL, if relevant. For example, this may be relevant for product categories with products with very similar lifespans, unpredictable lifespan, or lifespans that do not depend on the durability of the product (but on, e.g., the product being outdated because of fast technological development). If this is done, it shall be clearly justified in the c-PCR.

In EPDs using an RSL, the RSL used shall be declared together with the properties of the product and its reference use conditions.

PEP Ecopassport has developed several PSRs which define specific RSLs for multiple product categories of electric and electronic equipment, including for example PSR0002, PSR0003, PSR0005, PSR0006, PSR0007, PSR0009, PSR0010, PSR0014 and PSR0018. These PSRs shall be considered for adoption as c-PCRs in the International EPD System on a case-to-case basis. If not adopted, or before they have been adopted, the RSLs of these PSRs shall be considered when developing EPDs for products within the scopes of the PSRs.

Further guidance on RSL and product lifespan, for example in terms of general principles, prediction, performance evaluation and estimation can be found in ISO 15686 series. The standard series can be used as guidance during the development of a c-PCR.

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 PCR and EPDs based on it is *cradle to grave*. This means that the following processes shall be included within the system boundaries, when applicable:

- Raw material extraction

- Production of components
- Manufacturing
- Transport
- Installation process
- Use of the product
- Calibrations / Maintenance / Repair
- De-installation process
- Waste management, recycling, material and energy recovery, and landfilling.

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

All environmentally relevant processes from cradle to grave should be included, so that at minimum 95% of the total energy use, mass of product content, and environmental impact are accounted for (see Section 4.5).

4.3.1 LIFE-CYCLE STAGES

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

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

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

- Installation stage
- De-installation stage

Table 2 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.

Table 2. Life cycle stages and processes to include when applicable.

Life-cycle stages	Processes
Manufacturing (Module A1-A3)	Material and components supply (Sub-module A1)
	Transport (Sub-module A2)
	Manufacturing including all assembly and testing (Sub-module A3)
Distribution (Module A4)	Transport from gate to site/point of sale (Sub-module A4)
Installation (Module A5)	Installation at point of use (Sub-module A5)
Use (Module B1-B7)	Use (Sub-module B1)
	Maintenance (Sub-module B2)
	Repair (optional) (Sub-module B3)
	Reuse (optional) (Sub-module B4)
	Refurbishment (optional) (Sub-module B5)
	Operational energy use (Sub-module B6)
	Operational water use (Sub-module B7)
De-installation (Module C1-C4)	De-installation from point of use (Sub-module C1)

End of life (Module C1-C4)	Transport (Sub-module C2)	
	Waste processing	(Sub-module C3)
	Disposal (Sub-module C4)	

The processes included in the scope of the PCR and belonging to each life-cycle stage are described in Sections 4.3.1.1–6. They correspond to modules A1 to C4 as categorised under EN 15804.

For components, the use and end-of-life scenarios, as part of a final product, might be more uncertain than for final products, and assumptions have to be made. These assumptions and the rationales behind them shall be communicated as part of the product information section of the EPD (see Section 5.4.3).

The processes related to repair, reuse and refurbishment are optional. They can be included in the assessment, if relevant for product and representative data is available.

To accommodate the life cycle processes relevant to both equipment and components, the word “product” in the following sections (Sections 4.3.1.1-6) shall be understood as either a full product or a component, depending on the scope of the EPD. The terms “parts” and “components” shall be understood as parts and components of a full product, or parts and sub-components of a component, similarly, depending on the scope of the EPD.

4.3.1.1 Manufacturing stage

The following unit processes are part of the product system and shall be classified as manufacturing processes:

Material and components supply

- Extraction and processing of raw materials (e.g., mining process) for all main product parts and components (to be refined at c-PCR level when applicable).
- Extraction and processing of raw materials (e.g., mining process) for the packaging of raw materials.
- Collection of used components, used as input for the manufacturing/assembling of the final product.
- Processing of used components, parts and materials, including their cleaning and treatment, used as input for manufacturing/assembling of the final product.
- Extraction and processing of raw materials (e.g., mining process) for product packaging.
- Production of components, and production of intermediate materials used for the manufacturing of components, e.g., printed circuit board, electric components, batteries, plastic connectors, antennas, and wires. For electronic devices, the components and energy demand for production of the printed circuit board shall be included.
- Production of auxiliary products used for the manufacturing of the product, such as solvents and lubricants.
- Generation of electricity and production of fuels, steam and other energy carriers used in the production of materials and components.
- Transport of raw materials and components along the supply chain to a distribution point (e.g., a stockroom or warehouse), including energy inputs for warehouse storage for the raw materials/components corresponding to at least 75% of the mass of the product.

Transport

- Transport of materials and components to the manufacturing site.
- End-of-life treatment of transport waste, even if conducted by third parties.
- Generation of electricity and production of fuels, steam and other energy carriers used in the transport processes.

Manufacturing

- Internal transport of the product within the manufacturing site.
- Manufacturing and/or assembly of the product
- Maintenance and consumables of manufacturing equipment
- Storage of finished products.

- End-of-life management of manufacturing waste, even if conducted by third parties, including transport to end-of-life treatment facility.
- Production of distribution and consumer packaging.
- Transportation of the packaged product from the packaging site to the manufacturer's last logistics platform.
- Generation of electricity and production of fuels, steam and other energy carriers used in the manufacturing processes.

Reject rates shall be accounted for. This means that defective products are accounted for in the LCA model.

Regular product testing, which is part of the manufacturing stage, shall be included in the assessment, unless it meets the cut-off rules requirements specified in Section 4.5. The following processes shall not be included:

- manufacturing of production equipment, buildings, and other capital goods (with a few exceptions, see Section 4.3.2),
- building, maintenance, decommissioning and disposal of service facilities,
- business travel of personnel,
- travel to and from work by personnel, and
- research and development activities, marketing, and advertisement (including design activities).

Manufacturing stage processes not listed may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

4.3.1.2 Distribution stage

The following unit process is part of the product system and shall be classified as a distribution process:

- Transport of the product in its packaging from manufacturer's last logistics platform to the distributor and from the distributor to the place of installation and/or operation.
- Production processes associated with additional materials and components (e.g., additional packaging materials) needed for the distribution of the product.
- In case of repacking, end-of-life management of the generated waste (e.g., packaging).

4.3.1.3 Installation stage

The following process is part of the product system and shall be classified as an installation process:

- Installation at point of use, including required materials and components needed for installation, e.g., as specified by the manufacturer and/or applicable regulations and standards
- End-of-life management of waste generated at the installation place, including packaging, discarded installation materials, and other waste associated with the installation processes. This includes collection, transport, and treatment.

4.3.1.4 Use stage

The following processes are part of the product system and shall be classified as use processes:

Use

- Product use causing direct emissions
- Production, use and waste treatment of consumables used in product use

Maintenance

This shall include all technical and management (including supervision) processes intended to retain an item in a state in which it can perform as required, comprising as applicable:

- Inspection, adjustments, emptying, cleaning, lubrication, testing, software update and replacement of worn-out parts.

- Production, transport, and/or waste management of any resources (e.g., materials, replacement parts, energy, water) necessary for the maintenance operation.

The following process, aiming at extending the product lifetime, are part of the product system and shall be classified as use processes:

Repair

This shall include all processes needed to restore a product to a condition needed for the product to function according to its original purpose, comprising as applicable:

- Renewal or replacement of worn, damaged, or degraded parts of the product
- Production, transport, and/or end-of-life management of any resources (e.g., materials, replacement parts, energy, water) necessary for the repair process. In case of replacement of parts, the end-of-life management of the replaced parts is included here, and the end-of-life management of the new part is included in the end-of-life stage.

Reuse

This shall include the processes needed for the utilisation of a product or component after its initial utilization intended by the original design, comprising as applicable:

- Treatment of the product or component needed by the user to allow for reuse.
- Production, transportation, and/or end-of-life management of any resources (e.g., materials, replacement parts, energy, water) necessary for the reuse process.

Refurbishment

This shall include the processes applied during the expected service life to restore a product to a condition of safety and performance according to the specification of the manufacturer, comprising as applicable:

- Repair, rework, replacement of worn parts, and update of software or hardware. It does not include activities that result in the need of a new certification of the product and a legal manufacturer status of the refurbisher.
- Production, transport, and/or waste management of any resources (e.g., materials, replacement parts, energy, water) necessary for the refurbishment.

Operational energy use

- Use of energy during product operation, including generation of electricity and production of fuels, steam, and other energy carriers.
- Energy consumption of ICT infrastructure, for electronic equipment requiring interaction with an ICT infrastructure and where the electronic equipment functions with specific, clearly defined and identified services.

Operational water use

- Use of water during product operation
- Waste treatment of used water

4.3.1.5 De-installation stage

The following processes are part of the product system and shall be classified as de-installation processes:

- Processes needed for the de-installation from point of use, e.g., as specified by the manufacturer and/or applicable regulations and standards.
- End-of-life management of the waste generated at the de-installation place, This includes collection, transport, and treatment.

4.3.1.6 End-of-life stage

The following processes are part of the product system and shall be classified as end-of-life processes:

Transport

- Transportation of the product to end-of-life treatment facility (e.g., recycling and/or disposal facilities).

Waste processing

- Cleaning, separation, dismantling and other any pre-treatment needed for materials and/or energy recovery or for further processing at the disposal site.

Disposal

- Disposal (incineration without energy recovery or landfill) of any wasted part of the product.

4.3.2 INFRASTRUCTURE AND CAPITAL GOODS

In general, the production and end-of-life processes of infrastructure or capital goods[7] used in the product system shall not be included within the system boundaries. Exceptions to this rule are:

- If infrastructure/capital goods are produced with the intention to be used one or a few times only, e.g., a manufacturing plant or machinery constructed to produce only one product.
- If a generic LCI dataset includes infrastructure/capital goods, and it is not possible, within reasonable effort, to subtract the data on infrastructure/capital goods from this dataset.

If infrastructure/capital goods are included within the system boundaries, this shall be described in the EPD, unless it is shown in a sensitivity analysis that they contribute less than 10% to the cradle-to-gate results for all the environmental impact indicators declared in the EPD. This description shall include which life-cycle stages, or processes, that infrastructure/capital goods are included for. Furthermore, the description should[8] include the type of infrastructure/capital goods included (e.g., factory building, manufacturing machinery, transport vehicles, transport infrastructure, energy infrastructure). If some or all of these types of infrastructure/capital goods are included in a generic LCI dataset used, the name of the dataset (including the database it has been derived from) shall be declared in the EPD if the full dataset (i.e., not just the infrastructure/capital goods) contributes more than 5% to the cradle-to-gate results of any of the environmental impact indicators.

The above rule to, in general, exclude infrastructure/capital goods is primarily because LCI data on infrastructure/capital included in generic datasets often are of poor quality, for example in terms of technical, geographical, and temporal representativeness, which may significantly increase the uncertainty of the results declared in the EPD. The rule may change in the future if the quality of LCI data on infrastructure/capital goods improves.

4.3.3 OTHER BOUNDARY SETTING

4.3.3.1 Boundary towards nature

Boundaries to nature are defined as where the flows of material and energy resources leave nature and enter the technical system (i.e., the product system). Emissions cross the system boundary to nature when they are emitted to air, soil, or water.

4.3.3.2 Boundary towards other technical systems

Boundaries towards other technical systems define the flow of materials and components to/from the product system under study and from/to other product systems. The setting of boundaries towards other technical systems shall follow the rules in Section 4.6.

[7] Examples of infrastructure and capital goods: the building in which the studied product or upstream materials or components are produced, the machinery used in the manufacturing of the product or its materials or components, and the vehicles used in transports in the product system. For example, if the EPD is on a server installation, the server itself is considered the studied product and not infrastructure/capital goods. However, the buildings and machinery that make the server components are considered infrastructure/capital goods. Similarly, if the EPD is on a means of transport, the vehicle is considered the studied product and not infrastructure/capital goods.

[8] A reason not to declare this information can, for example, be that this information is not available in the LCI dataset documentation.

4.3.3.3 Temporal boundary

The temporal boundary defines the time period for which the life cycle inventory data is recorded, e.g., for how long emissions from waste deposits are accounted. As default, the period over which inputs to and outputs from the product system are accounted for shall be 100 years from the year that the LCA model best represents, considering the representativeness of the inventory data. This year shall, as far as possible, represent the year of the publication of the EPD.

4.3.3.4 Geographical boundary

The geographical boundary defines the geographical coverage of the LCA. This shall reflect the physical reality of the product under study, accounting for the representativeness of technology, input materials and input energy for the different life cycle stages.

4.4 SYSTEM DIAGRAM

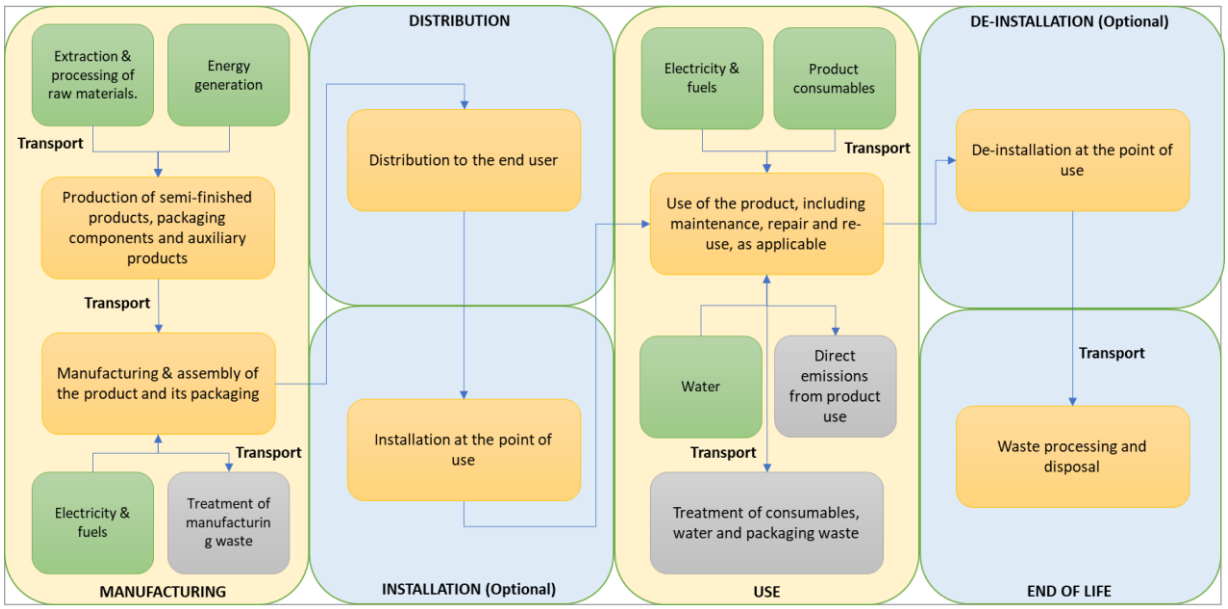

Figure 3. System diagram illustrating the processes that shall be included in the product system. The illustration of processes to include may not be exhaustive.

4.5 CUT-OFF RULES

Criteria for excluding LCI data (cut-off rules) are intended to facilitate data collection and support efficient LCA modelling. All available data shall be used, and cut-offs should be avoided and shall not be done to "hide" data. Any application of the cut-off rules, including LCI data excluded based on cut-offs, shall be described in the EPD.

The cut-off rule for EPDs based on this PCR is 5% over the product life cycle. In other words, inputs/outputs that are known or expected to contribute more than 5% to the results of any of the environmental performance indicators shall be included. The 5% cut-off does not include LCI data that are explicitly outside the system boundary according to the GPI, the PCR, or any normative reference standard referenced to in the PCR.

If less than 100% of the actual inputs or outputs are accounted for, proxy data (e.g., extrapolation of included data) should be used to achieve 100% completeness. Exclusion of LCI data based on the cut-off rule shall be based on a sensitivity analysis and/or conservative assumptions in combination with plausibility considerations and expert judgement. This shall be documented in the LCA report in a way that makes it verifiable (it is the verifier that decides what information is necessary).

The above cut-off rule does not apply to the following components when integrated into the product (i.e., these components shall always be included in the LCA model):

- batteries and accumulators,

- printed circuit board assembly (PCBA),
- electronic displays (including LED, LCD, OLED display technologies), regardless of their size, and
- the following materials and components (adopted from Table 2 of PEP Ecopassport's PCR for Electrical, Electronic and HVAC-R Products (edition 4 from 2021):
  - gold
  - silver
  - copper and alloys
  - antimony trioxide (additive used in plastics)
  - insulating gas (e.g., SF6)
  - coolants
  - rare earths: indium, molybdenum, neodymium,
  - microprocessors,
  - magnesium anode,
  - tantalum capacitor, and
  - arsenic-gallium capacitor.

4.6 ALLOCATION RULES

Allocation can be divided into allocation of co-products, i.e., allocation of unit processes that generate several products, and allocation of waste, i.e., allocation of unit processes that generate materials that are, for example, landfilled recovered, recycled or reused, and which require further processing to cease being waste and become products (see criteria for end-of-waste state in Section 4.6.2).

The principles for allocation of co-products and allocation of waste are described separately in the following subsections:

4.6.1 CO-PRODUCT ALLOCATION

In co-product allocation, the sum of the allocated inputs and outputs to the products shall be equal to the total inputs and outputs from the same unit process, and consistent allocation procedures shall be uniformly applied to similar inputs and outputs of the system under consideration. This means that no double counting or omission of inputs or outputs through allocation is permitted (unless a conservative assumption is made).

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

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, area) 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.

4.6.2 ALLOCATION OF WASTE TREATMENT PROCESSES

The allocation of waste shall follow the point-of-substitution principle.

The point of substitution corresponds to the point in the value chain where secondary materials substitute primary materials as a recovered material or as a solid recovered fuel (incineration with energy recovery).

The system boundary to the subsequent product system is set where the waste (e.g., the discarded product) reaches the point of substitution. This point is reached when at least all the following criteria are fulfilled:

- the recovered material, component or product is commonly used for specific purposes,
- a market or demand, identified e.g., by a positive economic value, exists for such a recovered material, component, or product,
- the recovered material, component or product fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products,
- the use of the recovered material, product or construction element will not lead to overall adverse environmental or human health impacts, and
- necessary processing of the recovered material, component, or product, to the point where it can replace primary materials, has occurred.

Note that the “specific purpose” in this context is not restricted to the function of a certain product but can also be applied to material or energyware serving as input to the production process of another product.

At the system boundary, cut-off allocation shall be applied, i.e., all unit processes before the point of substitution shall be assigned to the product system generating the waste and all unit processes after the point of substitution shall be assigned to the subsequent product system.

If a waste flow does not reach the point of substitution, and thus does not cross the system boundary, all waste treatment processes including those of disposal shall be assigned to the product system generating the waste.

Treatment of waste classified as hazardous, if not treated/upgraded and by legalisation reclassified as a product, will be based on the above criteria always be allocated to the system generating this waste.

If it is unknown whether the point of substitution is reached, a conservative assumption shall be made. This means that in case the product under study has generated the waste, the point of substitution shall be assumed not to be fulfilled and the further waste processing and waste incineration/disposal shall be assigned to the product.

If material or energy is recovered from the waste, this presumably results in benefits because of substituted production of primary material/energy. These benefits may be calculated and declared in the EPD. If the benefits are not declared, the rules in Section G.2 of Annex G of EN 50693 shall be followed. If the benefits are declared, the rules in Section G.4 of Annex G of EN 50693 shall be followed. If there is any material/energy recovery, the EPD shall specify whether the rules in Sections G.2 or G.4 have been used.

Note that the benefits shall be accounted for in each of the life-cycle stages in which the recovery processes take place, and that any calculated benefits from material/energy recovery shall be declared separately from the other results of each life-cycle stage.

If a c-PCR is developed under this main PCR, it should specify whether the rules in Sections G.2 or G.4 of EN 50693 shall be used to calculate the benefits of substituted production of primary material/energy. This is important to increase comparability between EPDs using the same c-PCR.

4.7 DATA QUALITY REQUIREMENTS AND SELECTION OF DATA

Life cycle inventory (LCI) data are classified into specific data and generic data, where the latter can be selected generic data or proxy data. The data categories are defined as follows:

- Specific data (also referred to as “primary data” or “site-specific data”):
  - LCI data collected from the manufacturing plant where product-specific processes are carried out.
  - LCI data from other parts of the life cycle traced to the product under study, for example site-specific data on the production of materials or generation of electricity provided by contracted suppliers, and transportation data on distances, means of transportation, load factor, fuel consumption, etc., of contracted transportation providers.

- LCI data from secondary data sources (e.g., databased, literature) on transportation or energyware (e.g., electricity[9], fuels, and heat) that qualify as selected generic data, that are combined with collected activity data on energy (quantity and type of electricity mix, fuels, heat, etc.) are transportation (means of transportations, fuels, distances, load factors, etc., of contracted transportation providers).[10]
- LCI data from secondary data sources (e.g., databased, literature) on materials that qualify as selected generic data, that are combined with collected (specific) data on the composition of components used in manufacturing of the studied product.

- Generic data (sometimes referred to as "secondary data"), divided into:
  - selected generic data: data (e.g., from commercial databases and free databases) that fulfil prescribed data quality requirements for precision, completeness, and representativeness (see below Section 4.7.2),
  - proxy data: data (e.g., from commercial databases and free databases) that do not fulfil all the data quality requirements of "selected generic data".

Specific data shall be prioritized and used for the EPD, unless it is not available, in which case generic data may be used. Generic data should be used in cases in which they are representative for the purpose of the EPD, e.g., for bulk and raw materials on a spot market, if there is a lack of specific data on the final product or if a product consists of many components.

4.7.1 DATA QUALITY REQUIREMENTS FOR SPECIFIC DATA

For specific data, the following rules apply:

- Data should be averaged over at least one year of operations (this year does not need to be a calendar year); deviations shall be justified. A deviation may for example be justified if production under normal conditions only occurs during part of a year (e.g., only once, during a certain season each year, or as batch production a few days a year. Data for more than one year of production shall be used when year-to-year variations are large, so that, for example, five-year averaged data is more representative for the coming year.
- When data is averaged over several machines or manufacturing sites, the production volume per machine/site shall be accounted for.
- The period for data collection should be as recent as possible; deviations shall be justified. A possible justification for a deviation is when disruption in the recent year effects representativeness of the data.
- The reference year of the data shall not be more than five years old and shall be representative for the validity period of the EPD (if not, the EPD shall be updated, see Section 2.2.3). The reference year, which does not need to be a calendar year, is the latest year in which the data provider confirmed the data to be representative, i.e., the starting year for the most recently set validity period.[11] This means that primary LCI data can have been collected more than five years ago, but the representativeness shall have been reassessed and confirmed by the data provider (the manufacturer/service provider) within the past five years.[12]
- Inputs to and outputs from the product system shall be accounted for over a period of 100 years.

[9] Data on electricity modelled by contractual instruments or a residual grid mix shall be considered specific data. If there is no contractual instrument for demonstrating the origin of the electricity on the market, that fulfils the requirements on electricity modelling in Section 4.7.5, data on the consumption mix of the market shall be considered specific data.

[10] For example, supplier data on the actual quantity of electricity supplied, combined with LCI data from a database on the electricity mix used, qualifies as specific data

[11] This definition of "reference year" is a specification and merge of the definitions in EN 15804, EN 15941, ISO 21930 and the ILCD format.

[12] This reassessment can, for example, be done based on collected metadata, which is also part of the specific data. That is, it can be that some data (LCI or meta data) has been collected within five years, but some of the specific data is older than five years but has been confirmed to still be representative by the more recently collected data. An example: the amount of electricity a machine uses and the emissions it emits was measured seven years ago; but within the past five years the producer has confirmed the same machine is still used and has provided updated data on how much the machine is used per product output and the type of electricity used to run the machine.

- Data shall comply with the rules on system boundaries and the cut-off rule of this PCR.

4.7.2 DATA QUALITY REQUIREMENTS FOR GENERIC DATA

For generic data to qualify as selected generic data, the following requirements apply:

- Datasets shall be based on attributional LCA modelling (e.g., not be based on marginal data and not include credits from system expansion).
- The reference year shall be as current as possible and not represent a reference year older than 10 years (if not, the EPD shall be updated, see Section 2.2.3), and should be representative for the validity period of the EPD. The reference year is defined as above for specific data, but for generic data the provider of the data is often a commercial provider of generic datasets, which then often has set the reference year. Note that the reference year is not necessarily the year of data collection, modelling, calculation, or publication.
- The 5% cut-off rule (as described in Section 4.5) shall be met on the level of the product system.
- The technological, geographical, and temporal coverage of the data shall as much as possible reflect the physical reality of the declared product/product group.
    - If the data represents a different reference product than the product actually used as input to the manufacturing process, the technological coverage shall be deemed to be sufficient for the data to be qualified as selected generic data if the products belong to the same homogenous product family, i.e., they share the same main function(s) and same manufacturing technologies (i.e., the type of materials and manufacturing processes). If such extrapolation is done, it shall follow the rules in Annex A of EN 50693.
- Datasets from databases should be from the latest version of the database. If not, the database version shall not be older than two years counting from when the EPD was published with a new validity period.

If selected generic data that meets the above data quality requirements is not available, proxy data may be used. The environmental impacts associated with proxy data shall not exceed 10% of the overall environmental impact of the product system.

4.7.3 EXAMPLES OF DATABASES FOR GENERIC DATA

When conducting an EPD, database providers should be referenced, and an explanation should be given for why these databases have been used. Table 3 lists examples of databases and datasets that can be used for generic data. Please note that a data quality assessment shall be performed also for data listed in the table, and that other data that fulfil the data quality requirements may also be used.

Table 3. Examples of databases and datasets to use for generic data.

Process	Geographical scope	Database
Electricity	Worldwide	Data combined with IEA (International Energy Agency) statistics on electricity generation mixes for nations, regions, etc., www.iea.org/statistics/ Electricity residual mixes for European countries can be sourced from the Association of Issuing Bodies (AIB), www.aib-net.org
Plastics	Europe	Plastics Europe
Transport	Europe	European Reference Life Cycle Data System (ELCD)
Waste management	Europe	European Reference Life Cycle Data System (ELCD)
Electronic components	Worldwide	Ecoinvent (latest version)
Packaging materials	Worldwide	Ecoinvent (latest version) EMPA, Swiss Packaging Institute

Multiple	Worldwide	Sphera Managed LCA Content (formerly known as GaBi database) Ecoinvent (latest version)

4.7.4 DATA QUALITY DECLARATION

The EPD shall declare the share specific data contributing to the GWP-GHG results in the manufacturing stage. If this share is more than 90%, ">90%" may be reported. In connection to the reported share of specific data, the EPD shall include the following statement: "The share of specific data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more specific data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories."

The shares of selected generic and proxy data for the manufacturing stage may also be reported in the EPD. The shares of specific data selected generic data, and proxy data, may be declared also for indicators others than the GWP-GHG indicator.

The calculations of the shares of specific data shall be clearly shown in the LCA report.

Additionally, the quality of used data shall be assessed and documented in the LCA report according to ISO 14044. This assessment shall address the following aspects:

- Precision
- Completeness
- Representativeness:
  - Time-related coverage: datasets should be based on 1-year averaged data; they should have been updated within the last 10 years for generic data and 5 years for specific data.
  - Geographical coverage: the specifics of the location shall be reflected in term of the different life cycle stages.
  - Technological coverage: the LCA shall reflect the physical reality of the reference product or product family-
- Consistency
- Alignment with the defined system boundaries

Any deviations to these requirements shall be justified in the LCA report. Such data is then defined as proxy data, see Section 4.7.2.

The data quality assessment may be done using the data quality level and criteria schemes of UN Environment Global Guidance on LCA database development or the PEF method (European Commission 2021).[13]

The data quality declaration in the LCA report may be summarised in the EPD. Such a summary of the data quality declaration is mandatory to include in the EPD when generic data is used that do not fulfil any of the requirements on selected generic data described in Section 4.7.2. In other words, a summary of the data quality declaration is mandatory if proxy data is used. This summary shall include the reason for why the proxy data does not fulfil the data quality requirements.

4.7.5 DATA QUALITY REQUIREMENTS AND OTHER MODELLING GUIDANCE PER LIFE-CYCLE STAGE

Below are further data quality requirements per life-cycle stage. Exceptions to the requirements may be accepted, if justified in the EPD; such exceptions are subject to the approval by the verifier on a case-to-case basis.

4.7.5.1 Manufacturing and distribution processes

- Data referring to processes and activities in a supply chain over which the EPD owner has direct management control shall be specific and collected on site.

[13] Both these schemes are outlined in Annex E of EN 15804.

- Data referring to contractors that supply main parts, packaging, or main auxiliaries should be requested from the contractor as specific data, when available.
- Data on transport of main parts and components along the supply chain to a distribution point (e.g., a stockroom or warehouse) where the final delivery to the manufacturer can take place, should be specific and based on the actual transportation mode, distance from the supplier, type of fuel (e.g., gasoline, diesel, etc.) and vehicle load. Use of specific data is of particular importance if air freight is used.
- In case specific data is lacking, selected generic data may be used. If this is also lacking, proxy data may be used (see Section 4.7).
- For processes modelled with specific data, generation of electricity used shall be accounted for in this priority:
    1. Specific electricity mix as generated, or purchased from an electricity supplier, demonstrated by a Guarantee of Origin or similar as provided by the electricity supplier.
    2. Residual electricity mix on the market.
    3. Electricity consumption mix on the market.

  The residual electricity mix[14] is the mix when all contract-specific electricity, that has been sold to other customers, has been subtracted from the total consumption mix.

  "The market" in the above hierarchy may correspond a national electricity market, if this can be justified.

  The mix of electricity used in manufacturing processes shall be documented in the EPD, where relevant.
- Packaging: specific data shall be used for the consumer packaging production if it is under the direct control of the organization or if the environmental impact related to the consumer packaging production is more than 10% of all product environmental indicators' results. In other cases, generic data may be used. When consumer packaging shows the organization's logo, the LCA report should report the exerted/non-exerted direct control on the production of consumer packaging by the organization.
- Transport from the final delivery point of raw materials, chemicals, main parts, and components to the manufacturing plant/place of service provision should be based on the actual transportation mode, distance from the supplier, fuel and vehicle load, if available.
- For electricity used in the production processes, generation of electricity used shall be accounted for in this priority:
    1. Specific electricity mix as generated, or purchased from an electricity supplier, demonstrated by a Guarantee of Origin or similar as provided by the electricity supplier.
    2. Residual electricity mix on the market.[15]
    3. Electricity consumption mix on the market. This option shall not be used for electricity used in processes over which the manufacturer (EPD owner) has direct control, as long as the composition of the residual grid mix has been publicly disclosed[16].

  The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total consumption mix.

  "The market" in the above hierarchy may correspond a national electricity market, if this can be justified.

  The mix of electricity used in the production processes shall be documented in the EPD, where relevant.
- Waste treatment processes of manufacturing waste should be based on specific data, if available.

4.7.5.2 Use and end-of-life processes

[14] Information on residual electricity mix for Europe can be found at Association of Issuing Bodies (2024).

[15] For electricity markets without trade of Guarantees of Origin (or similar), the residual mix will, however, be identical to the consumption mix.

[16] If the composition of the residual grid mix has not been publicly disclosed, the second option in the above hierarchy is not feasible and thus the third option is the only remaining option (if the first option is not chosen).

- Specific data, representing the actual use of the product, shall be used when available. In the absence of specific data, data representing the use set by default[17] by the manufacturer should be used.
- Data on the emissions from the use stage should be based on documented tests, verified studies in conjunction with average or typical product use, or recommendations concerning suitable product use. Whenever applicable, test methods shall be internationally recognised.
- Existing standards for measures and test methods shall be used to justify the calculations. The normative references shall be mentioned in the EPD.
- Energy and other resources consumed during the use stage of the equipment shall be representative of the configuration in which the equipment is delivered to the end user (i.e., default settings).
- The use of electricity in the region/country where the product is used (as specified in the geographical scope of the EPD) shall be modelled using the electricity consumption mix on the market.

  The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total production mix.

  "The market" in the above hierarchy may correspond a national electricity market, if this can be justified.

  When the product is used in two or more markets having distinct residual electricity or electricity consumption mix, sales data (i.e. the percentage of products sold in each market) shall be used in the calculation of the total electricity used and its related emissions, in order to properly reflect the variability in impact associated to each electricity mix.

  The mix of electricity used in the use processes shall be documented in the EPD, where relevant.

  When the energy consumption linked to the use of ICT infrastructure is included, it should only consider the allocated emissions linked to that power consumption use, rather than the manufacturing of the ICT infrastructure. The results of the ICT use impacts shall be reported separately than the direct impacts linked to the use of the product.
- The transport of the product to the customer shall be described in the EPD, where relevant, and be accounted for in this priority:
  1. Actual transportation modes and distances to specific a customer or market, representing the geographical scope of the EPD. Use of specific data is of particular importance if air freight is used.
  2. A weighted average of transportation modes and distances, based on transportation to several customers or markets, representing the geographical scope of the EPD.
- Scenarios for repair, reuse and refurbishment can be added, as long as available data is representative. Any key assumption on the modelling of repair, reuse or refurbishment shall be documented in the LCA report and the EPD.
- Scenarios for the end-of-life stage shall be technically and economically practicable. The end-of-life scenario shall be compliant with current regulations in the relevant geographical region based on the geographical scope of the EPD, meaning that it shall not contradict the minimum collection rates, recycling rates or landfilling prohibitions (when applicable) imposed on the relevant actors (i.e., manufacturers or members states in the European Union). Key assumptions regarding the end-of-life stage scenario shall be documented in the LCA report and in the EPD. Default values for material recovery rates through recycling are available for reference in standard EN 50693 (Table G.4). It is recommended to use more recent and representative values for material recovery rates whenever these are available.

Energy consumption of electric and electronic equipment

The following section describes rules and guidance for estimating energy consumption of electric and electronic equipment. These rules and guidance, including information on operation modes, regulations, and standards, are not applicable to electronic components and thus this section is not relevant for EPDs of electronic components.

Electric and electronic equipment depends on the energy input from the mains power source in order to work as intended. Certain equipment is constantly connected to the mains power while others are only connected at certain time intervals.

[17] "Default" here refers the value of a specific feature (e.g., brightness, volume, connectivity, cooling temperature, operation time, etc.) as set at the factory and available when the customer uses the product for the first time or after performing a "reset to factory settings" (if applicable for the product).

While connected to the mains power, electric and electronic equipment can have different modes, such as on-mode or active mode[18], off-mode[19], standby mode[20], or networked standby mode[21] (as per EC 2023), which draw power from the grid at different levels, depending on the functions delivered at each mode, and the energy efficiency strategies implemented in the design of the equipment. Battery-operated devices draw power from the mains for the charging of the battery in the device, and from the mains in an idle mode once the battery in fully charged.

The EPD should include an evaluation of the availability of different modes, other than on-mode, in the equipment and when available, include the energy consumption associated with such mode(s) into the calculation of energy consumption during of use stage. This energy consumption should be reflected during the entire reference service life specified for the equipment, according to Section 4.2.

Other modes available in the equipment, which do not correspond exactly to the definitions offered in EN (2023), should also be included in the calculation of total energy consumption.

The following equation can be taken into consideration for the calculation of total energy consumption (TEC) for the electric and electronic equipment intended to maintain a continuous connection to the mains power, as applicable:

$$TEC = [(Pon\ x\ Ton) + (Poff\ x\ Toff) + (Pstandby\ x\ Tstandy) + (Pnet\ standby * Tnet\ standby) + (Pother\ x\ Tother)]\ x\ \ RSL$$

where,

TEC = total energy consumption

Pon = power consumed by the device in the available on or active modes (i.e. on mode, off mode, standby mode, networked standby mode, and other available modes)

Poff = power consumed by the device in the off mode

Pstandby = power consumed by the device in the standby mode

Pnet standby = power consumed by the device in the networked standby mode

Pother = power consumed by the device in other modes (not corresponding to the modes defined in EC (2023)

T = time spend by the device in each of the modes. The sum of the time the device spends in each of the modes should equal 24 hours.

RSL = reference service life, as defined according to Section 4.2 or applicable c-PCR.

The mix of time spent in each of the modes should correspond to the normal operating conditions of the equipment.

Example:

Over a period of one day, an electronic display (television) is expected to be in the on-mode for 4 hours, while the end-user actively uses it. During the remaining time (20 hours), the display is expected to remain in standby mode, waiting for

[18] 'active mode(s)' means a condition in which the equipment is connected to the mains power source and at least one of the main functions has been activated;

[19] 'off mode' means a condition in which the equipment is connected to the mains power source and is not providing any function, or it is in a condition providing only:

(a) an indication of off mode condition;

(b) functionalities intended to ensure electromagnetic compatibility under Directive 2014/30/EU of the European Parliament and of the Council

[20] 'standby mode(s)' means a condition where the equipment is connected to the mains power source, depends on energy input from the mains power source to work as intended and provides only one or more of the following functions, which may persist for an indefinite time:

(a) reactivation function;

(b) reactivation function and only an indication of enabled reactivation function;

(c) information or status display;

[21] "networked standby" means a condition in which the equipment is able to resume a function by way of a remotely initiated trigger from a network connection;

reactivation by the user without intervention of a network. As determined according to Section 4.2, the declared RSL for this specific electronic device is 7 years.

In this case:

Pon = 80 W

Ton = 4 hours

Pstandby = 0.5 W

Tstandby = 20 hours

Off mode, networked standby mode, other modes are not applicable.

$$TEC = [(80\ W\ x\ 4\ hours) + (0.5\ W\ x\ 20\ hours)]\ x\ 365\ days\ x\ 7\ years = 843.15\ kWh$$

The use method or use settings recommended by the manufacturer, often set by default, should be used to determine the energy consumption of the equipment in its active mode. In case documented evidence is available, showing an actual use method that is different from the one recommended by the manufacturer, the actual use method shall be used.

The calculation of on-mode power consumption should account for the time distribution spent between nominal power use and peak power use, as expected for the product, when applicable.

European standards EN 50564:2011 and EN 50643:2018 and their amendments can be used, when suitable, to measure energy consumption in the different modes. Other reliable, accurate, reproducible, and recognized state-of-the-art methods can also be used for the measurement of power consumption.

C-PCRs, used together with this PCR, shall define a use stage reference scenario, when possible, and refine the calculation methods and aspects to consider for an accurate estimation of energy consumption in the use stage, according to the nature, use profile and functionalities of the equipment.

4.8 ENVIRONMENTAL PERFORMANCE INDICATORS

The EPD shall declare the default environmental performance indicators and their methods as described on the website (www.environdec.com/indicators), which includes both inventory indicators and indicators of potential environmental impact. Additionally, the EPD shall declare a supplementary indicator for climate impact: GWP-GHG indicator, which is equal to GWP-total except that the characterisation factor for biogenic CO_2 is set to zero.[22]

The source and version of the impact assessment methods and characterisations factors used shall be reported in the EPD. Also, other indicators may be declared, if justified, see Section 5.4.5.

If the default list of environmental performance indicators and methods at the www.environdec.com/indicators is updated, the previous version of the list is valid in parallel to the new version during a transition period of at least 90 days, as described on the website.

Apart from inventory indicators (such as the required and optional inventory indicators listed on www.environdec.com/indicators), other inventory data may also be declared in the EPD, if relevant and useful for EPD users. Such data shall not be declared in the main body of the EPD, but in an annex.

Specific additional indicators that shall be declared, related to the specific type of product and or application, are provided in the c-PCRs, when applicable.

[22] The GWP-GHG indicator creates comparability with how climate declarations are calculated in various regulative contexts. In particular, the GWP-GHG indicator allows direct comparison of the climate impact of the manufacturing stage (module A1-A3) of comparable products in different EPDs, without having to consider the biogenic content of the products. As such, the GWP-GHG indicator supports the modular principle. The GWP-GHG indicator shall, in EPDs based on this PCR, also be used for declaring the share of specific data, see Section 4.7.4.

4.9 INCLUDING MULTIPLE PRODUCTS IN THE SAME EPD

4.9.1 MULTIPLE PRODUCTS FROM THE SAME COMPANY

Several sets of results, reflecting different products, are not allowed to be declared in the same EPD. However, similar products from a single or several manufacturing sites covered by the same PCR and manufactured by the same company with the same major steps in the manufacturing processes may be grouped and thereby included in the same EPD. For such an EPD, there are three options:

- For each indicator, declare the average results of the included products. This average shall be weighted according to the production volumes of the included products, if relevant. In this option, the average content shall be declared in the content declaration.
- Declare the results of one of the included products – a representative product. The choice of the representative product shall be justified in the EPD, using, where applicable, statistical parameters. For example, the choice may be based on production volumes. In this option, the content of the representative product shall be declared in the content declaration.
- For each indicator and life-cycle stage, declare the highest result of the included products (i.e., the results of a "worst-case product", which may be the results of one or several of the included products). In this option, the content declaration shall include the lowest amounts of recycled and biogenic content of the included products and their packaging, respectively, and the information on environmental and hazardous properties of substances shall reflect the highest share and most hazardous such substances contained in the any of the included products.

If the declared environmental impact indicator results differ by more than 10% between any of the included products, the grouping of products shall be justified in the LCA report and the EPD shall declares the variation of each impact indicator results for which the variation is above 10%.

The second option above (the results of a representative product are used) is only possible if all products covered by the EPD belong to the same homogeneous product family. In other words, the products shall share the same main function, adhere to the same product standards, and have similar manufacturing technology (using the same type of materials and processes). Homogeneous products are essentially identical or very similar in terms of their characteristics and use. In such cases, the rules described in Annex A.1 on EN 50693, for extrapolation of results to a homogeneous product family, shall be followed.

4.9.2 SECTOR EPDS

Industry association or any other group of companies may develop an EPD in the form of a sector EPD. A sector EPD declares the average product of multiple companies in a clearly defined sector in a clearly defined geographical area. Products covered in a sector EPD shall follow the same PCR and the same declared/functional unit shall be applied. Any communication of the results from a Sector EPD should contain the information that the results are based on averages obtained from the sector as defined in the EPD. The communication shall not claim that the sector EPD results are representative for a certain manufacturer or its product.

The following information shall also be included a Sector EPD:

- a list of the contributing manufacturers that the Sector EPD covers,
- a description of how the selection of the sites/products has been done and how the average has been determined, and
- a statement that the document covers average values for an entire or partial product category (specifying the percentage of representativeness) and, hence, the declared product is an average that is not available for purchase on the market.

4.10 EPD PUBLISHED BY A TRADER

Traders (e.g., retailers, wholesalers) whose products are produced by one or several other organisations (the manufacturer(s)) may publish an EPD under their own name. The EPD can be based on one or several valid EPD registered

by the original manufacturer(s) or based on specific data obtained from the manufacturer(s). The EPD shall be follow the same data quality requirements and other rules as EPDs published by a manufacturer under the same PCR and c-PCR.

In addition, the transportation from the manufacturer(s) to a central warehouse or to the border of the market of the EPD scope shall be included and shall be based on specific data. In case of retailer/wholesaler, also the transportation to the store of the retailer/wholesaler shall be included and based on specific data. Transportation from central warehouse/ the border of the market/retail store to an average customer may also be included. If the trader uses its own packaging, the production of the packaging shall be included and be based on specific data.

If the EPD published by the trader is based on EPD(s) of manufacturer(s), the validation and verification shall be done based on the same PCR with the same version number in terms of the first digit (e.g., an EPD based on version 1.0.0 of a PCR can be used as input to an EPD based on version 1.1.0 of the same PCR). All the information in the EPD shall be validated and verified, which means that the verifier shall have access to the underlying EPD and its LCA report. In case the manufacturer's EPD is updated, the trader's EPD shall also be updated and re-verified. This is to prevent liability issues that may occur.

5 CONTENT AND FORMAT OF EPD

EPDs based on this PCR shall contain the information described in this section. Flexibility is allowed in the formatting and layout provided that the EPD still includes the prescribed information. A generic template for EPDs is available on www.environdec.com.

The EPD content shall:

- be in line with the requirements and guidelines in ISO 14020 (Environmental labels and declarations – General principles),
- be verifiable, accurate, relevant, and not misleading, and
- not include rating, judgements, or direct comparison with other products[23].

An EPD should be made with a reasonable number of pages for the intended audience and use.

The content of EPDs published in machine-readable format shall correspond with the content of the underlying EPD.

5.1 EPD LANGUAGES

EPDs should be published in English but may also be published in additional languages. If the EPD is not available in English, it shall contain an executive summary in English including the main content of the EPD. This summary is part of the EPD and, thus, also subject to the verification process.

5.2 UNITS AND QUANTITIES

The following requirements apply for units and quantities:

- The International System of Units (SI units) shall be used where available, e.g., kilograms (kg), Joules (J) and metres (m). Reasonable multiples of SI units may be decided in the PCR to improve readability, e.g., grams (g) or megajoules (MJ). The following exceptions apply:
  - Resources used for energy input (primary energy) should be expressed as kilowatt-hours (kWh) or megajoules (MJ), including renewable energy sources, e.g., hydropower, wind power and geothermal power.
  - Water use should be expressed in cubic metres (m^3)
  - Temperature should be expressed in degrees Celsius (°C),
  - Time should be expressed in the most practical units, e.g., seconds, minutes, hours, days or years.
  - Results of the environmental performance indicators shall be expressed in the units prescribed by the impact assessment methods, e.g., kg CO_2 equivalents.
- Three significant figures[24] should be adopted for all results. The number of significant digits shall be appropriate and consistent.
- Scientific notation may be used, e.g., 1.2E+2 for 120, or 1.2E-2 for 0.012.
- The thousand separator and decimal mark in the EPD shall follow one of the following styles (a number with six significant figures shown for illustration):
  - SI style (French version): 1 234,56
  - SI style (English version): 1 234.56

[23] Therefore, results of normalization are not allowed to be reported in the EPD.

[24] Significant figures are those digits that carry meaning contributing to its precision. For example, with two significant digits, the result of 123.45 shall be displayed as 120, and 0.12345 shall be displayed as 0.12. In scientific notation, these two examples would be displayed as $1.2*10^2$ and $1.2*10^{-2}$.

In case of potential confusion or intended use of the EPD in markets where different symbols are used, the EPD shall state what symbols are used for thousand separator and decimal mark.

- Dates and times presented in the EPD should follow the format in ISO 8601. For years, the prescribed format is YYYY-MM-DD, e.g., 2017-03-26 for March 26th, 2017.
- The result tables shall:
  - Only contain values or the letters "ND" (Not Declared). It is not possible to specify ND for mandatory indicators. ND shall only be used for voluntary parameters that are not quantified because no data is available.[25]
  - Contain no blank cells, hyphens, less than or greater than signs or letters (except "ND").
  - Use the value "0" only for parameters that have been calculated to be zero.
  - Footnotes shall be used to explain any limitation to the result value.

5.3 USE OF IMAGES IN EPD

Images used in the EPD, especially pictures featured on the cover page, may in themselves be interpreted as an environmental claim. Images such as trees, mountains, wildlife that are not related to the declared product shall therefore be used with caution and in compliance with national legislation and best available practices in the markets in which the EPD is intended to be used.

5.4 EPD REPORTING FORMAT

The reporting format of the EPD shall include the following sections:

- Cover page (see Section 5.4.1)
- Programme information (see Section 5.4.2)
- Product information (see Section 5.4.3)
- Content declaration (see Section 5.4.4)
- Environmental performance (see Section 5.4.5)
- Additional environmental information (see Section 5.4.6)
- Additional social and economic information (see Section 5.4.7)
- References (see Section 5.4.10)

The following sections shall be included, if relevant:

- Differences versus previous versions (see Section 5.4.9)
- Executive summary in English (see Section 5.4.11)

5.4.1 COVER PAGE

The cover page shall include:

- Product name and image
- Name and logotype of EPD owner
- The text "Environmental Product Declaration" and/or "EPD"
- Programme: The International EPD System, www.environdec.com
- Programme operator: EPD International AB

[25] This requirement does not intend to give guidance on what indicators are mandated ("shall") or voluntary.

- Logotype of the International EPD System
- EPD registration number as issued by the programme operator[26]
- Date of publication (issue): 20XX-YY-ZZ
- Date of revision: 20XX-YY-ZZ, when applicable
- Date of validity; 20XX-YY-ZZ
- A note that *"An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication on* www.environdec.com*."*
- A statement of conformity with ISO 14025 and EN 50693.
- For EPDs covering multiple products: a statement that the EPD covers multiple products and a list of all products covered by the EPD.
- For Sector EPDs: a statement that the EPD is a Sector EPD.

In the case of EPDs registered through a regional hub (a regional or national programme based on and fully aligned with the International EPD System through an agreement with the programme operator), "Programme", "Programme operator", and "Logotype" shall be expanded to include a reference to the regional programme and the organisation responsible for it.

Where applicable, the cover page shall also include the following information:

- Information about dual registration of EPD in another programme, such as registration number and logotype.
- A statement of conformity with other standards and methodological guides.

5.4.2 PROGRAMME INFORMATION

The programme information section of the EPD shall include:

- Address of programme operator: *EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: support@environdec.com*
- The following statement on the requirements for comparability of EPDs, adapted from ISO 14025: *"EPDs within the same product category but from different programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison."*
- A statement that the EPD owner has the sole ownership, liability, and responsibility of the EPD
- The EPD shall include information about the PCR (and c-PCR, if applicable) used according to Table 4. Any text displayed in grey is solely for guidance and shall not be included in the EPD.

[26] The EPD shall not include a "registration number" if such is provided by the certification body, as this may be confused with the registration number issued by the programme operator.

Table 4. Information on PCR.

Product Category Rules (PCR)
CEN standard EN 50693 serves as the core Product Category Rules (PCR)
Product Category Rules (PCR): *<name, registration number, version, and UN CPC code(s)>* *If applicable, the corresponding information about c-PCR shall also be included. In case a c-PCR has been adopted from another EPD programme, this the name and version number of the original c-PCR shall be included.*
PCR review was conducted by: *<name and organisations of the review chair, and information on how to contact the chair through the programme operator>* *If applicable, the corresponding information about c-PCR shall also be included.*

- The EPD shall include information about verification according to Table 5. Any text displayed in grey is solely for guidance and shall not be included in the EPD. The verification shall follow the rules in latest version of the GPI[27], accounting for transition periods for verification rules.

Table 5. Information on verification.

Verification
External and independent ('third-party') verification of the declaration and data, according to ISO 14025:2006, via: ☐ EPD verification through an individual EPD verification ☐ EPD verification through an EPD Process Certification* ☐ EPD verification through a pre-verified LCA/EPD tool In case of individual EPD verification: Third-party verifier: *<Name, and organisation of the individual verifier>* or *<Name of certification body (incl. address.)>* Approved by: The International EPD System or Accredited by: *< Name of accreditation body & accreditation number, where applicable>* In case of EPD Process Certification: Third-party verifier, accountable for the certification: *<Name of certification body (incl. address)>* Accredited by: *<Name of accreditation body & accreditation number, where applicable>* In case of pre-verified LCA/EPD tool and a verifier Third-party verifier, accountable for the EPD verification: *<Name, and organisation of the individual verifier>* or *<Name of certification body (incl. address.)>* Approved by: The International EPD System or Accredited by: *< Name of accreditation body & accreditation number, where applicable>* Pre-verified LCA tool or Pre-verified EPD tool <Name and version> Third-party verifier, accountable for the tool verification: *<Name, and organisation of the individual verifier>* or *<Name of certification body (incl. address)>* Approved by: The International EPD System or Accredited by: *< Name of accreditation body & accreditation number, where applicable>*

[27] When this PCR was originally published, in October 2024, the currently applicable verification rules were found in Section 8 of version 5.0.0 of the GPI.

Include disclaimer in all cases. *EPD Process Certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.envrondec.com.
Procedure for follow-up of data during EPD validity involves third-party verifier.[28] ☐ Yes ☐ No

5.4.3 PRODUCT INFORMATION

The product information section of the EPD shall include:

- address and contact information to EPD owner,
- description of the organisation. This may include information on products- or management system-related certifications (e.g., ISO 14024 Type I environmental labels, ISO 9001- and 14001-certificates and EMAS-registrations).
- location of production site, including, as a minimum, the city (or municipality, if not located in a city),
- product identification by name, and an unambiguous identification of the product by standards, concessions, or other means,
- identification of the product according to the UN CPC scheme system. Other relevant codes for product classification may also be included, e.g.
  - Common Procurement Vocabulary (CPV),
  - United Nations Standard Products and Services Code® (UNSPSC),
  - Classification of Products by Activity (NACE/CPA),
  - Australian and New Zealand Standard Industrial Classification (ANZSIC), or
  - Global Trade Item Number (GTIN).
- a description of the product,
- a description of the technical purpose of the product, including its application/intended use,
- a description of the background system, including the main technological aspects,
- for EPDs covering multiple products: a description of the selection of products/sites, a list of contributing manufacturers (if Sector EPD), etc. (see Section 4.9),
- geographical scope of the EPD, i.e., for which geographical location(s) of use and end-of-life the product's performance has been calculated,
- the electricity mix (percentage per source), for the electricity consumed during the use stage, together with the emission factor of this electricity mix,
- declared/functional unit, and applied standards, when applicable,
- reference service life (RSL) and/or technical/actual lifespan, and applied standards, if relevant,
- declaration of the year(s) covered by the data used for the LCA calculation and other relevant reference years,
- reference to the main database(s) and its version for generic data and LCA software used, if relevant,

[28] Procedure for follow-up the validity of the EPD is required at minimum once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period (see Section 2.2.3). The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier.

- data quality declaration according to Section 4.7.4,
- system diagram of the processes included in the LCA, divided into the life cycle stages,
- description if the EPD system boundary is “cradle-to-grave”,
- information on which life-cycle stages are not considered (if any), with a justification of the omission, and
- references to any relevant websites for more information or explanatory materials.

This section may also include:

- name and contact information of organisation carrying out the underlying LCA study,
- any additional information about the underlying LCA-based information, such as cut-off rules, data quality, allocation methods, and other methodological choices, limitations, and assumptions,
- a description of the material properties of the product with a declaration of relevant physical or chemical product properties, such as density, etc., and

5.4.4 CONTENT DECLARATION

If relevant, the EPD shall include a section on content declaration according to the below rules. If not relevant, the PCR shall specify that the content declaration shall not be included in EPD.

- The mass (weight) of one unit of a product, as purchased or per declared unit, shall be declared.
- Information about the content of the product in the form of a list of materials and substances, and their mass, shall be declared.
    - Proprietary materials and substances of confidential nature are exempted from the above requirement. If not declared, these shall be replaced by a generic term/description of the material/substance and/or a range[29] of values (instead of specific values), provided that the applicable rules for declaration of hazardous are followed (see below).
- The mass and the content of distribution and/or consumer packaging shall be declared, when applicable.
- The gross mass of material in the content declaration shall cover 100% of one unit of product and its packaging.
- If there is more than 5% biogenic content in the product, this share (in mass-%) shall be declared along with the mass of biogenic carbon content in kg C per product or declared unit. If below 5%, this may be declared.
- If there is more than 5% post-consumer recycled content in the product, this share shall be declared. If below 5%, this may be declared. The share of pre-consumer recycled content of the product may also be declared, and shall then be declared separately from the share of post-consumer content.[30] The share of pre-consumer recycled content may further be divided into content originating from within, or from outside, the manufacturing site/company.
- If there is more than 5% biogenic content in the packaging, this share shall be declared. If below 5%, this may be declared. Additionally, the share of recycled content of the packaging material may be declared; if the share of pre-consumer recycled content is declared, it shall be declared separately from the share of post-consumer content.
- If the share of biogenic/recycled material is unknown, this part of the content declaration can be left out or be declared as 0% (a conservative estimate) or unknown.
- EPDs of multiple products or sector EPDs shall include a description what the content declaration represents.

[29] The declared range shall be reasonable (e.g., not be a very broad range, such as 20-80% of the mass of the product).

[30] Together, pre- and post-consumer recycled content corresponds to recycled content as defined in ISO 14021. Pre-consumer recycled content consists of pre-consumer material, and post-consumer recycled content consists of post-consumer material, as defined in ISO 14021. Note that the indicator secondary material, included among the environmental performance indicators (see www.environdec.com/indicators), considers all post- and pre-consumer materials that enter the product system from another product system, and not just the material contained in the product, and is therefore a complementary indicator.

- Information on the environmental and hazardous/toxic properties of a substances contained in the product shall be declared if the substance is in the candidate list of Substances of Very High Concern (SVHCs) which exceeds the limits for registration with the European Chemicals Agency (i.e., if the substance constitutes more than 0.1% of the weight of the product). The candidate list of SVHCs is available via the European Chemicals Agency[31].
- The content declaration shall also include other information on substances with hazardous and toxic properties that can be of concern for human health and/or the environment, if required by normative standards or regulation applicable in the market for which the EPD is valid. Note that declaration of toxic/hazardous substances shall be done irrespective of whether the substances have been included or excluded from the LCA model based on, for example, the cut-off rules.
- Information on the environmental and hazardous properties of substances should follow the requirements given in the latest revision of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[32] issued by the UN or national or regional applications of the GHS.

The declared share of biogenic/recycled materials shall be based on the actual share of biogenic/recycled material in the product (in average over the studied time period, normally one year of production). In other words, the share of biogenic/recycled materials of, for example, global average production of the constituent materials, for example as stated in generic LCI datasets, shall not be used as the basis for the declaration of biobased/recycled content. As such, the declared content information may be different from the product content as stated in the LCA model (as this may partly be based on generic LCI data).

Claims that a product is "free" of a specific hazardous material or substance should be done with caution and only when relevant, following the rules in ISO 14021 on self-declared environmental claims. For example, such a claim shall not be done with the material/substance that has never been associated with the product category, is not included in the product category, or if the product category is legally required not to include the material/substance in the market(s) covered by the geographical scope of by the EPD.

The content declaration shall be consistent with the product's technical data sheet (if any). The product's safety data sheet (if any) shall be made available to the verifier, for example to enable confirmation of presence/absence of SVHC in the product.

Additional rules for the content declaration may be set by the PCR. For example, for complex products consisting of very large numbers of materials/substances, it may make sense to allow the presence of hazardous substances to be presented as a reference to the corresponding notification number in the SCIP (Substances of Concern In articles as such or in complex objects (Products)) database[33]. Furthermore, for some product categories (e.g., food, feed, beverages, chemicals) it may be suitable to declare the water content.

5.4.5 ENVIRONMENTAL PERFORMANCE

Below subsections list the mandatory environmental performance indicators to declare in the EPD. LCA results based on additional indicators may be declared, if they are relevant for the product category, their inclusion is justified in the EPD, appropriate methods are used, and the results are verifiable. If the additional indicators appear to the reader to display duplicate information, the EPD shall contain an explanation of the differences between the declared indicators.

5.4.5.1 Environmental impacts

The EPD shall declare the environmental impact indicators, per functional/declared unit, per life-cycle stage (with potential benefits of material/energy recovery separately declared) and in aggregated form, using the default impact categories, impact assessments methods and characterisation factors available on www.environdec.com/indicators. The source and version of the impact assessment methods and characterisation factors used shall be reported in the EPD.

Alternative regional life cycle impact assessment methods and characterisation factors may be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the difference between the different sets of indicators, as they may appear to the reader to display duplicate information.

[31] See http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp.

[32] The GHS document is available on www.unece.org.

[33] See https://echa.europa.eu/scip.

5.4.5.2 Use of resources

The EPD shall declare the mandatory, and may declare the optional, indicators for resource use listed on www.environdec.com/indicators per functional/declared unit, per life-cycle stage (with potential benefits of material/energy recovery separately declared) and in aggregated form.

5.4.5.3 Waste production and output flows

Waste generated along the whole life cycle production chains shall be treated following the technical specifications described in the GPI. The EPD may declare the optional indicators for waste production and output flows as listed on www.environdec.com/indicators per functional/declared unit, per life-cycle stage (with potential benefits of material/energy recovery separately declared) and in aggregated form.

5.4.6 ADDITIONAL ENVIRONMENTAL INFORMATION

An EPD may declare additional environmentally relevant information, in addition to the LCA results of the section on environmental performance results. The additional environmental information may cover various aspects of specific relevance for the product, for example:

- The release of dangerous substances into indoor air, soil, and water during the use stage.
- Instructions for proper use of the product, e.g., to minimise energy or water consumption or to improve the durability of the product.
- Instructions for proper maintenance and service of the product, e.g., to minimise energy or water consumption or to improve the durability of the product.
- Information on key parts of the product that determine its durability.
- Information on recycling including, e.g., suitable procedures for recycling the entire product or selected parts and the potential environmental benefits gained.
- Information on a suitable method of reuse of the product (or parts of the products) and procedures for disposal as waste at the end of its life cycle.
- Information regarding disposal of the product, or inherent materials, and any other information considered necessary to minimise the product's end-of-life impacts.
- A more detailed description of an organisation's overall environmental work, in addition to the information listed under Section 5.4.3, such as:
  - the existence of any type of organised environmental activity, and
  - information on where interested parties may find more details about the organisation's environmental work.

Specifically, it is recommended that the additional environmental information includes information on the electromagnetic interference (EMI) and electromagnetic compatibility (EMC) of the product, when relevant, with reference to the applicable standard in the intended market (e.g., EU's EMC Directive (EC 2014)).

Any additional environmental information declared shall be substantiated and verifiable, and be derived using appropriate methods and be specific, accurate, not misleading, and relevant to the specific product. Quantitative information is preferred over qualitative information.

The additional environmental information shall not include LCA results, with some exceptions:

- If the EPD owner wants to display results of several scenarios for use or end-of-life stages, the most representative scenario (for the geographical scope of the EPD) shall be declared in the section on environmental performance results, and the other scenarios shall be declared in the section on additional environmental information.
- The LCA results of an alternative modelling approach may be declared as additional environmental information, if such an alternative modelling approach is explicitly allowed by the applicable PCR or the GPI. According to this PCR, alternative GWP-biogenic results may be declared, which considers the effect of long-term storage of biogenic carbon (see next bullet point).

- The additional environmental information may include information on permanent (more than 100 years) storage of biogenic carbon, either in the product, in a landfill, or as a consequence of applying carbon capture and storage (CCS) to the incineration of biogenic carbon, and how this would influence GWP-biogenic results if the GWP-biogenic indicator would allow consideration of such storage.

5.4.7 ADDITIONAL SOCIAL AND ECONOMIC INFORMATION

The EPD may also include other relevant social and economic information as additional and voluntary information. This may be product information or a description of an organisation's overall work on social or economic sustainability, such as activities related to supply chain management or social responsibility.

Any additional social and economic information declared shall be substantiated and verifiable, and be derived using appropriate methods and be specific, accurate, not misleading, and relevant to the specific product. Quantitative information is preferred over qualitative information.

5.4.8 INFORMATION RELATED TO A SECTOR EPD

For sector EPDs, the following information shall also be included:

- a list of the contributing manufacturers that the Sector EPD covers,
- a description of how the selection of the sites/products has been done and how the average has been determined.
- a statement that the document covers average values for an entire or partial product category (specifying the percentage of representativeness) and, hence, the declared product is an average that is not available for purchase on the market.

5.4.9 DIFFERENCES VERSUS PREVIOUS VERSIONS

For EPDs that have been updated, the following information shall be included:

- a description of the differences versus previously published versions, and
- a revision date on the cover page.

5.4.10 REFERENCES

A reference section shall be included, including a list of all sources referred to in the EPD, including the GPI (including version number), and PCR (registration number, name, and version) used to develop the EPD.

5.4.11 EXECUTIVE SUMMARY IN ENGLISH

The executive summary, if included (see Section 5.1), shall contain relevant summarised information related to the programme, product, environmental performance, and information related to sector EPDs. Besides this, further information may be added such as additional environmental, social, or economic information, references as well as differences versus previous EPD versions.

6 LIST OF ABBREVIATIONS

AC	Alternating Current
ANZSIC	Australian and New Zealand Standard Industrial Classification
CPC	Central product classification
C-PCR	Complementary Product Category Rule
CPV	Common procurement vocabulary
DC	Direct Current
DU	Declared Unit
EC	European Commission
EN	European Standard
EEE	Electronic and Electric Equipment
ELCD	European Reference Life Cycle Data System
EMAS	Eco-Management and Audit Scheme
EPD	Environmental product declaration
EU	European Union
FU	Functional Unit
GHS	Global Harmonized System
GPI	General Programme Instructions
GTIN	Global trade item number
HS	Harmonized System
Hz	Frequency
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
J	Joule
kg	Kilogram
kWh	Kilowatt-hours
LCA	Life cycle assessment
LCI	Life cycle inventory
m	Metre
m^3	Cubic meter
NACE/CPA	Classification of products by activity
ND	Not declared
PEFCR	Product Environmental Footprint Category Rules
PCBA	Printed circuit board assembly
PCR	Product category rules
REACH	Restriction of chemicals

RSL	Reference service life
SI	The International System of Units
UN	United Nations
UNSPSC	United Nations standard products and services code
UV	Ultraviolet
V	Voltage
°C	Celsius

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8 VERSION HISTORY OF PCR

VERSION 1.0.0, 2024-10-28

Original version of the PCR.

VERSION 1.0.1, 2024-12-09

A typo corrected in footnote 16 on page 26. It was erroneously referred to a non-existing *fourth* option, this has now been changed to the *third* option.

ANNEX 1: EXAMPLE OF A DECLARED UNIT FOR AN EXTERNAL POWER SUPPLY FOR A SMARTPHONE

The specification of the declared unit contains a description of the product and its technical characteristics by means of mass, volume, area, power, and other pertinent units. More details on defining a declared unit are laid out in Section 4.1.

This Annex presents an example of a declared unit for an external power supply.

In this example, an external power supply is defined as:

- A device which meets all the following criteria:
  - is designed to convert alternating current (AC) power input from the mains power source input into one or more lower voltage direct current (DC) or AC outputs,
  - is used with one or more separate devices that constitute the primary load,
  - is contained in a physical enclosure separate from the device or devices that constitute the primary load,
  - is connected to the device or devices that constitute the primary load with removable or hard-wired male/female electrical connections, cables, cords or other wirings, and
  - has nameplate output power not exceeding 250 watts.

Source: Adapted from Commission Regulation (EU) 2019/1782 of 1 October 2019 laying down ecodesign requirements for external power supplies (EC 2019b).

The declared unit is one external power supply unit, having the following technical properties:

- Size: 37.5 cm^3
- Weight: 0.03 Kg
- Rated input: 100-240V; 200mA; 50-60Hz
- Rated output: 5V; 1500mA; 7.5W
- Specific unit of operation: power delivered in watts (W)
- Designed for operation with a smartphone

ANNEX 2: COMPARISON WITH SELECTED PCRS FOR ELECTRIC AND ELECTRONIC EQUIPMENT AND CONSTRUCTION PRODUCTS

Table 6. Comparison between the approach followed in this PCR and selected PCRs, with regards to main aspects of the LCA method.

Name of PCR/standard	Equivalent in scope	Consistency of aspects of LCA method		Additional specifications
EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems	Yes	☒	Functional/declared unit	Aligned
		☒	Systems boundary	Aligned
		☒	Life cycle inventory	Aligned
		☒	Cut-off criteria	Aligned
		☒	Allocation rules	Aligned
		☒	Data quality	Aligned
EN 15804+A2:2019 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products	No	☒	Functional/declared unit	Aligned
		☐	Systems boundary	EPDs developed in accordance with EN 15804+A2 encompass all life cycle stages, which are further categorized into modules A1–A3, A4–A5, B1–B7, C1–C4, and module D. Additionally, the standard outlines specific conditions under which certain products are exempt from declaring information modules. These exemptions apply when: ▪ The product is physically integrated with another product and cannot be separated at the end of its life cycle. ▪ The product loses its identity due to a physical or chemical transformation process at the end of its life. ▪ The product does not contain biogenic carbon.
		☒	Life cycle inventory	Aligned
		☒	Cut-off criteria	For a unit process, data cut-off is acceptable if it accounts for 1% of both renewable and non-renewable primary energy usage and 1% of the total mass input. Additionally, each module (e.g., A1-A3, A4-A5, B1-B5, B6-B7, C1-C4, and module D) can exclude a maximum of 5% of energy usage and mass from input flows.
		☐	Allocation rules	EN 15804+A2 follows the ”end of waste state” principle for allocation of waste processes to the system. The system boundary to the subsequent product system is set where the waste (e.g., the discarded product) reaches the end-of-waste state, i.e., when the material has become a usable flow (e.g., for reuse, energy recovery and/or

				recycling). The end-of-waste state is reached when all the following criteria are fulfilled: ▪ the recovered material, component or product is commonly used for specific purposes; ▪ a market or demand, identified e.g., by a positive economic value, exists for such a recovered material, component, or product; ▪ the recovered material, component or product fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and ▪ the use of the recovered material, product or construction element will not lead to overall adverse environmental or human health impacts. The environmental impacts associated to the waste processing of the material flows during each module are included up to the system boundary of the respective module until the end of waste stage is reached.
		☐	Data quality	EPDs developed based on EN15804 shall use manufacturer average or specific data for all the processes over which the manufacturer has influence. Under this PCR, in case specific data is lacking, selected generic data may be used. If this is also lacking, proxy data may be used, while respecting data rules detailed in Section 4.7.
PEP Ecopassport - PCR Product Category Rules for Electrical, Electronic and HVAC-R Products (PCR-ed4-EN-2021 09 06)	Yes	☒	Functional/declared unit	Aligned
		☒	Systems boundary	Aligned
		☒	Life cycle inventory	Aligned
		☐	Cut-off criteria	Similarly to this PCR, the environmental impacts not taken into account shall be less than or equal to 5% of the total environmental impacts generated during the life cycle of the reference product corresponding to the functional unit. In addition: ▪ The mass of intermediate flows not taken into account shall be less than or equal to 5% of the mass of the elements of the reference product corresponding to the functional unit. ▪ The energy flows not taken into account shall be less than or equal to 5% of the total use of primary energy during the life cycle of the reference product corresponding to the functional unit.
		☐	Allocation rules	Aligned

		☒	Data quality	Aligned.
European Commission PEF category rules (PEFCR) – Guidance (Version 6.3 – May 2018)	Yes	☐	Functional/declared unit	The description of the FU in a PEFCR includes qualitative and quantitative aspects of the product function and is described according to these four aspects: ▪ The function(s)/service(s) provided: "what" ▪ The extent of the function or service: "how much" ▪ The expected level of quality: "how well" ▪ The duration/life time of the product: "how long"
		☒	Systems boundary	Aligned
		☒	Life-cycle inventory	Aligned
		☐	Cut-off criteria	Exclusion of data from a specific process is permissible if it adheres to a 1% cut-off across all impact categories, considering their environmental significance. This criterion supplements the existing cut-off rules applied in life cycle inventory (LCI) databases.
		☐	Allocation rules	End-of-life modelling requires employing the Circular Footprint Formula (CFF). This formula integrates material, energy, and disposal considerations, addressing the impacts and advantages associated with recycling, re-use, and energy recovery.
		☐	Data quality	The PEFCR shall identify the key impact categories, life cycle stages, processes, and elementary flows that significantly contribute to environmental impact. These processes ought to be evaluated using higher-quality data compared to less relevant ones. Data quality for each dataset is determined based on four criteria: technological relevance, geographical context, temporal accuracy, and precision/uncertainty representation

ELECTRONIC AND ELECTRIC EQUIPMENT, AND ELECTRONIC COMPONENTS (NON-CONSTRUCTION)