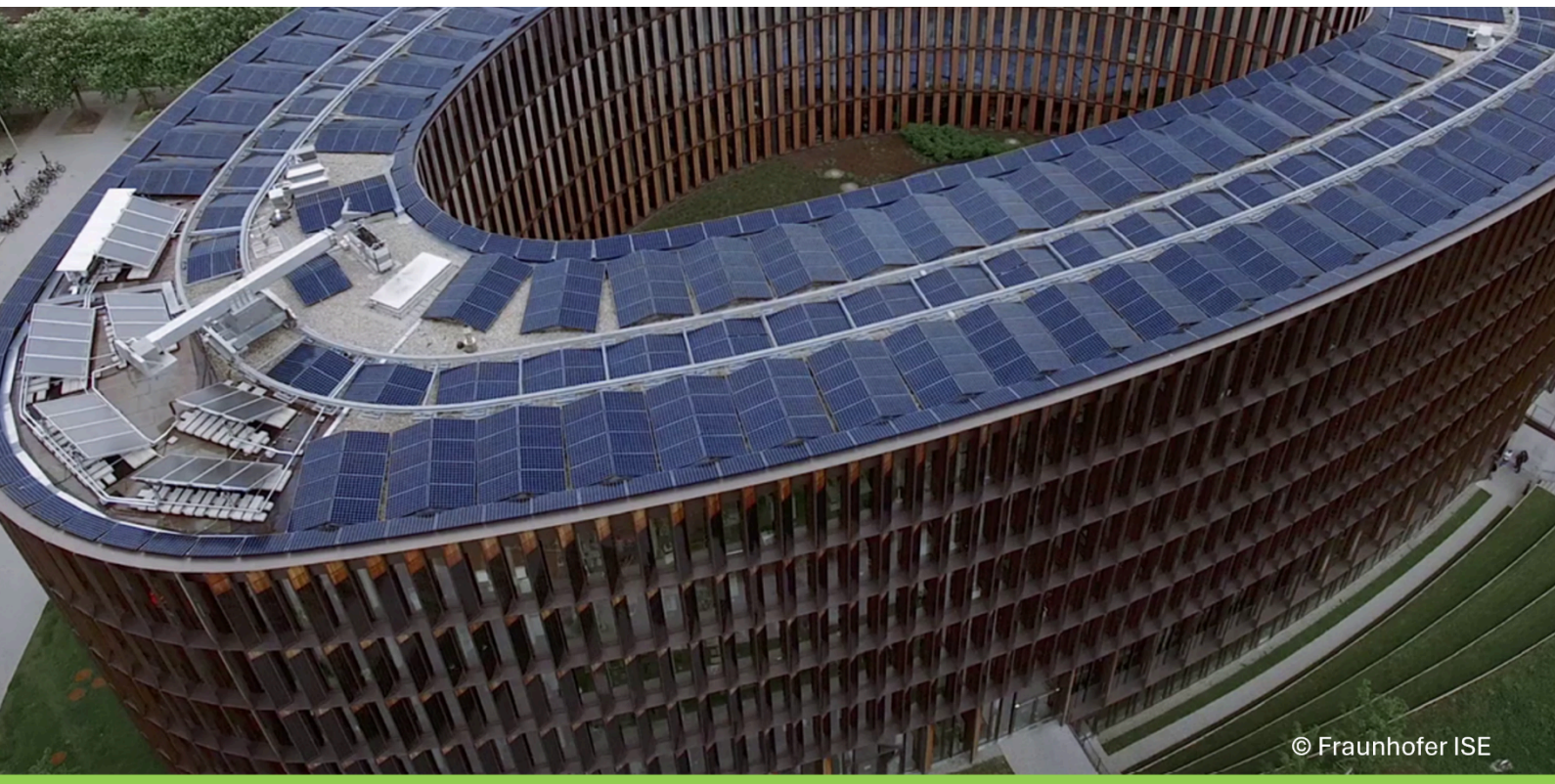
PCR Guidance-Texts for Building-Related Products and Services

From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU)

Part B: Requirements on the EPD for Rooftop and Building Integrated Photovoltaic Systems

www.ibu-epd.com



Hegelplatz 1
10117 Berlin

First publication and periodic revisions

1.2	Draft PCR submitted for open consultation process at IBU	17.12.2025

Tracking of versions of the PCR Template

Tracking of versions PCR specific

1.0	Draft PCR on PV rooftop and BIPV systems, A. Heimsath, F. Ensslen, H. Köhler, S. Nold, D. Subasi, S. Herceg	Under Review, 16.05.2025
1.1	File submitted to IBU SVR for consultation process and review of the file; comments received and addressed	26.05.2025
1.1	Draft PCR on PV rooftop and BIPV systems, A. Heimsath, F. Ensslen, H. Köhler, S. Nold, D. Subasi, S. Herceg	07.11.2025
1.1	File submitted to IBU SVR for consultation process and review of the file; no comments received	21.11.2025
1.2	Draft PCR on PV rooftop and BIPV systems, A. Heimsath, F. Ensslen, H. Köhler, M. F. Berwind, S. Nold, D. Subasi, S. Herceg	17.12.2025

Scope

This document contains the **Requirements on an Environmental Product Declaration (EPD)** for the range of environmental product declarations published by the Institut Bauen und Umwelt e.V. (IBU) based on the /EN 15804/ standard.

The document applies to:

Rooftop Photovoltaic (PV) and building integrated PV (BIPV) systems that deliver AC power. The system boundary includes PV modules, mechanical BOS (balance of system) elements such as frames and fasteners as well as electrical BOS such as inverters, combiner boxes and DC cabling. Storage systems such as batteries are explicitly excluded from these methodologies.

The requirements on the EPD include:

- Requirements on the /EN 15804/ standard as a European core EPD,
- Complementary requirements on IBU EPD

The calculation rules for the life cycle assessment and requirements on the project report are specified in a separate document as Part A of the Product Category Rules.

The general principles for the EPD range of Institut Bauen und Umwelt e.V. (IBU) also apply.
Insert text: Requirements on the content are shown in blue colour under the respective titles. These coloured texts can be edited by clicking. In the appearing text editor, the requirements on the content are outlined above for further assistance. The relevant text can be entered below. After confirming the input, texts are incorporated into the document and displayed.

Inserting images: Using the text editor, "broad" and "small" pictures can be added. If you click on the respective button in the editor, you can select the image file and upload it. After uploading, the figure is shown in the text editor and can be changed in size by clicking and pulling the edges.

Technical tables: Click on the table, to open the table editor. Insert your values (= numbers) in the respective field in the column "Value". For each row, you can choose between 3 value types: value (= number), range (= consisting of two numbers separated with a hyphen) and a free text (e.g. “test passed after 3 days”). On the far left, you can hide rows that are not relevant by clicking on the check. Click the button “add new property” to generate a new row with free text space. It is not allowed to insert a picture instead of a table!

Chapter 5, "Results of the LCA ': click on the first table "system boundaries" and select all life stages you want to declare in the following dialogue. Then the following three tables are adjusted according to your entries. Now you can insert numerical values by clicking on the tables. The numerical values are to be indicated with three significant digits. To achieve an optimal representation, the "exponential view" can be selected for each impact indicator.

Storing/saving is done fully automatically.

The first three pages of the document will be deleted automatically after creation of the EPD.

Labelled sample texts are proposals to facilitate the creation of an EPD. If they are accepted into an EPD, they should be checked for their accuracy and if necessary, adapted for the specific product.

Requirements on content and format:

The chapters of the EPDs must be described in a compact form and in a factually and technically correct way. Judgmental, comparative, or promotional texts are not permitted unless specifically requested in the PCR or if necessary, in the context of the EPD. Each document is carefully checked before publication.

(The) extent of an EPD: For technical reasons, an EPD may contain one data set only. This means that the tables for the LCA results are available only once per EPD. All four tables of the LCA results (Chapter 5) must be located entirely on one side.

Quotations should be indicated in italic (formatting), for example: *EN 15804*. The literature cited is to be shown completely in the references (Chapter 8).

Product-group-specific LCA calculation rules

As in *EN 15804:2012+A2:2019+AC:2021*, with the following additions:

A - Scenarios

The following two reference scenarios can be declared in the EPD:

Reference scenario 1 (mandatory):

Reference scenario at product level: The PV system must be declared under standardized installation conditions. This scenario serves as the comparability reference for any system declared under this PCR. When needed, default scenarios and data are provided in this PCR.

Reference scenario 2:

Reference scenario at building level: This scenario considers the PV system installed on or at a specific building at a specific location. Consequently, location- and building-specific data shall be applied.

B - Reference flow

The standard functional unit of this PCR is 1 kWh of AC electricity. LCA results shall be scaled to 1 kWh of AC energy output of the PV system. Accordingly, the total AC energy generated by the PV system over its reference service life (RSL) constitutes the reference flow for all life cycle modules declared in the EPD. The energy generation shall be calculated as follows:

For the first year:

$$E_1 = S_{rad} \bullet A \bullet \eta \bullet PR \bullet \left(1 - deg_1\right) \bullet \left(1 - \frac{deg_2}{2}\right) \quad (1)$$

For the following years:

$$E_n = E_1 \bullet \left(1 - deg_2\right)^{n-1} \quad (2)$$

For the entire reference service life:

$$E_{RSL} = E_1 \bullet \left(1 + \sum_{n=1}^{RSL-1} \left(1 - deg_2\right)^n\right) \quad (3)$$

- E_1, E_n, E_{RSL}: energy generation (kWh) in year 1, year n, and the full reference service life (RSL)
- S_{rad}: Site-specific annual average irradiance on tilted modules (kWh/m²/year), must take into consideration the specific inclination (slope, tilt) and orientation
- A: total area of the installed PV modules (m²)
- η: module efficiency (as stated in the module data sheet)
- PR: performance ratio, coefficient for losses, including inverter losses, temperature losses, cable losses, losses due to shadings, losses at weak radiation, losses due to dust or snow, and other losses
- deg_1: initial degradation rate (as stated in the module data sheet)
- deg_2: annual degradation rate (as stated in the module data sheet)
- RSL: reference service life of the plant as stated in the EPD

At product level, the following assumptions shall be made for calculating energy generation:

- Annual irradiance value of S_{rad} = 1100 kWh/m²/year [1]
- Performance Ratio PR = 0.84

At building level, assumptions shall be building- and installation-specific:

The irradiance value (S_{rad}) shall reflect the installation location as well as azimuth and tilt of the PV panels. Reliable sources annual tilted irradiation (in kWh/m²/year) at the specific location include Global Solar Atlas[2] and the European PV GIS[3]. The input parameters and the resulting irradiance value shall be reported in the EPD.

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[1] Mean global horizontal irradiance in mid Germany, compare to https://globalsolaratlas.info/map

[2] https://globalsolaratlas.info/map

[3] https://re.jrc.ec.europa.eu/pvg_tools/en/tools.html

A Performance Ratio of 0.84 may be assumed. Also, the PR can be modeled in detail by including installation-specific losses. Details on how quantify the losses and derive the PR can be found in Annex A.

Alternatively, site-specific generation may be modeled using PV simulation tools (e.g., PVSyst), provided that installation-specific losses such as shading are adequately represented. All underlying assumptions and input parameters shall be reported and justified in the EPD.

C - Components to be included

PV systems are products which consist of several sub-products. These will be referred to as PV system components in this PCR. These components can include:

- PV Modules
- Mechanical BOS (Balance of Systems):
  - Mounting structure, fasteners, support racks, screws, control cabinets, etc.
- Electrical BOS:
  - Inverters, optimizers, combiner boxes, junction boxes, switches
  - additional DC wiring (excluding the cabling attached to and part of the PV modules when purchased)
- Monitoring systems

All components that are part of the declared PV system must be included in the EPD. The minimum requirement is to declare PV modules, inverters, as well as adequate cabling and mounting structures.

The following image provides an overview of possible PV system components, without claiming to be exhaustive.

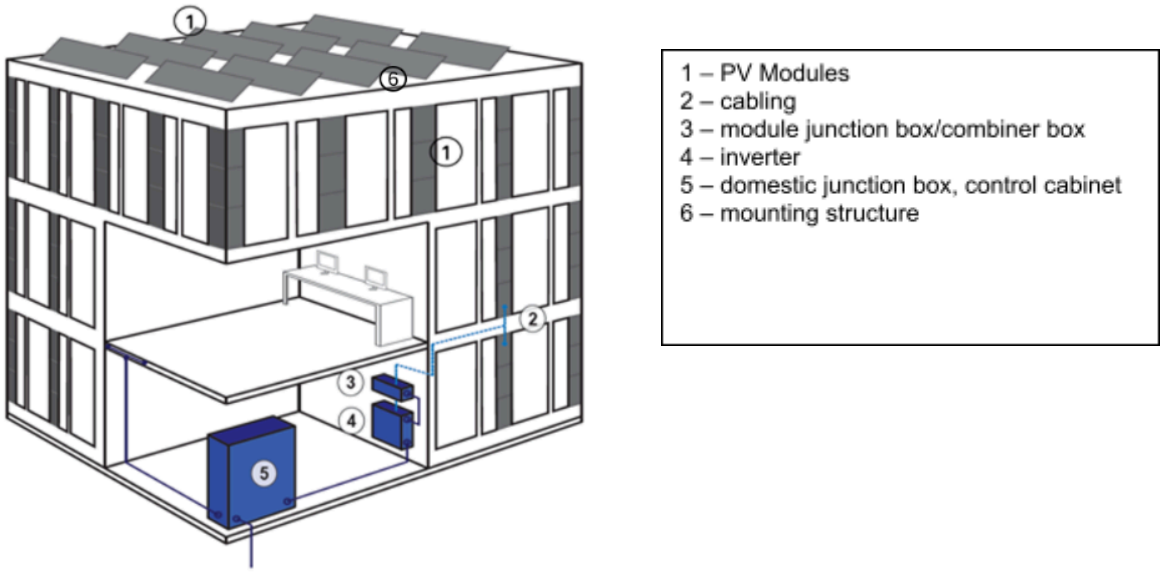


Figure 1: Reference building as an overview[4]

Batteries and battery chargers as well as electric vehicle chargers do not need to be included.

D - Calculation rules

The environmental impacts of the PV system depend on the impacts of individual PV components, but also on system-specific impacts. Accordingly, in accordance with this PCR, the total impacts shall be determined in two approaches:

(A) by summing the impacts from all individual PV components, and
(B) by calculating system-specific impacts.

[4] © Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW), Stuttgart

The applicable approach is defined per life cycle module, as specified in Chapter D.

For approach (A), the component-specific impacts should be sourced from the respective component EPDs, where available, in accordance with EN15941. Because component EPDs may use different declared or functional units, their results must be converted to the functional unit of this PCR before aggregation. Potential conversion factors are provided in Table 2 in Annex B. These conversion factors and their associated parameters shall be explicitly declared in the EPD.

Figure 2 illustrates the calculation principle for approach (A) for life cycle module x: for each system component i, the component-specific conversion factor c_i should be applied to convert the component's impacts of life cycle module x to the functional unit of the PV system, and then the impacts should be summed across all PV system components.

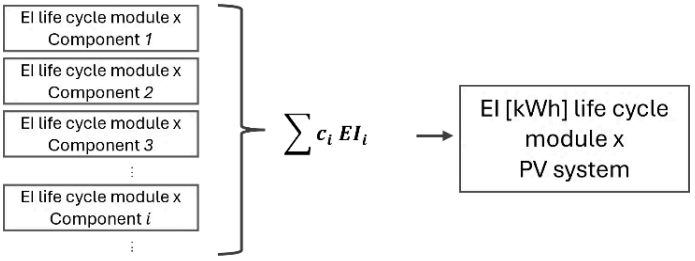


Figure 2: Example Environmental Impact (EI) calculation for a life cycle module x

E – Life Cycle Module Specifications

The ensuing sections will offer a more detailed definition of the life cycle modules.

Life cycle modules A1-A3

Modules A1-A3 cover the entire production process of the PV system.

Module A1 includes the production process for all components, subcomponents and materials associated with the PV system. The data shall be specific.
To obtain the environmental impacts for A1 of the PV system, component level results of the product stage (A1-A3) from the respective EPDs should be converted to the correct functional unit and summed across all components (*Figure* 2).

Module A2 covers the transport of these components from each component's gate (as defined in A3 of the respective component EPD) to the PV system manufacturer or provider, and may consist of:

(A) transport from the gate to the distributor, and
(B) transport from the distributor to the PV system provider or installer.

The data should be specific. Part (A) shall be based on information of the component manufacturers. It is assumed that life cycle module A4 of the component EPD covers the transport from the factory gate to the distributor. If so, and where applicable, the impacts withing module A4 of the component may be utilized for (A).

Module A3 covers any processes involved in assembling the final system. The location of the gate, i.e. of the PV system provider, shall be clearly defined. Data shall be specific.

Modules A1-A3 represent the product stage and, as explained in EN 15804+A2, may be summarized when necessary.

Life cycle module A4 – Transport to building site

Module A4 covers the final transportation of the product from the PV system provider or installer to the construction location. Site-specific data should be considered.

If no specific data are available, the following generic default data can be used at the product level:

- 100 km by truck for a local PV system manufacturer/provider

Variables such as distance and type of transport shall be listed explicitly in this module.

Life cycle module A5 – Installation

Module A5 covers the installation of the PV system on or at the building.

Installation can be based on scenarios, including waste treatment of product packaging and required installation energy. All underlying assumptions, variables and corresponding required energy (e.g. for lifting equipment) shall be reported and justified in the EPD.

Installation activities must be relevant to the PV system type, size and intended application area.

If no specific data are available for the installation energy, for generating scenarios at product level, it can be assumed that the PV system is installed manually, and no electrical lifting equipment is needed.

Personnel activities and transport of personnel should not be included.

The electricity grid mix used for calculation of the indicator results for module A5 shall be representative for the country or region in which the product is used, and can be either of the following:

- Average EU electricity grid mix for declaration at product level
- National residual electricity mix for one specific country, if product is only installed in that country or for declaration at building level

Life cycle module B1 – Use of the installed product

The PV system nets positive energy generation over the course of its lifetime, and any energy requirements for components during operation are met by this generated energy. With kWh as the declared or functional unit, the generated energy serves as the reference flow. Consequently, no energy generation is declared in B1.

Life cycle module B2 – Maintenance

Module B2 covers preventative and regular maintenance activities, which includes cleaning actions.

Data for maintenance activities can be based on scenarios. The scenarios must be relevant to the installation location and application area of the PV system. All underlying assumptions and variables shall be reported and justified in the EPD.

Life cycle modules B3-B5

Module B3 covers repair processes for PV system components, including transport and end-of-life handling.

Module B4 addresses replacement of components. If a system component must be replaced during the RSL of the PV system, as specified in the EPD, the production of the replacing component as well as the end-of-life of the replaced component shall be included in module B4.

Module B5 covers refurbishment.

Data for these modules can be based on scenarios. The scenarios should be based on information of the PV system provider and must be relevant for the intended market and intended area of application. The underlying assumptions shall be reported and justified in the EPD.

Life cycle module B6 – Operational energy use

Module B6 accounts for the operational energy use of the system. The declaration of B6 is mandatory for compliance with this PCR. It is defined as the standby energy during non-active hours when grid electricity is required. Energy used during active hours can be neglected in B6 because it is PV-generated and already accounted for in the reference flow. Curtailment, clipping, and self-consumption effects are not considered beyond those mentioned in subsequent sections. Batteries or other storage devices are not considered in these rules and must be addressed with a separate methodology.

Standby consumption from active electrical BOS components – such as inverters or optimizers – must be included. For each relevant component, standby energy is calculated as:

$$E_{Standby} = P_{Standby} \bullet \left(8760 \frac{hours}{year} - ALAS\right) \bullet RSL \quad (4)$$

- $E_{Standby}$: Standby energy over the entire RSL (kWh)

- $P_{Standby}$: Standby power of the component (kW)
- $ALAS$: average local annual sunshine hours (hours/year)
- RSL: reference service life of the plant as stated in the EPD

The total operational energy use is the sum of the standby energy of all relevant components.

At product level, the following reference value should be assumed for the average annual sunshine hours:

- $ALAS$ = 1600 hours[5]

At building level, the average local annual sunshine hours should be determined based on the given installation location, with reference to appropriate sources (e.g. the website Current Results[6]).

All variables used and the corresponding energy values shall be reported in the EPD.

The electricity grid mix used for calculation of the indicator results for module B6 shall be representative for the country or region in which the product is used, and can be either of the following:

- Average EU electricity grid mix for declaration at product level
- National residual electricity mix for one specific country, if product is only installed in that country or for declaration at building level

Life cycle module C1 Deconstruction

Module C1 covers the deconstruction process, which includes dismantling and on-site sorting of the materials.

Deconstruction processes can be based on scenarios which must be relevant to the application area and intended market.

The electricity grid mix used for calculation of the indicator results for module C1 shall be representative for the country or region in which the product is used, and can be either of the following:

- Average EU electricity grid mix for declaration at product level
- National residual electricity mix for one specific country, if product is only installed in that country or for declaration at building level

Deconstruction activities must be relevant to the PV system type, size and intended application area. All underlying assumptions and corresponding variables shall be reported and justified in the EPD.

Life cycle module C2 Transport

Module C2 addresses the transport of the discarded product as part of the waste processing as well as transportation of waste. Transport data should be relevant for the intended market.

The following default values can be assumed to develop transport scenarios:

- 500 km by truck for transporting the PV modules to a specialized PV recycling facility
- 100 km by truck for all other components

All underlying assumptions and corresponding variables shall be reported and justified in the EPD.

Life cycle module C3-C4 Waste Processing and Disposal

Modules C3 and C4 cover waste processing and waste disposal. Data should be based on information of the component manufacturers and be representative for the intended market.

To obtain the environmental impacts for PV system's C3 and C4, the component level results for C3 and C4 from the respective EPDs should be converted to the correct functional unit and summed across all components (see *Figure* 2), provided the assumed processing and disposal routes algin with the target market. If local end-of-life pathways differ from those in the component EPDs, the scenarios should be adjusted accordingly, and the underlying assumptions must be reported.

Life cycle module D

[5] Average annual sunshine hours in Germany according to : https://www.currentresults.com/Weather/Europe/Cities/sunshine-annual-average.php
[6] Current Results weather and science facts: https://www.currentresults.com/Weather/Europe/Cities/sunshine-annual-average.php

Module D includes reuse, recovery and/or recycling potentials. Data should be based on information provided by the manufacturer and be relevant for the intended market.
To obtain the environmental impacts for the module D of the PV system, the component level results for D from the respective EPDs should be converted to the correct functional unit and summed across all components (see *Figure* 2), provided the assumed potentials align with the target market. If the local potentials differ from those in the component EPDs, the scenarios should be adjusted accordingly, and the underlying assumptions must be reported.

ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

LOGO

Owner of the Declaration	
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	
Issue date	
Valid to	

Name of declared product

Name of manufacturer/association

Large picture of the product

Small picture
max. 4 MB

Small picture size:

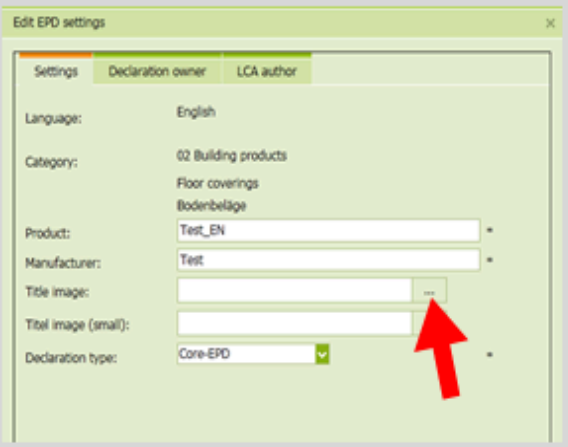
w x h = 400 x 400 pixel

Maximum file size 4 MB!

Recommended picture size: width 1000 pixel, height 650 pixel

Note: if the size of the image does not correspond to the dimensions given, the image shown may be distorted.

Insert the picture: Click on the right side of your screen "Edit Properties" and enter the location of the image on your PC.



LOGO

1. General Information

Name of the manufacturer

Programme holder
IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Declaration number

This declaration is based on the product category rules:
Name of PCR, 02.2016
(PCR checked and approved by the SVR)

Issue date

Valid to

[Unterschrift]

Dipl.-Ing.Hans Peters
(chairman of Institut Bauen und Umwelt e.V.)

[Unterschrift]

Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.))

Name of the product

Owner of the declaration
Name of the manufacturer
Street
Postal Code/City

Declared product / declared unit
Name of declared product / declared unit

Scope:
The products, plants and their locations must be outlined, on which data the Life Cycle Assessment is based and for which the declaration applies.

For average EPDs, e.g. association EPDs, the plants/companies under review on whose data the LCA is based must be named; as an alternative, the representatively of the declaration can be depicted, e.g. for the association, by declaring the production volume covered by the LCA as a percentage of the entire volume of the declared product manufactured by all association members in the year of reference. In both cases the companies that have contributed data have to be named in the project report. It shall be clearly mentioned in this clause if the EPD represents an average EPD, e.g. as an association EPD.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of *EN 15804+A2*. In the following, the standard will be simplified as *EN 15804*.

Verification

The standard *EN 15804* serves as the core PCR

Independent verification of the declaration and data
according to *ISO 14025:2011*

☐ internally ☒ externally

[Unterschrift]

Name of verifier
(Independent verifier)

2. Product

2.1 Product description/Product definition

The declared products must be described.

In addition to a general product description, the trade names of the products/product groups (including any product codes) must be mentioned to which the EPD applies.
If the declaration of trade names is not meaningfully possible (e.g. in the context of association EPDs), the product description must clearly demarcate the products product groups to which the EPD applies.

Example Rooftop Photovoltaic System:

The declared product is a photovoltaic (PV) system mounted on the rooftop of a building for generating electrical energy. The PV modules of the PV system convert sunlight to electricity, which is then converted by an inverter, allowing it to be either consumed on-site or fed into the grid.
These PV systems consist of PV modules and the balance of system (BOS) components. The mechanical BOS includes elements like support racks

and mounting structures. while the electrical BOS consists of DC cabling, inverters, and may include additional components for protection and output maximization, such as junction boxes, combiner boxes, DC optimizers, additional switches, and monitoring systems.

Example Building-Integrated Photovoltaic System:

The declared product is a building-integrated PV (BIPV) system, which is a type of PV system that features PV modules seamlessly integrated into the building's structure and design, including roofs, facades, windows, or other structural elements. Unlike traditional solar panels that are mounted on existing structures, BIPV systems serve dual purposes: they generate electricity from sunlight while also functioning as part of the building's envelope, providing aesthetic, structural, and energy-producing benefits.
The PV modules convert sunlight to electricity, which is then converted by PV inverters, allowing it to be either consumed on-site or fed into the grid.
These PV systems consist of solar modules and the balance of system (BOS) components. The mechanical BOS includes elements like support racks and mounting structures, while the electrical BOS consists of DC cabling, inverters, and may include additional components for protection and output maximization, such as junction boxes, combiner boxes, DC optimizers, additional switches, and monitoring systems.

Please select one of the following options and delete the header of the selected [alternative]:

[Alternative 1a: Product according to the CPR based on a hEN]:
For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration *EN xyz:date, title* and the CE-marking.
For the application and use the respective national provisions apply.

[Alternative 1b: Products according to the CPR based on an hEN].
For the placing of the product on the market in the European Union/European Free Trade Association /EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 2024/3110 (CPR) applies. The product needs a declaration of performance taking into consideration *ETA no. xyz:date, title* and the CE-marking.
For the application and use the respective national provisions apply.

[Alternative 2a: Product not harmonised in accordance with the CPR but in accordance with other provisions for harmonisation of the EU]:
For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply:
- *Directive no. xyz: date, title*
- *Regulation no. xyz: date, title*
- and the harmonised standards based on these provisions:
- *EN xyz:date, title*

The CE-marking considers the proof of conformity with the respective harmonized standards based on the legal provisions above.
For the application and use the respective national provisions apply.

[Alternative 2b: Product harmonized as well in accordance with the CPR as with other provisions for harmonisation of the EU]:
For the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011/ (CPR) and the following other provisions for harmonisation apply:
- *Directive (EU) xyz:date, title*
- *Regulation (EU) no. xyz:date, title.*

The product needs a declaration of performance in accordance with the CPR taking into consideration /EN xyz: date/, title or /ETA no. xyz/:date, title respectively and the CE-marking.
The CE-marking for the product takes into account the Declaration of Performance in accordance with the CPR and the proof of conformity with the following harmonised standards or based on the other provisions for harmonisation:
- *EN xyz:date, title*
- *Source, date, title*

For the application and use the respective national provisions apply.

[Alternative 3: Product for which no legal provisions for harmonisation of the EU exist]
For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

2.2 Application

The designated application must be specified for the products covered in the EPD.

2.3 Technical Data

The technical specifications of the products within the scope of the EPD shall be listed, including the reference to the test methods/test standards for each specification.
For products with CE marking, the technical specifications must be specified in accordance with information in the declaration of performance. The properties relevant to the product should be specified in the table below. If no information is given for properties, an explanation must be given in the background report to the EPD as to why the property is not relevant to the product.

Constructional Data

Name	Value	Unit
General PV system data		
Capacity of the PV system		kWp
Number of PV modules		
Number of PV inverters		
Specification and number of other electrical BOS components		

Area spanned by the PV modules		m²
PV Modules (per unit)		
Specific model identifier		
Rated output power		kWp
Dimension		mm*mm*mm
Weight		kg
Initial and yearly degradation rates		%
Rated module efficiency		%
Type of technology		
Reference service life		years
PV inverter (per unit)		
Specific model identifier		
Rated AC power		kW
Dimension		mm*mm*mm
Weight		kg
Maximum and European efficiency		%
Standby power		W
Reference service life		years
Mounting Structure (per type)		
Specific model identifier		
Type of the mounting structure		
Main material of the mounting structure		
Total weight		kg
Reference service life		years
DC cables (per type)		
Specific model identifier		
Length		m
Cross-section		mm²
Weight		kg/m
Conducting material		
Voltage range		V
Maximum allowed current (e.g. current carrying capacity in air)		A
Reference service life		years
Other electrical equipment (e.g. combiner boxes)		
Specific model identifier		
Maximum/nominal input power		kW
Dimension		mm *mm*mm
Weight		kg
Efficiency		%
Standby power		W
Reference service life		years

Please select one of the following options and delete the header of the selected [alternative]:

[Alternative 1a: Product according to the CPR, based on a hEN]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN xyz:date, title.*
- Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 1b: Product according to the CPR, based on an ETA]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *ETA no. xyz, date, title*.
- Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 2a: Product not harmonised in accordance with the CPR but in accordance with other provisions for harmonisation of the EU]:

- Performance data of the product according to the harmonised standards, based on provisions for harmonization.
- Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 2b: Product harmonized as well in accordance with the CPR as with other legal provisions of the EU]:

- Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN xyz: date, title* or *ETA no. xyz, date, title* respectively.
- Performance data of the product, based on the harmonised standards, in accordance with the other provisions for harmonization.
- Voluntary data: *source, date, title* (not part of CE-marking).

[Alternative 3: Product for which no legal provisions for harmonisation of the EU exist]:
Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

2.4 Delivery status

The dimensions/quantities must be declared for the products covered in this EPD in their delivery status.

2.5 Base materials/Ancillary materials

The main constituents of the product or its components shall be indicated as mass percentages to enable the user of the EPD to understand the composition of the product in delivery status. This information should support safety and efficiency during installation, use, and disposal of the product.

When substances from the “Candidate List of Substances of Very High Concern for Authorisation” (SVHC) are part of the formulation with a mass percentage of > 0,1 of the mass of the construction product, i.e. when they were added to the formulation on purpose, then the substances shall be declared including CAS-number.

If the construction product is a substance or mixture under the chemical law (*REACH*), the concentration limit value refers to the entire product; if it is an article, the partial product or component applies as a unit of reference.

The Candidate list can be found on the ECHA website address: https://echa.europa.eu/de/home.

This declaration is mandatory for all EPDs and must be formulated as follows:

1) “This product/article/at least one partial article contains substances listed in the candidate list (date: dd.mm.yyyy) exceeding 0.1 percentage by mass: yes/no”.
[if yes: List of respective SVHC and their CAS-number]
..

[If yes:] - Information on the concentration and/or concentration range (comparable information on hazardous properties and if relevant, information on the partial article in the case of articles

If the construction product is a substance or mixture under the chemical law (REACH), the safety data sheet shall be made available in the EPD, e.g. by a link. In addition, the concentrations of the hazardous substance as well as its hazardous properties have to be stated in the EPD.

CMR substances in categories 1A and 1B must also be declared including CAS-number if a European harmonised classification is available as well as information on treatment with biocides. For IBU-EPDs statement 2) and 3) are mandatory.
This statement on other CMR substances which are not listed as SVHC and on biocides must be formulated as follows:

2) “This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: yes/no”

[If yes:] – List the concentration and/or concentration ranges (comparable to the information on a safety data sheet), provide information on hazardous properties and if relevant information on the partial article in the case of articles.

3) “Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): yes/no”

[If yes:] - List the biocides referred to above.
The active substance and the product type (in-can preservative, film preservative, wood protection, etc. according to the Ordinance on Biocide Products (see also 1.4) must be indicated.

Ancillary materials and additives remaining on the product must also be declared.
If additives such as fire retardants, softeners or biocides are used, their functional chemical group must be indicated.
.

Statements like “…free of ….” and/or “…does not contain…” may not be used.

2.6 Manufacture

The manufacturing process must be described and can be illustrated using a simple graphic. If the EPD applies for several locations, the production processes must be described for all sites in case they differ.

Quality management systems can be referred to.

2.7 Environment and health during manufacturing

Presentation of measures relating to health protection during the manufacturing process extending beyond national guidelines (of the production country).

Presentation of measures relating to environmental protection during the manufacturing process extending beyond national guidelines or plant-specific requirements, e.g. description of special environmentally-friendly dealings with waste air, waste water, and waste as well as noise emissions.

Information on the Environment Management System or similar (if available).

2.8 Product processing/Installation

Description of the type of processing,
machinery and tools used, dust extraction etc.,
auxiliary materials needed for installation as well as measures for noise reduction.
Information on the rules of technology as well as on workers safety and environmental protection is possible.

2.9 Packaging

Information on product-specific packaging:
type, composition, and possible reuse, recycling, energy recovery, and disposal of packaging materials (paper, pallets, foils, etc.).

2.10 Condition of use

Information should be provided here regarding changes in material composition over the service life of the product and/or regarding environmentally relevant material inherent properties over the service life of the product.

2.11 Environment and health during use

Information on the relationships between the product, the environment and health.

Information on the possible content of harmful substances or emissions.

Note: recommendations concerning cleaning, maintenance, etc. for the declared product should be listed in the corresponding section in 4 “Technical information on scenarios”.

2.12 Reference service life

The declaration of the reference service life (RSL) is imperative for EPDs covering the complete use stage (modules B1-B7), or if a use stage scenario is described, which refers to the lifetime of the product. If not all modules of the use stage are declared and no use stage scenario covering the full lifetime of the product is described, then the indication of the RSL (according to ISO 15686:1, -2, -7 and -8) is voluntary.

The RSL must refer to the declared technical and functional quality of the product. It must be established in line with all of the specific rules in the European product standards and must also take consideration of the ISO 15686:1, -2, -7 and -8 standards.
Where information is available for deriving the RSL from European product standards, such data has priority.
Information on the product’s RSL requires specification of compatible scenarios for the product stage,

construction process stage and use stage. The RSL is dependent on the properties of the product and reference in-use conditions. These conditions shall be declared together with the RSL in clause 4 and it shall be stated that the RSL applies for the reference conditions only.

If a reference service life (RSL) cannot be declared according to ISO 15686 (or it is not relevant for consideration of the LCA), this has to be stated clearly in the EPD.

In such cases, a service life can be declared in accordance with the BBSR table "Service lives of components for life cycle assessment according to BNB" (http://www.nachhaltigesbauen.de/baustoff-und-gebaeudedaten/nutzungsdauern-von-bauteilen.html).

It shall be unambiguously stated that a service life (not: a reference service life) in accordance with the BBSR table (or based on a manufacturer's declaration (see below)) is not a RSL according to ISO 15686.

A service life provided by the manufacturer can be declared as an alternative to the value from the BBSR table. This information shall be accompanied by explanations on the origin of the declared service life, e.g. referring to simulations, tests, an assessment of the manufacturer or statistical data, etc. and shall contain the specification of the application for which the stated service life is valid (to be provided in clause 4).

The requisite information for technical building installations should be taken from VDI 20673.

Description of the influences on the ageing of the product when applied in accordance with the rules of technology.

The declaration of the reference service life (RSL) is imperative for EPDs declared under this PCR with 1 kWh as the defined functional unit.
In this case, the reference service life of the PV system should be 25 years. Any deviation from this shall be justified by declaring the product properties and reference in-use conditions and it shall be stated that the RSL applies for the reference conditions only.

2.13 Extraordinary effects

Fire

Information on the fire performance according to *EN 13501:1* or established national standards. According to *EN 13501:1*:

- The classes of building products regarding their fire performance are predefined as: A1, A2, B, C, D, E, and F;
- The classes of flaming droplets/particles are pre-defined as: d0, d1, or d2;
- The classes for smoke density are pre-defined as: s1, s2, or s3

Fire protection

Name	Value
Building material class	
Burning droplets	
Smoke gas development	

Water
Information on the product performance including possible impacts on the environment following the unforeseeable influence of water, e.g. flooding.

Mechanical destruction
If relevant: information on the product performance including possible impacts on the environment following unforeseeable mechanical destruction.

2.14 Re-use phase
The possibilities of re-use, recycling, and energy recovery must be described.

2.15 Disposal
The possible disposal channels must be indicated. The waste code in accordance with the European Waste Index must be described.

2.16 Further information
Possible sources of additional information, e.g. website, a reference source for safety data sheet.

3. LCA: Calculation rules

3.1 Functional Unit

The functional unit and the mass reference must be indicated in the appropriate table as declared. If there are several units to choose from, a suitable one must be selected.

If averages are declared across various products, the average breakdown must be explained.

The function unit is defined as:

- 1 kWh net of electricity generated at the AC output by the PV system under defined installation conditions for the defined Reference Service Life (RSL).

Name	Value	Unit
Functional Unit		kWh
Conversion factor for FU in m²		m²/kWh
Conversion in Wp		Wp/kWh

Other declared units, e.g. 1 m², are allowed if the conversion is shown transparently.

The reference flow calculation shall be reported in detail, as described in the upper part of the PCR.

The minimum declaration of the results is cradle-to-gate with modules C1-C4 and module D.

For IBU core EPDs (where clause 3.6 is part of the EPD): for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning variability of the production process, geographical representativeness and the influence of background data and preliminary products compared to the environmental impacts caused by actual production.

3.2 System boundary

Type of the EPD: choose as appropriate: cradle to gate, cradle to gate - with options, cradle to grave.

The modules considered in the life cycle assessment as per “system boundaries” outlined in section 5.5. of the PCR, Part A: “Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report” must be described in brief. The description should be product specific; it should be apparent as to what processes are considered in what modules.
If green electricity has been calculated, the following sentence must be declared in the IBU EPD under the assumptions:
For the environmental impact, the use of green electricity was calculated taking into account the residual electricity mix for the remaining electricity. The proportion of the electricity demand covered by green electricity in the total electricity demand is x%.

3.3 Estimates and assumptions

Key assumptions and estimates for interpretation of the life cycle assessment should be listed here, provided that they are not dealt with in other sections of the main clause 3 “LCA: Calculation rules”.

3.4 Cut-off criteria

The use of cut-off criteria as per the PCR, Part A: “Calculation Rules for the Life Cycle Assessment and Requirements on the project report” must be documented here.

3.5 Background data

The sources for background data in the LCA used must be provided.

Detailed descriptions of specific data/adjusted generic data form databases must be justified in the LCA report.
For upstream processes, EPD's are preferable, followed by specific data. Generic data from databases (such as ecoinvent) should only be used if the other two categories are not available.

3.6 Data quality

An estimate should be made as regards data quality (addressing both foreground and background data), whereby the age of background data used must be indicated.

For average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning variability of the production process, geographical representatively and the influence of background data and preliminary products compared to the environmental impacts caused by the actual production.

3.7 Period under review

The period under review for the collection of production data and the resulting averages (if applicable) shall be documented.

3.8 Allocation

The allocations of relevance for calculation (appropriation of expenses across various products) must be indicated,
at least:

- Allocation of energy, auxiliary and operating materials used for individual products in a factory;
- Allocation of co-production processes;
- Allocation in the use of recycled and/or secondary raw materials;
- Loads and benefits beyond the system boundary from recycling or energy recovery of packaging materials and production waste;
- Loads and benefits beyond the system boundary from recycling or energy recovery from the end of life of the product.

whereby reference must be made to the modules in which the allocations are performed.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account.

The used background database has to be mentioned.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon
The biogenic carbon content quantifies the amount of biogenic carbon in a construction product leaving the factory gate, and it shall be separately declared for the product and for any accompanying packaging.
If the total mass of biogenic carbon containing materials is less than 5 % of the total mass of the product and accompanying packaging, the declaration of biogenic carbon content may be omitted. The mass of packaging containing biogenic carbon shall always be declared.
Note: 1 kg biogenic Carbon is equivalent to 44/12 kg of CO_2
Information on describing the biogenic Carbon Content at factury gate

Name	Value	Unit
Biogenic Carbon Content in product		kg C
Biogenic Carbon Content in accompanying packaging		kg C

The following technical scenario information is required for the declared modules and optional for non-declared modules. Modules for which no information is declared can be deleted; additional information can also be listed if necessary.

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).

If the use of packaging material for the declared product is declared in EPDs in Module A3, but Module A5 is not declared including the disposal of the packaging material on the construction site, the amounts of packaging materials included in the LCA calculations must be declared as technical scenario information for Module A5.

.

Transport from the gate to the site (A4)

Name	Value	Unit
Litres of fuel		l/100km
Transport distance		km
Capacity utilisation (including empty runs)		%
Gross density of products transported		kg/m^3
Capacity utilisation volume factor		-

Assembly (A5)

Name	Value	Unit
Auxiliary		kg
Water consumption		m^3
Other resources		kg
Electricity consumption		kWh
Other energy carriers		MJ
Material loss		kg
Output substances following waste treatment on site		kg
Dust in the air		kg
VOC in the air		kg

Use or application of the installed product (B1) see section 2.12 "Use"

Name	Value	Unit

Maintenance (B2)

Name	Value	Unit
Information on maintenance		-
Maintenance cycle		Number/RSL
Water consumption		m^3
Auxiliary		kg
Other resources		kg
Electricity consumption		kWh
Other energy carriers		MJ
Material loss		kg

Repair (B3)

Name	Value	Unit
Information on the repair process		-
Information on the inspection process		-
Repair cycle		Number/RSL
Water consumption		m^3
Auxiliary		kg
Other resources		kg
Electricity consumption		kWh
Other energy carriers		MJ
Material loss		kg

Replacement (B4) / Refurbishment (B5)

Name	Value	Unit
Replacement cycle		Number/RSL
Electricity consumption		kWh
Litres of fuel		l/100km
Replacement of worn parts		kg

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies for the reference conditions only

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list on service life by *BNB* is declared.

Reference service life

Name	Value	Unit
Reference service life (according to ISO 15686-1, -2, -7 and -8)		a
Life Span (according to BBSR)		a
Life Span according to the manufacturer		a
Declared product properties (at the gate) and finishes		-
Design application parameters (if instructed by the manufacturer), including the references to the appropriate practices and application codes		-
An assumed quality of work, when installed in accordance with the manufacturer's instructions		-
Outdoor environment, (for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature		-
Indoor environment (for indoor applications), e.g. temperature, moisture, chemical exposure		-
Usage conditions, e.g. frequency of use, mechanical exposure		-
Maintenance e.g. required frequency, type and quality and replacement of components		-

Operational energy use (B6) and Operational water use (B7)

Name	Value	Unit
Water consumption		m^3
Electricity consumption		kWh
Other energy carriers		MJ
Equipment output		kW

End of life (C1-C4)

Name	Value	Unit
Collected separately waste type		kg
Collected as mixed construction waste		kg
Reuse		kg
Recycling		kg
Energy recovery		kg
Landfilling		kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit

LOGO

LOGO

5. LCA: Results

In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND" (As default the modules B3, B4, B5 are marked as MNR – module not relevant).In the following tables, columns can be deleted for modules that are not declared. Indicator values should be declared with three valid digits (eventually using exponential form (e.g. 1,23E-5 = 0,0000123). A uniform format should be used for all values of one indicator.
If several modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names, while the readability and clear arrangement should be maintained; the legends can then be deleted.
If due to relevant data gaps, an indicator cannot be declared in a robust way, then the abbreviation “IND” (indicator not declared) should be used for this indicator.

- 0 – calculated value is 0
- 0 – value falls under the cut-off
- 0 – assumption which exclude any flows (e.g. exported electricity A1-A3)
- IND – in cases where the inventory does not support the methodological approach or the calculation of the specific indicator IND shall be used.

If no reference service life is declared (see chapter 2.13 "Reference Service Life"), the LCA results of the modules B1-B2 and B6-B7 shall refer to a period of one year. This shall then be indicated as an explanatory text below the tables. In addition, the formula for the quantification of such B-modules over the total life cycle shall be provided.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: declared unit and product

Core Indicator	Core Indicator	Unit	
GWP	Global warming potential	[kg CO_2-Eq.]	
GWP-total	Global warming potential - total	[kg CO_2-Eq.]	
GWP-fossil	Global warming potential - fossil fuels	[kg CO_2-Eq.]	
GWP-biogenic	Global warming potential - biogenic	[kg CO_2-Eq.]	
GWP-luluc	GWP from land use and land use change	[kg CO_2-Eq.]	
ODP	Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	
AP	Acidification potential of land and water	[kg SO_2-Eq.]	
AP	Acidification potential, accumulated exceedance	[mol H^+-Eq.]	
EP	Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	
EP-freshwater	Eutrophication, fraction of nutrients reaching freshwater end compartment	[kg P-Eq.]	
EP-marine	Eutrophication, fraction of nutrients reaching marine end compartment	[kg N-Eq.]	
EP-terrestrial	Eutrophication, accumulated exceedance	[mol N-Eq.]	
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	
POCP	Formation potential of tropospheric ozone photochemical oxidants	[kg NMVOC-Eq.]	
ADPE	Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	
ADPF	Abiotic depletion potential for fossil resources	[MJ]	
WDP	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m^3 world-Eq deprived]	

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: declared unit and product

Indicator	Indicator	Unit	
PERE	Renewable primary energy as energy carrier	[MJ]	
PERM	Renewable primary energy resources as material utilization	[MJ]	
PERT	Total use of renewable primary energy resources	[MJ]	

LOGO

PENRE	Non-renewable primary energy as energy carrier	[MJ]	
PENRM	Non-renewable primary energy as material utilization	[MJ]	
PENRT	Total use of non-renewable primary energy resources	[MJ]	
SM	Use of secondary material	[kg]	
RSF	Use of renewable secondary fuels	[MJ]	
NRSF	Use of non-renewable secondary fuels	[MJ]	
FW	Use of net fresh water	[m³]	

Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: declared unit and product

Indicator	Indicator	Unit	
HWD	Hazardous waste disposed	[kg]	
NHWD	Non-hazardous waste disposed	[kg]	
RWD	Radioactive waste disposed	[kg]	
CRU	Components for re-use	[kg]	
MFR	Materials for recycling	[kg]	
MER	Materials for energy recovery	[kg]	
EEE	Exported electrical energy	[MJ]	
EET	Exported thermal energy	[MJ]	

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: [declared unit and product]

Indicator	Indicator	Unit	
PM	Potential incidence of disease due to PM emissions	[Disease Incidence]	
IRP	Potential Human exposure efficiency relative to U235	[kBq U235-Eq.]	
ETP-fw	Potential comparative toxic unit for ecosystems	[CTUe]	
HTP-c	Potential comparative toxic unit for humans - cancerogenic	[CTUh]	
HTP-nc	Potential comparative toxic unit for humans - not cancerogenic	[CTUh]	
SQP	Potential soil quality index	[-]	

Caption	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”.
This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”.
The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

6. LCA: Interpretation

To facilitate comprehension of the life cycle assessment, both the relevant indicators of the life cycle inventory and the indicators of the impact assessment declared in section 5 “LCA results” have to be interpreted in a dominance analysis.
An illustration of the results with figures is recommended, e.g. for the dominance analysis, the distribution of impacts across the modules, the CO_2-balance, etc. as appropriate for a reader to understand the environmental profile of the declared product.
The interpretation shall also include a description of the time frame and/or variability of the LCIA results (in qualitative or quantitative terms) if the EPD is valid for several products or producers.

7. Requisite evidence

As a general rule, all statements must be documented with measured data (presented by the corresponding test certificates). The methods of evidence and the test conditions have to be described together with the results.

If substances are not detected, the limit of detection must be included in the declaration.

Interpreting statements such as "… free of …" or "… are entirely harmless …" are not allowed.

If evidence required by the specific PCR part B is not provided, this has to be justified under the respective title for the required evidence.

If relevant for the scope of application of the declared product, or if derivable from its material composition, it is recommended to provide additional adequate evidence.
Information and explanation on the representativeness of requisite evidence must be given in the project report for all members of the association.

PV systems on buildings are designed in accordance with the following standards:

- IEC 60364-8-1:2019 (DIN VDE 0100 – low voltage installations), esp. Part 7, Section 712 (DIN VDE 0100-712) – Solar photovoltaic power supply systems
- IEC 62446-1:2016+A1:2018 (DIN EN 62446 (VDE 0126-23)) – information and documentation required to be handed over to a customer following the installation of a grid connected PV system
- IEC 62305 - Protection against lightning
- VDE AR-N 4105 - Power Generating Plants in the Low Voltage Network
- IEC 62109-1/-2 – Safety of power converters for use in photovoltaic power systems
- EN 50521 – connectors for photovoltaic systems
- EN 50548 – junction boxes for photovoltaic modules
- BS EN IEC 62093 - Photovoltaic system power conversion equipment. Design qualification and type approval
- EN 50583-1: Photovoltaics in buildings – Part 1: BIPV modules
- EN 50583-2: Photovoltaics in buildings – Part 2: BIPV systems
- Construction Product Regulation 305/2011 (replaced by CPR 2024/3110)

8. References

Standards

EN 15804
EN 15804:2012+A1:2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

EN 15804
EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025
EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

EN 50693
EN 50693:2019, Product category rules for life cycle assessments of electronic and electrical products and systems

Further References

Report IEA-PVPS T13-27:2024
PVPS Task 13 - Performance of Partially Shaded PV Generators Operated by Optimized Power Electronics

PCR-ed4-EN-2021 09 06
PEP ecopassport Product Category Rules for Electrical, Electronic and HVAC-R Products

Title of the software/database
Title of the software/database. Addition to the title, version. Place: Publisher, Date of publication [Access on access date].

IBU 2021
Institut Bauen und Umwelt e.V.: General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021
www.ibu-epd.com

The literature referred to in the Environmental Product Declaration must be listed in full.

Standards already fully quoted in the EPD do not need to be listed here again.

The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be reference

Additional contents for the transmission of the EPD data set to the ÖKOBAUDAT system

A: Performance ratio calculation
Description of the performance ratio calculation for the energy generation calculation.

B: Conversion Factors

Annex A

The performance ratio (PR) of the PV system needs to be determined to calculate the energy generation, which serves as the reference flow under this PCR for 1 kWh AC energy as the defined functional unit.

A PR of 0.85 shall be assumed by default, which integrates default values for product- and system-specific losses (e.g. due to DC/AC conversion, module mismatch losses) as well as installation-specific losses (e.g. due to shading, snow, soil).

Additionally, the PR value can also be determined by integrating actual installation and location-specific losses such as shading. Table 1 presents the different loss mechanisms and respective default losses L_i. The total system losses L_{tot} in % are calculated from the single losses L_i by the following formula:

$$L_{tot} = 100 \cdot \left(1 - \prod_i \left(1 - \frac{L_i}{100}\right)\right) \quad (5)$$

The resulting PR is calculated as:

$$PR = 1 - \frac{L}{100\,\%} \quad (6)$$

Table 1: Default conservative loss values for calculating the performance ratio

Installation or location-related loss mechanism	**Default Value**	**Product-specific loss mechanism**	**Default Value**
Soiling	1 %	Inverter	3.5 %
Shading	3 %	Mismatch losses	2 %
Snow	0 %	Light-induced degradation	1.5 %
Connections	0.5 %	DC Wiring	1.5 %
Unavailability of the system	2 %	**Default total product-specific losses (L_{prod})**	**8 %**
Nameplate rating	1 %		
Module temperature losses	2 %		
Default total location-related losses (L_{loc})	**9 %**	**Default total fixed losses (L_{prod})**	**9 %**
Total default losses (L_{loc} and L_{prod})			**16 %**

With these default loss values, losses sum up to 16 %, resulting in a PR of 0.84. At building level, loss values can be adapted according to actual installation-, location- or system-specific conditions. Generally, all adaptions from the losses listed in Table 1 must be reported and justified.

For example, at building level, shading losses can be significantly lower than 3 %, e.g. for flat-roofed installations that are free from shading obstacles and nearby trees. However, shading losses but can also exceed 3 % in less favorable conditions. Inverter losses depend on the efficiency of the inverter, the string length for each MPP input and the MPP characteristics. Array mismatch losses arise due to mismatch in IV characteristics between modules. The default value of 2 % in this PCR could be reduced if microinverters or DC optimizers are used or if the number of modules in a string is small (< 4 modules[7]). Light-induced degradation causes a loss of performance during the initial hours of exposure to sunlight, primarily with Crystalline modules[8]. DC wiring,

[7] https://www.pvsyst.com/help/project-design/array-and-system-losses/array-mismatch-losses/index.html#the-string-voltages-are-different
[8] PVSyst: https://www.pvsyst.com/

connecting modules and inverters, causes resistive losses. The default value for wiring losses in this PCR is 1.5 %, but this can be reduced to 1 % if DC cable length is short.

Annex B

To correctly source the environmental impacts of each component from the related component EPDs, a conversion to the functional unit of this PCR is required. Table 2 presents different conversion factors for the impact assessment for 1 kWh.

Table 2: Conversion factors

	Conversion factor c	Parameters
Per kWp to kWh (e.g. for PV modules)	$\frac{P_{nom}[kWp]}{RF\ [kWh]}$	P_{nom}: Total installed power of the PV system (kWp) RF: reference flow – the total generated energy of the PV system (kWh) over its RSL, as stated in the EPD under this PCR RF_c: stated reference flow in the component EPD (kWh) – the total generated energy of the reference PV system (kWh) over its RSL A: total area spanned by the PV modules (m²) m: total mass of the respective component or material (kg) l: Length of the respective wiring (km or m)
Per unit to kWh (e.g. for electrical BOS)	$\frac{\#units}{RF\ [kWh]}$	
Per kWh to kWh (e.g. for electrical BOS)	$\frac{RF_c[kWh]}{RF\ [kWh]}$	
Per m² to kWh (e.g. for mechanical BOS)	$\frac{A\ [m^2]}{RF\ [kWh]}$	
Per kg to kWh (e.g. for mechanical BOS)	$\frac{m\ [kg]}{RF\ [kWh]}$	
Per km to kWh (e.g. for wiring)	$\frac{l\ [km]}{RF\ [kWh]}$	

The resulting environmental impact $EI_{k,i}$ can then be calculated for each relevant life cycle module k and each component i:

$$EF_{k,i} = c_i \bullet EI_{k,i} \quad (10)$$

For the impact assessment per m², the conversion can be done as follows:

$$EI_{m^2,k,i} = EI_{k,i} \bullet d \quad (11)$$

- d: Conversion factor, $d = \frac{RF}{A}, \left[\frac{kWh}{m^2}\right]$
  - RF: Reference flow in kWh, as stated in the beginning of the PCR.
  - A: Area spanned by the PV modules, as defined in the beginning of the PCR.