Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

3S Solar Roof based on TeraSlate Black Glass-Backsheet PV-Module

from

3S Swiss Solar Solutions AG

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0017335
Publication date:	2024-12-16
Valid until:	2029-12-16

Product recently on the market – Results of this EPD shall be used with care as the LCI data is not yet based on 1 year of production which may result in increased uncertainty.
An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com.

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): PCR 2019:14 Construction products, version 1.3.4, 2024-04-30 c-PCR-016 Photovoltaic modules and parts thereof (adopted from EPD Norway 2022-04-27)
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Life Cycle Assessment (LCA)
LCA accountability: Maria Feced Mateu, Re-Viu, www.re-viu.com Contact: info@re-viu.com
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 Third-party verifier: Niels Jungbluth, ESU-services Ltd, Vorstadt 10, CH-8200 Schaffhausen, www.esu-services.ch Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third-party verifier: ☒ Yes ☐ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.
EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit 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 identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: 3S Swiss Solar Solutions AG
Address: Schorenstrasse 39, 3645 Thun (Gwatt), Switzerland
Contact: info@3s-solar.swiss
Description of the organisation:
3S Swiss Solar Solutions has been developing and producing building-integrated photovoltaic systems (BIPV) since 2001: Photovoltaic modules are thus integrated into the building envelope and consequently replace tiles or other conventional building materials. BIPV modules also meet design requirements and offer architecturally aesthetic solutions.
3S Swiss Solar Solutions has installed over 20,000 solar roof systems, which are designed for high performance and maximum durability. Numerous awards and certificates prove the high quality and aesthetics of 3S systems. Goal of the company is the perfect integration of PV into the building envelope with maximum energy yield and thus contribute best possible to the energy transition.

Product-related or management system-related certifications: IEC 61730:2016, IEC 61215:2021, SIA 261 ff., Eurocode 1990 ff

Product information

Product recently on the market – Results of this EPD shall be used with care as the LCI data is not yet based on 1 year of production which may result in increased uncertainty.

Product name: TeraSlate Black Glass-Backsheet PV-Module for Solar Roof
Product identification:
The TeraSlate® roof system from 3S Swiss Solar Solutions is a well-designed, high-quality BIPV solution. Main component are high-performance, frameless, aesthetically designed solar modules. This EPD refers to the roof module L size, the conversion factors in this EPD allow the calculation for the roof systems with the other standard module sizes Q, M and S.

Dimensions:	1300 x 935 x 6.5 mm
Weight:	17.7 kg/module, 19.33 kg/module including the system elements
Glass thickness:	5 mm ESG solar glass
Number of solar cells per module:	24 (48 half-cells)
Type of cell:	G12 – PERC (mono c-Si) – half-cells
Product standards:	IEC 61730:2016; IEC 61215:2021; SIA 261 ff; Eurocode 1990 ff

Product description:
The 3S solar roof can be installed as a full or partial roof covering and fits on any roof with a slope of 10° and more. The system efficiently replaces conventional roofing materials. It has been successfully tested for increased wind, snow and ice loads and offers optimal weather protection. The TeraSlate system achieves hail resistance class 5 (HW 5) - means hailstones Ø 50 mm at 30.8 m/s (111 km/h) – and is registered in the Swiss hail protection register. A 40-year weather resistance guarantee makes the 3S solar roof a sustainable and safe solution. The system structure ensures maximum energy yields through optimal rear ventilation on each individual module. The frameless design means that the modules have excellent self-cleaning properties, accumulation of dirt is avoided.
The number of system components is kept to a minimum, the installation has been developed for highest efficiency. Hooks and water drainage rails are attached directly to the roof battens. The modules are just inserted, which means each module could be removed easily at any time.

Technical parameter	**Value, unit**
Rated power:	225 Wp
Voltage, U_{mpp}:	27.8 V
Current, I_{mpp}:	8.1 A
Voltage, open circuit, U_{oc}:	33.1 V
Short circuit current, I_{sc}:	8.5 A
Efficiency:	19.6%
Linear degradation rate (deg):	0.8%/year
Maximum load (Tested pressure and suction load according to IEC 61215):	5400 N/m^2 (pressure) 8000 N/m^2 (alpine pressure) 2400 N/m^2 (suction)
Hail resistance class:	HW 5 - hailstone Ø 50 mm at 30.8 m/s (111 km/h)
Fire class (EN 13051-5):	B_{ROOF}(t1)
Fire class (VKF):	Non-combustible top layer (RF1)

Name and location of production site: Rütimoosstrasse 5, 3076 Worb, Switzerland

Geographical scope: Switzerland, EU

LCA information

Functional unit: 1 Wp of manufactured photovoltaic module, from cradle-to-grave, with activities needed for a study period for a RSL of 25 years.
Converting factor to express the results per 1 m^2 of visible area: 196 Wp/m^2
Converting factor to express the results per mass (kg): 12.1 Wp/kg

Reference service life: 25 years, according to the c-PCR

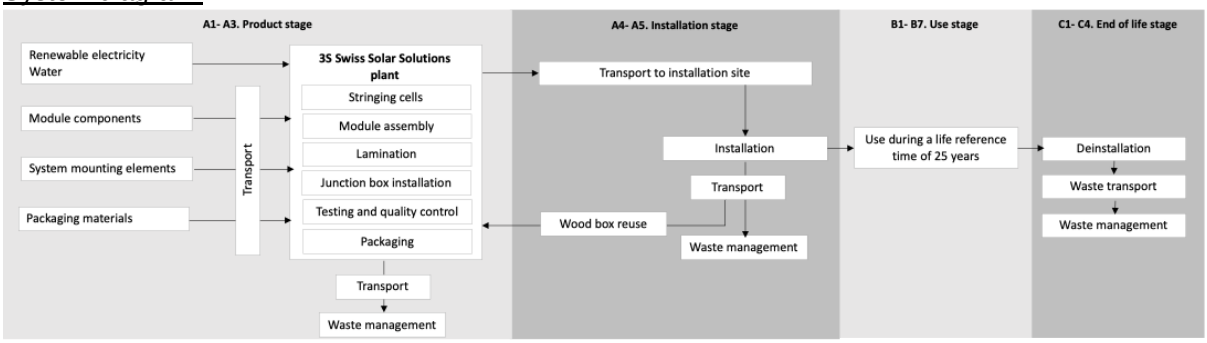
Time representativeness: Data collected refer to the period April – June 2024, as TeraSlate is a product recently on the market. As it's common in the PV industry, PV modules are constantly evolving and new

product versions are regularly developed, primarily affecting the internal components of the modules, being the manufacturing process taking place in 3S facility the same. The EPD and LCA will be updated when new data is available covering a longer period.

Database(s) and LCA software used:
Software: openLCA 2.2.0
Database: Ecoinvent v3.9.1 EN15804 add-on (cut-off system model)
The datasets used include the infrastructure from upstream and downstream processes. 3S Swiss Solar Solutions infrastructure is not included.

Description of system boundaries: Cradle to grave and module D (A + B + C + D).

System diagram:



As per c-PCR specifications, the system boundaries don't include inverters, switches, batteries, other electrical components and systems necessary to connect the module to the grid, screws and other additional materials, as, according to the c-PCR, these are expected to be included at building level assessment. The mounting system is included in the scope as it is designed and provided by 3S Swiss Solar Solutions.

A1-A3, Product stage:
All module components are assembled in the 3S Swiss Solar Solutions plant in Worb.
The manufacturing of photovoltaic modules begins with stringing cells, where individual solar cells are connected in series and parallel using metal busbars and soldering to form strings. The cell strings are laid out in a grid formation, aligned within the module frame and encapsulated in an encapsulant material for protection and electrical insulation. A protective glass layer with encapsulant material is placed on the front to shield the cells from physical damage and environmental factors. A back cover (glass for façade modules or a backsheet for roof modules) is then added to protect the rear of the module. The encapsulated cells are subjected to heat and pressure in a lamination process to bond the layers together, ensuring durability and protection from moisture and temperature fluctuations. A junction box with electrical terminals is mounted on the back of the module for connecting to external wiring and sealed to prevent water ingress. Finally, before packaging and shipping, the modules are subjected to final testing for electrical output, performance under various conditions, and mechanical strength Environmental tests, including temperature cycling, UV exposure, and humidity, are performed to ensure durability.
Apart from electricity, in the production line cooling water is consumed in laminators and compressed air.
Moreover, during the module production stage, the waste heat generated by the laminators warms up the building, so no extra heating is required.
The modules are packed in reusable wood boxes, that are returned to 3S to be reused.

A4-A5, Installation stage:

The modules and system elements are transported from the 3S facility mainly to the Swiss market. The installation process for the TeraSlate system involves several key steps. It starts by installing the mounting components directly to the roof battens. The TeraSlate modules are then shingled in place similar to traditional roofing materials. Additional features like integrated roof windows and snow guards make it versatile for various climates and building types. Per module, the following mounting materials are required and supplied by 3S:

- 6 stainless steel screws
- 3 hooks
- 1 metre of drainage profile

B1-B5, Use stage, information modules:

Thanks to the frameless design, the modules have excellent self-cleaning properties and no operations are required during the use stage.

B6, Use stage, operational energy use:

TeraSlate modules generate energy during the use stage. The site specific total produced electricity for the declared module can be calculated based on the module specifications and formulas provided by the c-PCR and described below.

Variable	Description and comments	Value, unit
S_{rad} = Solar radiation	Site-specific annual average solar radiation on the module (excluding shading), measured in kWh/kWp/year. The annual radiation calculation must account for the specific inclination (slope, tilt) and orientation of the module. As a reference, the average yield for a rooftop PV system in Switzerland is 976 kWh/kWp/year (Frischknecht et al., 2020).	Site specific
A = Area of module	Visible area, without overlap.	1.1505 m^2/module
Y = Module yield	Electrical power, kWp for standard test conditions of the module divided by the area of the module (visible).	0.196 kWp/m^2
PR = Performance ratio, coefficient for losses	Site specific performance ratio, that can be modelled with PV simulation software tools.	Site specific
deg = yearly degradation rate	Linear degradation rate	0.8%/year
RSL = Reference service life	It corresponds to the performance warranty	25 years

First year of operation energy production (E_1):

$$E_1 = S_{rad} \times A \times y \times PR \times (1 - deg)$$

Second year of operation energy production (E_2):

$$E_2 = E_1 \times (1 - deg)$$

Energy production for the entire reference service life (E_{RSL}):

$$E_{RSL} = E_1 \times \left(1 + \sum_{n=1}^{RSL-1} (1 - deg)^n\right)$$

B7, Use stage, operational water use:

No water is consumed to operate during the use stage.

C1-C4, End of life stage:
The photovoltaic modules can be easily dismantled without tools. The used modules and system (not include in the EPD) are sent to a recycling plant located in Germany by lorry.

Module D: In the module the benefits and loads of the recycling processes and energy recovery processes are included, from the plastic packaging recycling at the installation stage and from the module and system components recycling and energy recovery at the end of life.

Manufacturing electricity mix: The electricity mix supplied is 100% from renewable sources, mainly from hydropower. The GWP-GHG result of the specific electricity mix is 0.018 kg CO_2eq/kWh.

Cut-off criteria: All inputs and outputs to a unit process for which data are available have been included in the calculation. In case of insufficient input data or data gaps for a unit process, the cut-off criteria is limited to 1% of primary energy usage and 1% of the total mass input of that unit process, unless a material has the potential of causing significant emissions into the air, water, or soil or is known to be resource-intensive. The total sum of neglected input flows is limited to 5% each of energy usage and mass.

Allocation: Physical allocation based on number of modules at the manufacturing stage.

Data quality assessment:

Temporal representativeness	Specific data are as current as possible and refer to April-June 2024. As a new product, data availability is limited to the collection period instead of at least one year of production. The data may not account for effects of seasonal variations and incidences influencing productivity, which could affect the accuracy of the assessment. As a new product on the market, the EPD will be updated and re-verified when there is production data for one year of production available. On the other hand, ecoinvent v3.9.1 database cut-off system model, updated in 2022, has been used for generic data. For most relevant processes more recent data has been used, i.e. the cell obtention and all its upstream processes (wafer, CZ ingot, SoG-Si and MG-Si production) have been modelled using generic data from IEA-PVPS 2020/Frischknecht et al. (2020). Other references used for calculations have been updated within the last 10 years.
Geographical representativeness	Specific data used are representative of the geographical area where they took place. On the other hand, the generic data used are representative of the specific country or region (Switzerland or Europe and China or Global).
Technological representativeness	Specific data reflect the physical reality of the product and its components and generic data have been chosen to closely relate to the actual technology.

Scenarios after module A3: Module A4 is an estimate based on the distribution of other solar modules sold by 3S Swiss Solar Solutions.
Module C1-C4 is based on 3S recycler specific data and adapted to the module material composition.

A4 Scenario information	**Description and values**
Vehicle type used for transport	Lorry 7.5-16 tonnes EURO VI
Distance	73 km

A5 Scenario information	Description and values
Electricity consumption: Cutting, mounting & installation	0.05 kWh/module, modelled with the Swiss low voltage electricity consumption mix Ecoinvent dataset
Waste materials on the building site	Used wooden box for reuse: 1.32 kg/module Packaging plastic waste to energy recovery: 0.002 kg/module
Transport to energy recovery	Packaging plastic waste: 50 km Lorry 7.5-16 tonnes EURO VI
Transport to reuse	Wooden box: 73 km Lorry 7.5-16 tonnes EURO VI

End of life Scenario information	Description and values
Waste collected separately	100% of the system: - Module: 17.7 kg/module - System elements: 1.63 kg/module
Recovery system	Recycling: 13.98 kg/module Energy recovery: 5.34 kg/module
Transport to management	Distance: 200 km Lorry 7.5-16 tonnes EURO VI

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Geography	Global	CH	CH	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU	CH EU
Specific data used[1]	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not applicable			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not applicable			-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that do not capture all relevant aspects of data quality. The indicator is not comparable across product categories.

Content information

The content information is provided per 1 module. The weight per functional unit (Wp) and per m^2 is obtained by dividing the weight per module with the total module rated output (225 Wp/module) or visible area (1.1505 m^2/module), respectively.

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/module
Glass	15.19	-	-
Foils	1.83	-	-
Electronics	0.60	-	-
Other	0.08	-	-
System elements	1.63	-	-
TOTAL	19.33	-	-
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/module**
Wooden box	1.318	6.82%	0.659
Plastic foil	0.002	0.01%	-
TOTAL	1.320	6.83%	0.659

The product contains substances given by the REACH Candidate list that are less than 0.1% by weight.

Results of the environmental performance indicators

The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.
It is important to note that the results from modules A1-A3 should not be used without considering the results from module C.

The impact categories required by the EN 15804+A2 are based on the EC-JRC Environmental Footprint (EF) Reference Package 3.1 and corresponding characterisation factors.

Mandatory impact category indicators according to EN 15804

Results per functional unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	5.98E-01	1.57E-03	1.36E-04	0	0	4.01E-03	5.87E-02	0	-7.36E-02
GWP-biogenic	kg CO_2 eq.	1.59E-03	4.81E-07	5.78E-07	0	0	1.23E-06	5.07E-05	0	-4.14E-04
GWP-luluc	kg CO_2 eq.	3.45E-04	7.21E-07	5.82E-08	0	0	1.84E-06	1.73E-05	0	-3.96E-05
GWP-total	kg CO_2 eq.	6.00E-01	1.57E-03	1.37E-04	0	0	4.02E-03	5.88E-02	0	-7.41E-02
ODP	kg CFC 11 eq.	1.99E-07	3.42E-11	2.54E-12	0	0	8.76E-11	3.74E-09	0	-1.79E-09
AP	mol H^+ eq.	3.43E-03	3.24E-06	3.10E-07	0	0	8.29E-06	8.55E-05	0	-6.12E-04
EP-freshwater	kg P eq.	2.00E-04	1.09E-07	1.47E-08	0	0	2.78E-07	1.88E-05	0	-1.57E-05
EP-marine	kg N eq.	9.09E-04	8.05E-07	6.57E-08	0	0	2.06E-06	2.28E-05	0	-1.02E-04
EP-terrestrial	mol N eq.	7.46E-03	8.15E-06	6.82E-07	0	0	2.09E-05	2.19E-04	0	-1.20E-03
POCP	kg NMVOC eq.	2.33E-03	5.07E-06	3.68E-07	0	0	1.30E-05	7.91E-05	0	-3.47E-04
ADP-minerals&metals*	kg Sb eq.	1.52E-05	5.17E-09	1.24E-09	0	0	1.32E-08	1.40E-07	0	-4.65E-07
ADP-fossil*	MJ	7.38E+00	2.23E-02	2.19E-03	0	0	5.70E-02	3.11E-01	0	-9.48E-01
WDP*	m^3	2.88E-01	1.07E-04	1.10E-04	0	0	2.75E-04	8.54E-03	0	-1.86E-02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Additional mandatory and voluntary impact category indicators

Results per functional unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[2]	kg CO_2 eq.	6.00E-01	1.57E-03	1.37E-04	0	0	4.02E-03	5.88E-02	0	-7.41E-02
PM	Disease incidence	4.10E-08	9.83E-11	7.00E-12	0	0	2.51E-10	1.01E-09	0	-6.17E-09
IRP*	kBq U235 eq.	4.06E-02	3.58E-05	4.65E-05	0	0	9.16E-05	1.55E-03	0	-7.97E-03
ETP-fw**	CTUe	9.63E+00	1.12E-02	8.58E-04	0	0	2.87E-02	8.70E-01	0	-5.23E-01
HTP-c**	CTUh	1.34E-09	6.53E-13	6.07E-14	0	0	1.67E-12	3.43E-11	0	-2.80E-11
HTP-nc**	CTUh	4.95E-08	1.47E-11	1.94E-12	0	0	3.77E-11	2.82E-10	0	-4.28E-10
SQP**	dimensionless	1.79E+00	1.14E-02	8.09E-04	0	0	2.91E-02	4.57E-02	0	-2.13E-01
Acronyms	PM = Particulate matter emissions; IRP = Ionizing radiation, human health; ETP-fw = Eco-toxicity – freshwater; HTP-c = Human toxicity, cancer effect; HTP-nc = Human toxicity, non-cancer effects; SQP = Land use related impacts/Soil quality									

** Disclaimer: 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 Disclaimers shall be added, if required by EN 15804.*
*** Disclaimer: 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.*

Resource use indicators

Results per functional unit										
Indicator[3]	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	9.82E-01	3.86E-04	7.45E-04	0	0	9.88E-04	1.88E-02	0	-7.14E-02
PERM	MJ	7.09E-03	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0	0.00E+00
PERT	MJ	9.89E-01	3.86E-04	7.45E-04	0	0	9.88E-04	1.88E-02	0	-7.14E-02
PENRE	MJ	7.09E+00	2.03E-02	2.06E-03	0	0	5.21E-02	2.92E-01	0	-9.04E-01
PENRM	MJ	2.87E-01	1.93E-03	1.28E-04	0	0	4.95E-03	1.97E-02	0	-4.37E-02
PENRT	MJ	7.38E+00	2.23E-02	2.19E-03	0	0	5.70E-02	3.11E-01	0	-9.48E-01
SM	kg	1.57E-02	2.70E-05	3.58E-05	0	0	6.92E-05	2.65E-03	0	-3.97E-03

[2] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.
[3] For the Energy indicators, PCR 2019:14 Annex 3 option B has been applied.

RSF	MJ	5.48E-03	8.74E-06	2.04E-05	0	0	2.24E-05	1.39E-03	0	-2.17E-03
NRSF	MJ	2.15E-02	3.73E-05	8.71E-06	0	0	9.56E-05	9.86E-04	0	-3.72E-03
FW	m^3	5.90E-03	2.72E-06	2.60E-06	0	0	6.95E-06	1.94E-04	0	-5.07E-04
Acronyms	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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

Waste indicators

Results per functional unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	6.10E-02	1.85E-05	2.08E-06	0	0	4.73E-05	9.07E-03	0	-8.28E-04
Non-hazardous waste disposed	kg	5.49E-02	8.96E-04	6.16E-05	0	0	2.29E-03	1.12E-03	0	-3.89E-03
Radioactive waste disposed	kg	9.92E-06	8.77E-09	1.04E-08	0	0	2.24E-08	4.24E-07	0	-2.03E-06

Output flow indicators

Results per functional unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	5.87E-03	0	0	0.00E+00	0.00E+00	0	0.00E+00
Material for recycling	kg	1.12E-02	2.41E-05	3.45E-05	0	0	6.17E-05	6.45E-02	0	-4.14E-03
Materials for energy recovery	kg	0.00E+00	0.00E+00	8.89E-06	0	0	0.00E+00	2.38E-02	0	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0	0.00E+00

Abbreviations

BIPV: Building integrated photovoltaics
c-PCR: complementary Product Category Rules
CH: Switzerland
CZ: Czochralski
EC-JRC: European Commission, Joint Research Centre
EPD: Environmental Product Declaration
ESG: EinheitsSicherheitsGlas (Safety glass in English)
EU: European Union
PERC: Passivated Emitter and Rear Cell
HW: Hagelwiderstand (Hail resistance in English)
IEA-PVPS: International Energy Agency, Photovoltaic Power Systems Programme
ISO: International Organization for Standardisation
LCA: Life cycle assessment
LCI: Life cycle inventory analysis
MG-Si: Metallurgical grade silicon
mono c-Si: Mono crystalline silicon cell
PCR: Product Category Rules
PV: Photovoltaics
REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals
RSL: Reference service life
SoG-Si: Solar grade silicon
VKF: Vereinigung Kantonaler Feuerversicherungen

Version history

Version 1, 2024-12-16
Original version of the EPD

References

EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
General Programme Instructions of the International EPD® System. Version 5.0.
PCR 2019:14 Construction products, version 1.3.4, 2024-04-30
c-PCR-016 Photovoltaic modules and parts thereof (adopted from EPD Norway 2022-04-27)
R. Frischknecht, P. Stolz, L. Krebs, M. de Wild-Scholten, P. Sinha, V. Fthenakis, H. C. Kim, M. Raugei, M. Stucki, 2020, Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems, International Energy Agency (IEA) PVPS Task 12, Report T12-19:2020

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