Environmental Product Declaration

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

Photovoltaic solar panel 400-505 Wp

from

SoliTek Cells

Programme:	The International EPD System, www.environdec.com
Programme operator:	EPD International AB
Type of EPD:	EPD of multiple products, based on the average results of the product group
EPD registration number:	EPD-IES-0026515:002
Revision date:	2025-12-03
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	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

The list of the products covered by this EPD is SOLID series modules

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
E-mail:	support@environdec.com

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 (EN 15804+A2) (2.0.1) (2025-06-05)*
PCR review was conducted by: *Technical Committee of the International EPD® System. The review panel may be contacted via info@environdec.com.*
c-PCR: *PCR 2019:14-c-PCR-016 Photovoltaic modules and parts thereof (c-PCR to PCR 2019:14) (adopted from EPD Norway 2022-04-27)*

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ **Individual EPD verification without a pre-verified LCA/EPD tool** Third-party verifier: *Elisabet Amat, GREENIZE* Approved by: 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.

INFORMATION ABOUT EPD OWNER

Owner of the EPD: SoliTek Cells
Address: Lithuania, Vilnius, Mokslininku street 6a.
Contact: vilius.aleknavicius@solitek.eu
Address and contact information of the LCA practitioner commissioned by the EPD owner, if applicable: Eco Intelligent Growth, Barcelona (Spain)
T. (+34) 934 199 080, info@ecointelligentgrowth.net

Description of the organisation:

SoliTek, part of the BOD Group, is a leading European solar energy technology company, specializing in the production of premium solar panels and energy storage solutions (batteries). Established in 2009, the company focuses on sustainable, innovative, and eco-friendly technologies. SoliTek manufactures solar modules using 100% renewable energy, ensuring high durability and performance. Known for its advanced research, SoliTek provides tailored solar solutions to residential, commercial, and industrial sectors, with products exported to major European markets, including Germany and Sweden.

Product-related or management system-related certifications:

C2C Gold certification
ISO 9001:2015 Quality Management System
ISO 14001:2015 Environmental Management System
ISO 45001:2018 Health hand Safety Management System

PRODUCT INFORMATION

Product name: SOLID series module, 290-505 Wp

Product identification:

Product name	Brochure	Description	Fire class	Cells	Cell type	Cell configuration	Weight (kg)	Dimensions (mm)	Front, back glass (mm)	Frame	Junction box
SOLID Bifacial full black B108 435W	Rev.20250430_SOLID_Bifacial_full black_B108_435W_EN_frameless	The SOLID Bifacial glass-glass solar panel back is painted black, making the panel entirely black. Full-black solar modules offer a striking appearance, effortlessly integrate into any setting, and look great on roofs of any color or texture.	A	108	N type, TOPCon - bifacial	6x18	32	1729x1140x7.1	3.2	Frameless	Split / IP68
SOLID Bifacial transparent 435 Wp	SOLID_Bifacial_B108_435W_EN	SOLID Bifacial solar panel is a symbol of efficiency and durability. Made in Europe from the highest quality materials.	A	108	N type, TOPCon - bifacial	6x18	32	1729x1140x7.1	3.2	Frameless	Split / IP68
SOLID AGRO B.72 Increased Transparency 290W	Rev.20250429_SOLID_Agro_B72_290W_EN	SOLID Agro solar modules: the perfect blend of solar power and agriculture. SOLID Agro glass-glass solar panels are proudly made in Europe from thick, tempered top-quality glass.	A	72	N type, TOPCon - bifacial	4x18	32	1729x1140x7.1	3.2	Frameless	Split / IP68
BLACKSTAR B.108 435W	Rev.20250429_Blackstar_435W copy	Discover the next evolution in solar technology with BLACKSTAR - a premium solar panel	A	108	N type, TOPCon - bifacial	6x18	25	1722x1134x30	2	Black anodized aluminium frame	Split / IP68

		engineered for excellence proudly manufactured in the EU.									
SOLID Bifacial Framed transparent 35 mm B.108	Rev.20250429_SOLID_Bifacial_Framed_B108_435W_EN (35mm)	Combining the durability of frameless SOLID Bifacial panels with the flexibility of traditional framed panels. Engineered for durability, SOLID Bifacial modules can withstand extreme weather conditions while maintaining optimal performance.	A	108	N type, TOPCon - bifacial	6x18	33	1722x1134x35	3.2	Black anodized aluminium frame	Split / IP68
SOLID Bifacial Framed Full-black 35 mm B.108 435W	Rev.20250430_SOLID_Bifacial_Framed_full black_B108_435W_EN_35mm	Discover the perfect fusion of form and function with our all-black SOLID Bifacial Framed full-black solar panels. Engineered for both aesthetics and performance, these panels seamlessly blend into any architectural style while generating maximum clean energy.	A	108	N type, TOPCon - bifacial	6x18	33	1722x1134x35	3.2	Black anodized aluminium frame	Split / IP68
SOLID Bifacial Framed Transparent 40 mm B.108 435W	Rev.20250429_SOLID_Bifacial_Framed_B108_435W_EN (40mm)	Combining the durability of frameless SOLID Bifacial panels with the flexibility of traditional framed panels. Engineered for durability, SOLID Bifacial modules can withstand extreme weather conditions while maintaining optimal performance.	A	108	N type, TOPCon - bifacial	6x18	33	1722x1134x40	3.2	Black anodized aluminium frame	Split / IP68
SOLID Bifacial Framed Full-black 40 mm B.108 435W	SOLID_Bifacial_Framed_full black_B108_435W_EN_40mm	Discover the perfect fusion of form and function with our all-black SOLID Bifacial Framed full-black solar panels. Engineered for both aesthetics and performance, these panels seamlessly blend into any architectural style while generating maximum clean energy.	A	108	N type, TOPCon - bifacial	6x18	33	1722x1134x40	3.2	Black anodized aluminium frame	Split / IP68
SOLID Agro Framed B72 290W	Rev.20250429_SOLID_Agro_Framed_B72_290W_EN (35mm)	The SOLITEK SOLID AGRO Framed solar panel builds upon the innovative design of the frameless SOLID AGRO, specifically engineered for agricultural applications (agrivoltaics). However, it can also be used in places where partial shade is desired, such as terraces, shelters, and carports.	A	72	N type, TOPCon - bifacial	4x18	33	1722x1134x35	3.2	Black anodized aluminium frame	Split / IP68
SOLID Framed Transparent B.120 505W	Rev.20250429_SOLID_Agro_Framed_B72_290W_EN (35mm)	Introducing the SOLID Framed 505W Glass-Glass Solar Panel, the perfect choice for high-performance solar energy in large-scale installations. Engineered with a robust glass-glass design, this panel offers unparalleled durability and exceptional weather resistance,	A	120	N type, TOPCon - bifacial	6x20	29	1996x1134x30	2	Black anodized aluminium frame	Split / IP68

		making it ideal for even the harshest climates.									
SOLID Solrif D Transparent B.108 435W 3.2+3.2 mm	Rev.20250430_SOLID_Solrif_D_B108_435W_EN	Replace your traditional roof with a sleek, solar-powered one. SOLID Solrif solar modules integrate seamlessly into your roof, combining the beauty of a new roof with the power of solar energy.	A	108	N type, TOPCon - bifacial	6x18	33.5	1767x1160x20	3.2	Solrif®	Split / IP68
SOLID Solrif D Full-black B.108 435W 3.2+3.2 mm	Rev.20250507_SOLID_Solrif_D_B108_435W_EN_full black	Experience the perfect fusion of form and function with our all-black SOLID Solrif solar roof. These sleek, full-black panels seamlessly integrate into your home's architecture, offering both unparalleled aesthetics and exceptional energy generation.	A	108	N type, TOPCon - bifacial	6x18	33.5	1767x1160x20	3.2	Solrif®	Split / IP68
SOLID Solrif D Increased Transparency B.72 290W 3.2+3.2 mm	Rev.20250514_SOLID_Solrif_D_B72_290W_EN	This innovative solar panel offers a unique solution for applications where both sunlight transmission and power generation are desired. It boasts a significantly increased transparency of up to 40% compared to traditional solar panels.	A	72	N type, TOPCon - bifacial	4x18	33.5	1767x1160x20	3.2	Solrif®	Split / IP68
SOLID Solrif N Full-black B.108 435W 2+2 mm	Rev.20250507_SOLID_Solrif_N_B108_435W_EN_full black	Enhance your home's energy efficiency and aesthetic appeal with our SOLID Solrif integrated solar panels. These full-black, sleek panels blend seamlessly into your roof's architecture, offering a sophisticated look while delivering outstanding energy generation.	A	108	N type, TOPCon - bifacial	6x18	27	1767x1160x17	2	Solrif®	Split / IP68

Product description:

- 30 years product warranty.
- 30 years performance warranty.
- Bifacial.

Visual representation (e.g., an image) of the product

Figure 1. Image of frameless panel

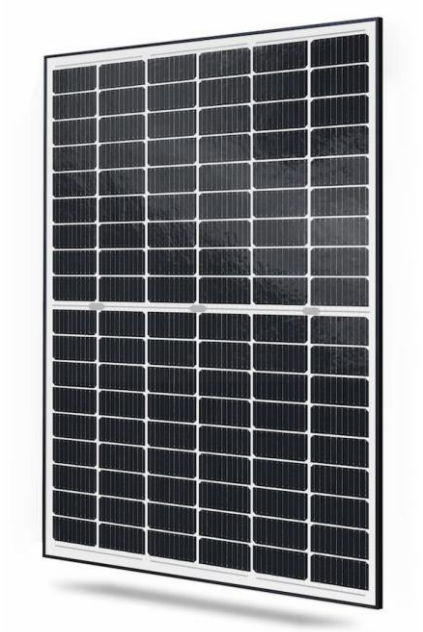


Figure 2. Image of framed panel

UN CPC code:
46111 Motors of an output not exceeding 37.5 W; other DC motors; DC generators
Name and location of production site(s):
Lithuania, Vilnius, Mokslininku street 6a.
References to any relevant websites for more information or explanatory materials, if applicable.
https://www.solitek.eu/en

CONTENT DECLARATION

The content declaration is based on the materials and packaging required to provide one Wp. The product declared is an average product based on 2024 sales of the solar panels included in the EPD.

Product content	Mass, kg/Wp	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/Wp
Solar cells	2.22E-03	0%	0%	0
Ribbons	4.17E-04	0%	0%	0
Glass	5.33E-02	0%	0%	0
Encapsulant	6.53E-03	0%	0%	0

Junction box with cables	6.92E-05	0%	0%	0
Silicone	7.14E-04	0%	0%	0
Frame	3.16E-03	0%	0%	0
TOTAL	6.52E-02	0%	0%	0

Packaging materials	Mass, kg	Mass-% (versus the product)	Biogenic material, kg C/Wp
Cardboard	2.46E-03	3.8%	1.23E-03
Plastic film	1.31E-04	0.2%	0.00E+00
Pallet	2.14E-03	3.3%	1.07E-03
TOTAL	4.73E-03	7.3%	2.30E-03

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO_2.

The product does not contain any REACH SVHC substances in amounts greater than 0,1% (1000 ppm).

LCA INFORMATION

Declared unit: 1 Wp of manufactured photovoltaic module, from cradle-to-grave.

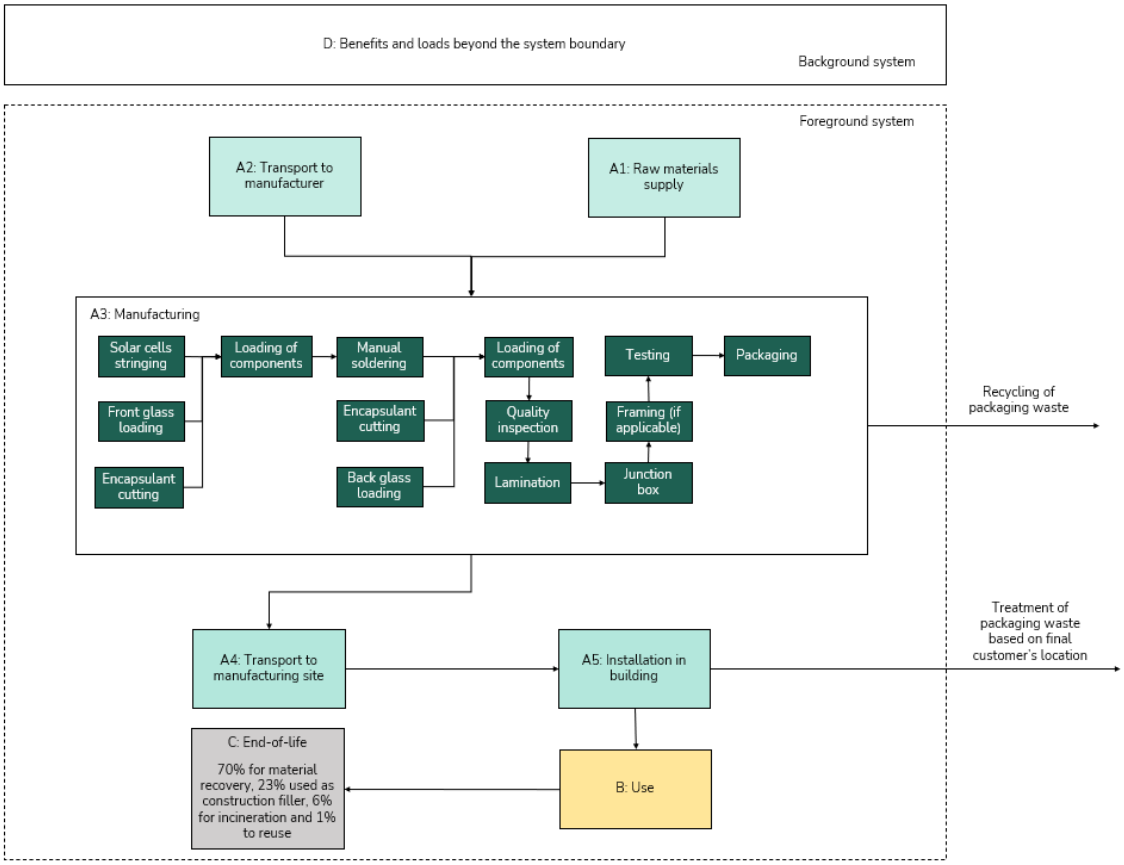
Conversion factors of the average product based on sales:

- 217.18 W/m^2
- 0.07 kg/Wp

Conversion factor to mass if mass is not used as functional/declared unit (not applicable for services).
Reference service life: 30 years
Time representativeness: Primary data corresponds to the year 2024.
Geographical scope:
For A1 and A2, raw, auxiliary, and packaging materials are supplied from various locations worldwide. The manufacturing process (A3) is done in Lithuania. For A4 and A5, the product is distributed to various countries in Europe. Modules B and C take place in the same country where the final product is sold. Module D takes place in the same country where the waste is originated.
Database(s) and LCA software used: The database used was Ecoinvent 3.9.1 “Allocation, cut-off EN15804”. The software used was brightway25 version 1.0.6.
Description of system boundaries:
The system boundaries of this EPD are Cradle to grave and module D (A + B + C + D).

All major materials, production energy use, and waste are included for product stages A1-A3, A4-A5, C1-C4, and D. Stages B1-B7 are also included, while the product only requires of limited maintenance by weekly cleaning. It is assumed that there is no replacement, or repair during its lifetime, and no direct emissions related to this kind of product.

Process flow diagram:



PRODUCT LIFE CYCLE:

A1 – Raw material supply

This module represents the extraction and processing of raw materials used in the SOLID photovoltaic panels. All the photovoltaic panels covered in the EPD have an aluminium frame, except for: SOLID Bifacial B108 435W, SOLID Bifacial full black B108 435W, and SOLID AGRO B.72 Increased Transparency 290W.

Key assumptions:

1. The solar cells were modelled using the LCIs provided in *Life Cycle Inventories and Life Cycle Assessments of Photovoltaic Systems* for the year 2018 by the International Energy Agency (2020). Given that the technology of solar cells has greatly improved since 2018, some modifications of the LCI are made to account for the new efficiency and the wafer thickness. The efficiency of the solar cells from the IEA study is 18%, whereas the ones used by Solitek have a greater efficiency of 22.27%. The wafer thickness is also reduced from 170 um in the IEA study to 130 um in the Solitek cells. The efficiency increase and the reduction of wafer thickness reduces the requirements of raw materials in the production of solar cells.
2. The solar modules use half solar cells. The cutting of the cells generates a waste of ~8%.
3. The electricity mix in the production of solar cells is also adjusted to the 2024 Chinese mix.
4. The packaging of all the raw materials is modelled.

A2 – Transport to production sites
Raw materials are transported to the factory. The modeling includes transport for each raw material. Some materials are transported by lorry alone, others by ship and lorry.

Key assumptions:

1. The use of 16-32 tonne trucks with EURO5 emission standard is assumed.

A3 – Manufacturing
This stage includes the manufacturing processes of the solar panels. Total annual inputs (packaging, energy, and water) and outputs (products and wastes) have been allocated according to mass. During manufacturing, electricity is used to string the solar cells together, to place the front and back glass, to cut the encapsulant to the desired dimensions, to load and solder the main components together, for the quality inspection, for lamination of the panel, and for quality testing. All the electricity used is of renewable origin by Guarantee of Origin, composed of 47% biomass, 40% wind and 13% solar.
The GWP-GHG of the renewable electricity mix is 0.072 kg CO_2 eq./kWh.

All the photovoltaic panels covered in the EPD have an aluminium frame, except for: SOLID Bifacial B108 435W, SOLID Bifacial full black B108 435W, and SOLID AGRO B.72 Increased Transparency 290W.

Key assumptions:

1. Process water use is assumed to be negligible.
2. Pallets are assumed to be reused 30 times.
3. Assumed 0.05% losses of solar cells and ribbons during the solar cell stringing process, 0.05% glass breakage for glass manipulation and placement, 0.04% losses of encapsulant during cutting, 0.07% losses of solar cells and ribbons during soldering and 0.1% of solar cells brokage or defects during quality inspection.

A4 - Transport
This module includes transport from the production facility to the building site. Transport is calculated on the basis of a scenario with the parameters described in the following table and the distances by road are weighted to different destinations of customers according to sales volumes in the analyzed period.

TECHNICAL PARAMETERS A4

Scenario parameter for truck transport	Value
Specific transport CO_2 eq. emissions, kg CO_2e / tkm Lorry, 16-32, EURO5	0.188
Average transport distance, km	1,275
Capacity utilization (including empty return) %	Default value from Ecoinvent 3.9.1
Bulk density of transported products	N/A
Volume capacity utilization factor	≈ 1

Key assumptions:

1. The use of 16-32 tonne trucks with EURO5 emission standard is assumed.
2. Assumes an additional average distance to the site of 20 km (Gervasio et al., 2018).

A5 - Installation
This module includes the waste generated during the installation of the panels. The installation process is assumed to be manual so there is no electricity consumption associated.
Scenarios of waste treatments of packaging are based on the EXIOBASE 3 hybrid database for the end-of-life treatment of wood, paper and plastics.

Key assumptions:

1. The installation process is assumed to be manual, so there is no electricity consumption associated.

B1 - B7- Use stage
No activities are modelled in the use stage for the SOLID photovoltaic panels. The cleaning of the panels is optional by the user as they are cleaned with rainwater. Furthermore, no direct emissions during the reference service life could be identified.

C1 - De-construction
Module C1 assumes no electricity consumption for removal, in the same was as A5.

C2 - Transport to waste processing
The transport distance to the nearest waste processing plant is estimated at 50 km and the mode of transport is assumed to be truck, which is most common.

C3 - Waste processing for reuse, recovery and/or recycling
The panel is assumed to be treated according to the end-of-life statistics from ELKretsen in Sweden, where 70% of PV panels go to material recovery, 1% are reused, 23% undergo another type of recycling such as filler in construction and 6% go to thermal combustion.

C4 - Final disposal
The end-of-life scenario assumed for the panels contains no final disposal corresponding to C4.

D - Reuse, recovery, or recycling potential
This module includes the benefits and loads of material recovery, reuse, recycling and incineration with energy recovery.

Net loads are established as those related to activities necessary for the preparation of a product related to recycling or recovery processes beyond the system boundary (after the end of the waste condition) up to the point of functional equivalence where secondary material or secondary energy replaces primary production.
The correction factors in the Ecoinvent 3.9.1 "Allocation, cut-off EN15804" database are applied.
The benefits and loads are modelled as follows:

1. For the 70% of panels that go to material recovery, it is assumed that the glass is recovered and substitutes the production of virgin glass.
2. For the 1% of panels that are reused, it is assumed that they substitute new photovoltaic panels.
3. For the 23% that are recycled, it is assumed that the final use is for inert filler for construction, substituting the production of new filler.

<u>CALCULATION METHOD FOR ELECTRICITY PRODUCTION</u>
Energy production in the first year of operation:

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

E_1 = Energy produced in the first year of operation, in kWh/year
S_{rad} = Site-specific annual average solar radiation on module (shadings not included), in kWh/kWp/year. The annual radiation must take into consideration the specific inclination (slope, tilt) and orientation.
A = Area of module, from functional unit (FU), in m^2.
y = Module yield: electrical power, in kWp for standard test conditions (STC) of the module divided by the area of the module. STC: The ratio is given for standard test conditions: irradiance 1 000 W/m^2, cell temperature 25 °C, wind speed 1 m/s, AM1.5.
PR = Performance ratio, coefficient for losses. Site specific performance ratio can be modelled with PV simulation software tools, such as PVSyst or similar.

- Inverter losses
- Temperature losses
- DC cables losses
- AC cables losses
- Shadings
- Losses at weak radiation
- Losses due to dust, snow
- Other Losses

deg = yearly degradation rate.

Degradation
For bifacial N-type monocrystalline silicon modules - 99% of the name plate power during 1st year. The maximum annual power degradation can be up to 0.31% in each of the remaining 29 years[1].
The nameplate capacity of the PV module, as printed in the data sheet, shall be used as the starting point of the degradation curve. If uncertainties on performance measurements are factored in the performance tolerance provided on the data sheet, e.g. +2.5% / -0%, the nameplate capacity without calculating uncertainties shall be used.

Energy production second year of operation:

$$E_2 = E_1 * (1 - deg) \tag{2}$$

Energy production n year of operation:

$$E_n = E_1 * (1 - deg)^{n-1} \tag{3}$$

Energy production over reference service life of module, assuming linear annual degradation:

$$E_{RSL} = E_1 * \left(1 + \sum_{n=1}^{RSL-1} (1 - deg)^n\right) \tag{4}$$

RSL = Reference service life for energy-producing unit, from functional unit (FU), stated in the EPD
n = year of operation.

[1] https://www.solitek.eu/storage/app/media/atsisiuntimai/2024-new/Warranty-for-Glass-Glass-solar-panels%20-%202024-09-11.pdf

Parameter	Value	Comment
S_{rad}	Site specific	Example of source for this is the Photovoltaic Geographical Information System (PVGIS): https://joint-research-centre.ec.europa.eu/pvgisphotovoltaic-geographical-information-system_en
A	Model specific	See product information for dimensions of the different models.
y	Model specific	Depends on the power and the area of the model. See product information for power and dimensions of the different models. For instance, the model SOLID Bifacial B108 435W has 0.22 kWp/m^2
PR	Site specific	Can be calculated with a PV simulation software such as PVSyst or similar
deg	0.31%	
RSL	30 years	Guarantee by Solitek

CUT-OFF RULES

No life cycle stage, processes, or required data were knowingly omitted. All relevant material and energy inputs were included. Flows related to both services (intangible products) and the use of fixed capital assets are considered irrelevant in the foreground system and are excluded. The effect of such exclusion is considered to be of low importance. No exclusion based on mass or energy has been made.

ALLOCATION

General allocation principles were applied according to EN 15804:2012+A2:2019. The background system uses economic partitioning with few exceptions where exergy partitioning is used. Regarding allocation of co-products in the foreground system, no allocation was required as no co-production takes place.

For the assigning of energy inputs at the plant level to specific processes related to the product under study in the foreground system, the assignment is done based on total number of panels produced in the plant. For the allocation of raw materials and packaging, the assignment is done based on the material needs for one panel. Regarding waste streams, the polluters pay principle has been considered for the modelling approach of end of life.

DATA QUALITY

According to the criteria of the "UN Environmental Global Guidance on LCA database development", the data quality for all three representativeness categories (geographical, technological and time) can be quantified as Very good. Data quality rating procedure has been performed using a rating system where “1” means Excellent quality, and “5” means Poor quality.

- Technological: 2 (All the input materials are modelled with the most accurate activities from Ecoinvent. The modelled solar cells do not match the exact characteristics of the bifacial cells used by Solitek)
- Geographic: 1.5 (Solar cell production is modelled for China, which is the most impactful raw material. The electricity is modelled for Lithuania, and the rest of raw materials are modelled for Europe, when available)
- Time: 2.5 (The inventories from Ecoinvent are from 2022. For the solar cells, the inventory was created in 2018, but is connected to the 2022 Ecoinvent version. Lastly, the electricity mix for the solar cells is from 2024 in China)
- Average DQR: 2

A summary of the data quality assessment, in line with requirements of PCR in Section 4.6.5. is shown below:

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Photovoltaic cell production, single-Si	Report (further adapted to match the characteristics of the cells used by Solitek)	*Life Cycle Inventories and Life Cycle Assessments of Photovoltaic Systems* for the year 2018 by the International Energy Agency (2020)	2022	Secondary data	0%
Glass production (front and back of solar panel)	Database	Ecoinvent v3.9.1	2024	Secondary data	0%
Other processes	Databases, collected data	Ecoinvent v3.9.1	2022–2024	Primary data, secondary data	4%
Total share of primary data, of GWP-GHG results for A1-A3					**4%**

The 4% in primary data of GWP-GHG comes from the transport in A2. The contribution of A3 to GWP-GHG is < 1%.

<u>Modules declared, geographical scope, share of primary data (in GWP-GHG results) and data variation (in GWP-GHG results):</u>

	Product stage			Distribution/ installation stage		Use stage							End-of-life stage				Beyond product life cycle
	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	GLO	GLO	LT	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU	EU
Share of primary data	4%[2]			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-12%/+21%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

[2] The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

ENVIRONMENTAL PERFORMANCE

LCA results of the product(s) - main environmental performance results based on average results of the product group weighted by sales

The Life Cycle Assessment study has been performed in accordance with the requirements of EN15804+A2:2019 (version 1.02), PCR 2019:14 (v2.0.1 issue data 2025-06-05 valid until 2030-04-07) and JRC characterization factors EF 3.1.

Mandatory impact category indicators according to EN 15804

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	5.24E-01	1.70E-02	1.15E-02	0.00E+00	0.00E+00	5.74E-04	3.14E-02	0.00E+00	-2.07E-01
GWP-fossil	kg CO_2 eq.	5.28E-01	1.70E-02	3.82E-04	0.00E+00	0.00E+00	5.73E-04	3.14E-02	0.00E+00	-2.09E-01
GWP-biogenic	kg CO_2 eq.	-4.74E-03	1.46E-05	1.11E-02	0.00E+00	0.00E+00	4.92E-07	0.00E+00	0.00E+00	2.42E-03
GWP-luluc	kg CO_2 eq.	7.08E-04	8.25E-06	3.34E-07	0.00E+00	0.00E+00	2.78E-07	1.82E-06	0.00E+00	-3.00E-04
ODP	kg CFC 11 eq.	1.73E-08	3.70E-10	4.46E-12	0.00E+00	0.00E+00	1.25E-11	4.50E-11	0.00E+00	-1.36E-08
AP	mol H^+ eq.	3.96E-03	5.54E-05	1.30E-06	0.00E+00	0.00E+00	1.87E-06	1.69E-05	0.00E+00	-1.32E-03
EP-freshwater	kg P eq.	2.70E-04	1.19E-06	4.12E-08	0.00E+00	0.00E+00	4.01E-08	5.08E-07	0.00E+00	-8.19E-05
EP-marine	kg N eq.	7.36E-04	1.91E-05	1.28E-06	0.00E+00	0.00E+00	6.44E-07	6.88E-06	0.00E+00	-2.62E-04
EP-terrestrial	mol N eq.	7.62E-03	2.01E-04	4.91E-06	0.00E+00	0.00E+00	6.79E-06	6.95E-05	0.00E+00	-2.64E-03
POCP	kg NMVOC eq.	2.41E-03	8.28E-05	1.70E-06	0.00E+00	0.00E+00	2.79E-06	1.68E-05	0.00E+00	-8.94E-04
ADP-minerals& metals*	kg Sb eq.	6.68E-05	5.65E-08	8.04E-12	0.00E+00	0.00E+00	1.92E-09	0.00E+00	0.00E+00	-5.73E-06
ADP-fossil*	MJ	6.71E+00	2.43E-01	2.69E-03	0.00E+00	0.00E+00	8.19E-03	2.27E-02	0.00E+00	-2.65E+00
WDP*	m^3	1.56E+00	1.22E-03	1.52E-04	0.00E+00	0.00E+00	4.11E-05	1.38E-03	0.00E+00	-2.38E-01
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									

** Disclaimers:*
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.
The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.
The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[3]	kg CO_2 eq.	5.29E-01	1.70E-02	3.83E-04	0.00E+00	0.00E+00	5.73E-04	3.14E-02	0.00E+00	-2.10E-01
Ecotoxicity-freshwater	CTUe	4.54E+00	1.18E-01	4.98E-03	0.00E+00	0.00E+00	3.98E-03	2.91E-01	0.00E+00	-1.49E+00
Human toxicity: carcinogenic	CTUh	3.89E-10	8.06E-12	3.56E-13	0.00E+00	0.00E+00	2.72E-13	3.73E-11	0.00E+00	-1.29E-10
Human toxicity: non-carcinogenic	CTUh	1.05E-08	1.71E-10	8.51E-12	0.00E+00	0.00E+00	5.75E-12	2.43E-09	0.00E+00	-4.80E-09
Ionising radiation: human health	kBq U235 eq.	4.36E-02	3.22E-04	8.83E-06	0.00E+00	0.00E+00	1.09E-05	7.08E-05	0.00E+00	-1.91E-02
Land use/soil quality potential	-	3.01E+00	1.43E-01	1.89E-03	0.00E+00	0.00E+00	4.84E-03	3.03E-02	0.00E+00	-7.40E-01
Particulate matter formation	disease incidence	3.16E-08	1.35E-09	2.85E-11	0.00E+00	0.00E+00	4.56E-11	1.85E-10	0.00E+00	-1.44E-08

Resource use indicators

Results per functional or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.09E+00	3.28E-03	1.01E-04	0.00E+00	0.00E+00	1.11E-04	1.69E-03	0.00E+00	-3.83E-01
PERM	MJ	2.10E-01	4.55E-04	1.32E-05	0.00E+00	0.00E+00	1.53E-05	7.34E-04	0.00E+00	-4.06E-02
PERT	MJ	1.30E+00	3.73E-03	1.15E-04	0.00E+00	0.00E+00	1.26E-04	2.42E-03	0.00E+00	-4.23E-01
PENRE	MJ	3.71E-01	3.80E-03	6.36E-05	0.00E+00	0.00E+00	1.28E-04	5.67E-04	0.00E+00	-9.13E-02
PENRM	MJ	1.47E-01	2.33E-03	1.86E-05	0.00E+00	0.00E+00	7.85E-05	1.32E-04	0.00E+00	-5.83E-03
PENRT	MJ	5.18E-01	6.13E-03	8.21E-05	0.00E+00	0.00E+00	2.07E-04	6.99E-04	0.00E+00	-9.72E-02
SM	kg	1.58E-03	1.09E-04	2.44E-06	0.00E+00	0.00E+00	3.68E-06	2.74E-05	0.00E+00	-2.21E-03

[3] 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.

RSF	MJ	1.12E-03	1.39E-06	2.63E-08	0.00E+00	0.00E+00	4.68E-08	9.92E-06	0.00E+00	-1.22E-04
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.46E-02	2.96E-05	1.94E-06	0.00E+00	0.00E+00	9.99E-07	3.58E-05	0.00E+00	-5.57E-03
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 or declared unit										
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1-B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	2.95E-02	1.63E-04	1.15E-05	0.00E+00	0.00E+00	5.49E-06	8.92E-04	0.00E+00	-9.40E-03
Non-hazardous waste disposed	kg	1.08E+00	4.95E-03	1.68E-04	0.00E+00	0.00E+00	1.67E-04	1.84E-02	0.00E+00	-3.32E-01
Radioactive waste disposed	kg	1.08E-05	7.83E-08	2.18E-09	0.00E+00	0.00E+00	2.64E-09	1.74E-08	0.00E+00	-4.76E-06

Output flow indicators

Results per functional or declared 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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	3.60E-04	1.78E-06	1.03E-03	0.00E+00	0.00E+00	6.00E-08	1.33E-04	0.00E+00	4.71E-04
Materials for energy recovery	kg	6.33E-07	1.49E-08	2.42E-10	0.00E+00	0.00E+00	5.02E-10	3.28E-09	0.00E+00	-3.23E-07
Exported energy, electricity	MJ	2.80E-03	3.89E-05	9.40E-07	0.00E+00	0.00E+00	1.31E-06	2.40E-04	0.00E+00	-1.67E-03
Exported energy, thermal	MJ	2.46E-03	5.15E-05	5.96E-07	0.00E+00	0.00E+00	1.74E-06	8.80E-06	0.00E+00	-1.61E-03

ADDITIONAL ENVIRONMENTAL INFORMATION

Variations for max-average and min-average results among the modules A1-A3

LCA result of one declared unit product (A-C)	Unit	Min	Representative/ Average	Max	Variation (Min to average)	Variation (Max to average)
GWP-total	kg CO2 eq.	4.62E-01	5.24E-01	6.52E-01	12%	20%
GWP-fossil	kg CO2 eq.	4.65E-01	5.28E-01	6.59E-01	12%	20%
GWP-biogenic	kg CO2 eq.	-8.34E-03	-4.74E-03	-3.65E-03	76%	30%
GWP-luluc	kg CO2 eq.	6.48E-04	7.08E-04	8.11E-04	8%	13%
ODP	kg CFC 11 eq.	1.60E-08	1.73E-08	1.99E-08	8%	13%
AP	mol H+ eq.	3.35E-03	3.96E-03	5.38E-03	15%	27%
EP-freshwater	kg P eq.	2.46E-04	2.70E-04	3.48E-04	9%	22%
EP- marine	kg N eq.	6.31E-04	7.36E-04	9.80E-04	14%	25%
EP-terrestrial	mol N eq.	6.49E-03	7.62E-03	1.03E-02	15%	26%
POCP	kg NMVOC eq.	2.07E-03	2.41E-03	3.24E-03	14%	26%
ADP-minerals&metals*	kg Sb eq.	6.45E-05	6.68E-05	6.91E-05	3%	3%
ADP-fossil*	kg CO2 eq.	5.96E+00	6.71E+00	8.33E+00	11%	19%
WDP*	kg CO2 eq.	1.48E+00	1.56E+00	1.61E+00	5%	3%

The variations in results showed above occur due to the material differences between the products included in the EPD. As it can be seen in the product information section, the products differ in the thickness of the front and back glass, the quantity of solar cells per panel, whether the panel has frame or not, and the quantity of silicone and encapsulant.

The four scenarios of the End of life (100% material recovery, 100% reuse, 100% recycled as construction filler, 100% incinerated) have been declared in the EPD.

The 100% material recovery scenario

Results per declared unit						
Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	0.00E+00	5.74E-04	1.71E-02	0.00E+00	-5.88E-02
GWP-fossil	kg CO2 eq.	0.00E+00	5.73E-04	1.71E-02	0.00E+00	-6.21E-02
GWP-biogenic	kg CO2 eq.	0.00E+00	4.92E-07	0.00E+00	0.00E+00	3.26E-03
GWP-luluc	kg CO2 eq.	0.00E+00	2.78E-07	1.56E-06	0.00E+00	-1.31E-05
ODP	kg CFC 11 eq.	0.00E+00	1.25E-11	2.94E-11	0.00E+00	-1.38E-09
AP	mol H+ eq.	0.00E+00	1.87E-06	1.26E-05	0.00E+00	-6.19E-04
EP-freshwater	kg P eq.	0.00E+00	4.01E-08	3.73E-07	0.00E+00	-8.01E-06
EP-marine	kg N eq.	0.00E+00	6.44E-07	4.17E-06	0.00E+00	-9.28E-05
EP-terrestrial	mol N eq.	0.00E+00	6.79E-06	4.80E-05	0.00E+00	-1.22E-03
POCP	kg NMVOC eq.	0.00E+00	2.79E-06	1.07E-05	0.00E+00	-3.34E-04
ADP-minerals&metals	kg Sb eq.	0.00E+00	1.88E-09	1.42E-08	0.00E+00	-4.91E-07
ADP-fossil	MJ	0.00E+00	8.19E-03	1.67E-02	0.00E+00	-6.91E-01
WDP	m3	0.00E+00	4.11E-05	7.49E-04	0.00E+00	-1.53E-02
GWP-GHG	kg CO2 eq.	0.00E+00	5.73E-04	1.71E-02	0.00E+00	-6.21E-02
Ecotoxicity-freshwater	CTUe	0.00E+00	3.98E-03	1.65E-01	0.00E+00	-5.22E-01
Human toxicity: carcinogenic	CTUh	0.00E+00	2.72E-13	3.40E-11	0.00E+00	-1.64E-11

Human toxicity: non-carcinogenic	CTUh	0.00E+00	5.75E-12	2.17E-09	0.00E+00	-3.59E-10
Ionising radiation: human health	kBq U235 eq.	0.00E+00	1.09E-05	5.84E-05	0.00E+00	-3.04E-03
Land use	-	0.00E+00	4.84E-03	2.58E-02	0.00E+00	-2.50E-01
Particulate matter formation	disease incidence	0.00E+00	4.56E-11	1.37E-10	0.00E+00	-6.50E-09
PERE	MJ	0.00E+00	1.11E-04	1.56E-03	0.00E+00	-3.46E-02
PERM	MJ	0.00E+00	1.53E-05	7.51E-04	0.00E+00	-1.37E-02
PERT	MJ	0.00E+00	1.26E-04	2.31E-03	0.00E+00	-4.83E-02
PENRE	MJ	0.00E+00	1.28E-04	4.42E-04	0.00E+00	-1.68E-02
PENRM	MJ	0.00E+00	7.85E-05	9.17E-05	0.00E+00	-2.65E-03
PENRT	MJ	0.00E+00	2.07E-04	5.34E-04	0.00E+00	-1.95E-02
SM	kg	0.00E+00	3.68E-06	2.00E-05	0.00E+00	-8.00E-05
RSF	MJ	0.00E+00	4.68E-08	1.04E-05	0.00E+00	-3.60E-05
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m3	0.00E+00	9.99E-07	2.46E-05	0.00E+00	-3.94E-04
Hazardous waste disposed	kg	0.00E+00	5.49E-06	5.91E-04	0.00E+00	-6.81E-04
Non-hazardous waste disposed	kg	0.00E+00	1.67E-04	6.34E-03	0.00E+00	-3.58E-02
Radioactive waste disposed	kg	0.00E+00	2.64E-09	1.44E-08	0.00E+00	-7.72E-07
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	6.00E-08	1.67E-05	0.00E+00	1.05E-03
Materials for energy recovery	kg	0.00E+00	5.02E-10	3.14E-09	0.00E+00	-2.05E-07
Exported energy, electricity	MJ	0.00E+00	1.31E-06	4.78E-06	0.00E+00	-4.35E-04
Exported energy, thermal	MJ	0.00E+00	1.74E-06	5.69E-06	0.00E+00	-1.65E-03

The 100% panel reuse scenario

Results per declared unit						
Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	0.00E+00	5.74E-04	8.06E-02	0.00E+00	-1.17E+00
GWP-fossil	kg CO2 eq.	0.00E+00	5.73E-04	8.06E-02	0.00E+00	-1.17E+00
GWP-biogenic	kg CO2 eq.	0.00E+00	4.92E-07	0.00E+00	0.00E+00	-3.19E-03
GWP-luluc	kg CO2 eq.	0.00E+00	2.78E-07	2.52E-06	0.00E+00	-2.05E-03
ODP	kg CFC 11 eq.	0.00E+00	1.25E-11	9.56E-11	0.00E+00	-8.88E-08
AP	mol H+ eq.	0.00E+00	1.87E-06	3.21E-05	0.00E+00	-6.21E-03
EP-freshwater	kg P eq.	0.00E+00	4.01E-08	9.86E-07	0.00E+00	-5.37E-04
EP-marine	kg N eq.	0.00E+00	6.44E-07	1.59E-05	0.00E+00	-1.39E-03
EP-terrestrial	mol N eq.	0.00E+00	6.79E-06	1.43E-04	0.00E+00	-1.25E-02
POCP	kg NMVOC eq.	0.00E+00	2.79E-06	3.64E-05	0.00E+00	-4.62E-03
ADP-minerals&metals	kg Sb eq.	0.00E+00	1.88E-09	2.01E-08	0.00E+00	-3.76E-05
ADP-fossil	MJ	0.00E+00	8.19E-03	4.05E-02	0.00E+00	-1.53E+01
WDP	m3	0.00E+00	4.11E-05	2.98E-03	0.00E+00	-1.60E+00
GWP-GHG	kg CO2 eq.	0.00E+00	5.73E-04	8.06E-02	0.00E+00	-1.17E+00
Ecotoxicity-freshwater	CTUe	0.00E+00	3.98E-03	7.28E-01	0.00E+00	-7.91E+00
Human toxicity: carcinogenic	CTUh	0.00E+00	2.72E-13	5.57E-11	0.00E+00	-8.26E-10
Human toxicity: non-carcinogenic	CTUh	0.00E+00	5.75E-12	3.78E-09	0.00E+00	-3.21E-08
Ionising radiation: human health	kBq U235 eq.	0.00E+00	1.09E-05	1.19E-04	0.00E+00	-1.19E-01
Land use	-	0.00E+00	4.84E-03	4.35E-02	0.00E+00	-3.82E+00
Particulate matter formation	disease incidence	0.00E+00	4.56E-11	3.12E-10	0.00E+00	-6.90E-08
PERE	MJ	0.00E+00	1.11E-04	2.40E-03	0.00E+00	-2.52E+00
PERM	MJ	0.00E+00	1.53E-05	8.54E-04	0.00E+00	-2.14E-01
PERT	MJ	0.00E+00	1.26E-04	3.26E-03	0.00E+00	-2.74E+00
PENRE	MJ	0.00E+00	1.28E-04	9.72E-04	0.00E+00	-5.60E-01

PENRM	MJ	0.00E+00	7.85E-05	2.33E-04	0.00E+00	-2.75E-02
PENRT	MJ	0.00E+00	2.07E-04	1.20E-03	0.00E+00	-5.88E-01
SM	kg	0.00E+00	3.68E-06	4.16E-05	0.00E+00	-1.52E-02
RSF	MJ	0.00E+00	4.68E-08	1.09E-05	0.00E+00	-6.83E-04
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m3	0.00E+00	9.99E-07	7.94E-05	0.00E+00	-3.73E-02
Hazardous waste disposed	kg	0.00E+00	5.49E-06	1.98E-03	0.00E+00	-6.29E-02
Non-hazardous waste disposed	kg	0.00E+00	1.67E-04	5.32E-02	0.00E+00	-2.16E+00
Radioactive waste disposed	kg	0.00E+00	2.64E-09	2.92E-08	0.00E+00	-2.96E-05
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	6.00E-08	5.04E-04	0.00E+00	-3.06E-03
Materials for energy recovery	kg	0.00E+00	5.02E-10	4.22E-09	0.00E+00	-1.32E-06
Exported energy, electricity	MJ	0.00E+00	1.31E-06	1.28E-05	0.00E+00	-9.54E-03
Exported energy, thermal	MJ	0.00E+00	1.74E-06	1.96E-05	0.00E+00	-3.17E-03

The 100% recycling as construction filler scenario

Results per declared unit						
Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	0.00E+00	5.74E-04	8.06E-02	0.00E+00	3.35E-04
GWP-fossil	kg CO2 eq.	0.00E+00	5.73E-04	8.06E-02	0.00E+00	-3.40E-03
GWP-biogenic	kg CO2 eq.	0.00E+00	4.92E-07	0.00E+00	0.00E+00	3.73E-03
GWP-luluc	kg CO2 eq.	0.00E+00	2.78E-07	2.52E-06	0.00E+00	-2.09E-07
ODP	kg CFC 11 eq.	0.00E+00	1.25E-11	9.56E-11	0.00E+00	-5.47E-11
AP	mol H+ eq.	0.00E+00	1.87E-06	3.21E-05	0.00E+00	-2.56E-05
EP-freshwater	kg P eq.	0.00E+00	4.01E-08	9.86E-07	0.00E+00	-1.15E-06
EP-marine	kg N eq.	0.00E+00	6.44E-07	1.59E-05	0.00E+00	2.07E-06
EP-terrestrial	mol N eq.	0.00E+00	6.79E-06	1.43E-04	0.00E+00	-7.79E-05
POCP	kg NMVOC eq.	0.00E+00	2.79E-06	3.64E-05	0.00E+00	-2.44E-05
ADP-minerals&metals	kg Sb eq.	0.00E+00	1.88E-09	2.01E-08	0.00E+00	-2.18E-08
ADP-fossil	MJ	0.00E+00	8.19E-03	4.05E-02	0.00E+00	-5.92E-02
WDP	m3	0.00E+00	4.11E-05	2.98E-03	0.00E+00	-9.69E-04
GWP-GHG	kg CO2 eq.	0.00E+00	5.73E-04	8.06E-02	0.00E+00	-3.40E-03
Ecotoxicity-freshwater	CTUe	0.00E+00	3.98E-03	7.28E-01	0.00E+00	-7.38E-03
Human toxicity: carcinogenic	CTUh	0.00E+00	2.72E-13	5.57E-11	0.00E+00	-2.37E-12
Human toxicity: non-carcinogenic	CTUh	0.00E+00	5.75E-12	3.78E-09	0.00E+00	-4.39E-11
Ionising radiation: human health	kBq U235 eq.	0.00E+00	1.09E-05	1.19E-04	0.00E+00	-8.34E-04
Land use	-	0.00E+00	4.84E-03	4.35E-02	0.00E+00	-1.20E-01
Particulate matter formation	disease incidence	0.00E+00	4.56E-11	3.12E-10	0.00E+00	-2.48E-10
PERE	MJ	0.00E+00	1.11E-04	2.40E-03	0.00E+00	-1.03E-02
PERM	MJ	0.00E+00	1.53E-05	8.54E-04	0.00E+00	-4.46E-03
PERT	MJ	0.00E+00	1.26E-04	3.26E-03	0.00E+00	-1.47E-02
PENRE	MJ	0.00E+00	1.28E-04	9.72E-04	0.00E+00	-1.25E-03
PENRM	MJ	0.00E+00	7.85E-05	2.33E-04	0.00E+00	-3.24E-04
PENRT	MJ	0.00E+00	2.07E-04	1.20E-03	0.00E+00	-1.57E-03
SM	kg	0.00E+00	3.68E-06	4.16E-05	0.00E+00	4.46E-05
RSF	MJ	0.00E+00	4.68E-08	1.09E-05	0.00E+00	-2.02E-07
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m3	0.00E+00	9.99E-07	7.94E-05	0.00E+00	-8.81E-05
Hazardous waste disposed	kg	0.00E+00	5.49E-06	1.98E-03	0.00E+00	-7.06E-05
Non-hazardous waste disposed	kg	0.00E+00	1.67E-04	5.32E-02	0.00E+00	-6.15E-03

Radioactive waste disposed	kg	0.00E+00	2.64E-09	2.92E-08	0.00E+00	-2.13E-07
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	6.00E-08	5.04E-04	0.00E+00	1.06E-03
Materials for energy recovery	kg	0.00E+00	5.02E-10	4.22E-09	0.00E+00	4.21E-08
Exported energy, electricity	MJ	0.00E+00	1.31E-06	1.28E-05	0.00E+00	-1.22E-04
Exported energy, thermal	MJ	0.00E+00	1.74E-06	1.96E-05	0.00E+00	-1.03E-05

The 100% incineration scenario

Results per declared unit						
Indicator	Unit	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	0.00E+00	5.74E-04	1.25E-03	0.00E+00	2.84E-03
GWP-fossil	kg CO2 eq.	0.00E+00	5.73E-04	1.20E-03	0.00E+00	-9.01E-04
GWP-biogenic	kg CO2 eq.	0.00E+00	4.92E-07	5.65E-05	0.00E+00	3.73E-03
GWP-luluc	kg CO2 eq.	0.00E+00	2.78E-07	2.12E-06	0.00E+00	4.64E-06
ODP	kg CFC 11 eq.	0.00E+00	1.25E-11	2.47E-11	0.00E+00	-1.46E-11
AP	mol H+ eq.	0.00E+00	1.87E-06	6.66E-06	0.00E+00	-4.74E-06
EP-freshwater	kg P eq.	0.00E+00	4.01E-08	1.68E-07	0.00E+00	-8.80E-07
EP-marine	kg N eq.	0.00E+00	6.44E-07	2.40E-06	0.00E+00	8.68E-06
EP-terrestrial	mol N eq.	0.00E+00	6.79E-06	2.54E-05	0.00E+00	-6.26E-06
POCP	kg NMVOC eq.	0.00E+00	2.79E-06	9.22E-06	0.00E+00	-1.96E-06
ADP-minerals&metals	kg Sb eq.	0.00E+00	1.88E-09	3.19E-09	0.00E+00	-1.20E-08
ADP-fossil	MJ	0.00E+00	8.19E-03	2.19E-02	0.00E+00	-2.49E-02
WDP	m3	0.00E+00	4.11E-05	2.26E-03	0.00E+00	-5.88E-04
GWP-GHG	kg CO2 eq.	0.00E+00	5.73E-04	1.20E-03	0.00E+00	-8.97E-04
Ecotoxicity-freshwater	CTUe	0.00E+00	3.98E-03	1.43E-02	0.00E+00	1.32E-02
Human toxicity: carcinogenic	CTUh	0.00E+00	2.72E-13	1.76E-12	0.00E+00	-4.05E-13
Human toxicity: non-carcinogenic	CTUh	0.00E+00	5.75E-12	1.04E-11	0.00E+00	-1.92E-11
Ionising radiation: human health	kBq U235 eq.	0.00E+00	1.09E-05	2.20E-05	0.00E+00	-7.82E-04
Land use	-	0.00E+00	4.84E-03	3.02E-02	0.00E+00	-5.39E-02
Particulate matter formation	disease incidence	0.00E+00	4.56E-11	2.27E-10	0.00E+00	1.84E-12
PERE	MJ	0.00E+00	1.11E-04	3.10E-04	0.00E+00	-9.64E-03
PERM	MJ	0.00E+00	1.53E-05	5.52E-05	0.00E+00	-4.38E-03
PERT	MJ	0.00E+00	1.26E-04	3.65E-04	0.00E+00	-1.40E-02
PENRE	MJ	0.00E+00	1.28E-04	4.04E-04	0.00E+00	-6.22E-04
PENRM	MJ	0.00E+00	7.85E-05	1.99E-04	0.00E+00	-3.22E-06
PENRT	MJ	0.00E+00	2.07E-04	6.03E-04	0.00E+00	-6.25E-04
SM	kg	0.00E+00	3.68E-06	5.65E-05	0.00E+00	6.35E-05
RSF	MJ	0.00E+00	4.68E-08	6.58E-07	0.00E+00	-2.43E-08
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m3	0.00E+00	9.99E-07	-7.17E-06	0.00E+00	-1.91E-05
Hazardous waste disposed	kg	0.00E+00	5.49E-06	3.11E-05	0.00E+00	-3.54E-05
Non-hazardous waste disposed	kg	0.00E+00	1.67E-04	2.07E-02	0.00E+00	-4.99E-03
Radioactive waste disposed	kg	0.00E+00	2.64E-09	5.30E-09	0.00E+00	-2.01E-07
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	6.00E-08	1.77E-07	0.00E+00	1.06E-03
Materials for energy recovery	kg	0.00E+00	5.02E-10	1.08E-09	0.00E+00	4.40E-08
Exported energy, electricity	MJ	0.00E+00	1.31E-06	3.89E-03	0.00E+00	-1.17E-04
Exported energy, thermal	MJ	0.00E+00	1.74E-06	2.06E-06	0.00E+00	-4.36E-06

ABBREVIATIONS

General Abbreviations	
EN	European Norm (Standard)
EPD	Environmental Product Declaration
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rules
c-PCR	Complementary Product Category Rules
CEN	European Committee for Standardization
CPC	Central product classification
Other Relevant Terms	
SVHC	Substances of Very High Concern
EC No.	European Community Number
CAS No.	Chemical Abstracts Service Number
MJ	Megajoule
kg	Kilogram
m^3	Cubic Meter
NMVOC	Non-Methane Volatile Organic Compounds
Sb eq.	Antimony Equivalents
P eq.	Phosphorus Equivalents
N eq.	Nitrogen Equivalents
CFC-11 eq.	Chlorofluorocarbon-11 Equivalents
CO_2 eq.	Carbon Dioxide Equivalents
kg C	Kilograms of Carbon
kg CO_2 eq.	Kilograms of Carbon Dioxide Equivalent
ND	Not Declared

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VERSION HISTORY

Original Version of the EPD, 2025-10-24

Revision 1, 2025-12-03: some changes are made to the solar cells. In the original EPD, 108 cells were assumed to weigh 1.134 kg. Since half cells are used, the weight is adjusted to 0.571

kg/108 half cells. For the cutting of the solar cells, an average loss of ~8% is assumed. Also, in this revision the wafer is modelled from the IEA paper instead of Ecoinvent. Lastly, originally the solar cells were erroneously modelled as multi-Si, now corrected to single-Si cells.

EPD
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