

Environmental Product Declaration

In accordance with 14025 and EN15804 +A2

First Solar Series 7 Photovoltaic Module



Owner of the declaration:
First Solar

Product name:
Series 7 Photovoltaic Module

Declared unit:
1 Watt peak (Wp)

Product category /PCR:
Photovoltaic modules / NPCR 029:2020 Part B
Version 1.1

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-5039-4377-EN

Registration number:
NEPD-5039-4377-EN

Issue date: 27.09.2023

Valid to: 27.09.2028

General information

Product:

Series 7 Photovoltaic Module

Program operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Tlf: +47 23 08 80 00
e-mail: post@epd-norge.no

Declaration number:

NEPD-5039-4377-EN

This declaration is based on Product Category Rules:

EN 15804:2012+A2:2019 serves as core PCR.
NPCR Part A: Construction products and services,
Version 2.0. NPCR 029:2020 Part B Version 1.1

Statements:

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

Declared unit:

1 Wp*

Declared unit with option:

Functional unit:

1 Wp*

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal external



Joep Meijer, President of the Right Environment
Independent verifier approved by EPD Norway

Owner of the declaration:

First Solar
Contact person: Parikhit Sinha
Phone: 480-619-3960
e-mail: parikhit.sinha@firstsolar.com

Manufacturer:

First Solar
350 W Washington St, Tempe, AZ 85281
Phone: 1.419.662.6899
e-mail: sustainability@firstsolar.com

Place of production:

Perrysburg, Ohio, USA | Sriperumbudur, Tamil Nadu, India; 50% | 50% production capacity

Management system:

ISO 9001, ISO 14001, ISO 45001, EPEAT Silver

Organisation no:

[NA]

Issue date:

27.09.2023

Valid to:

27.09.2028

Year of study:

2023

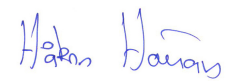
Comparability:

EPDs from other programmes than EPD Norway may not be comparable.

The EPD has been worked out by:

Parikhit Sinha

Approved



Manager of EPD Norway

Product

Product description:

Series 7 thin film solar PV modules combine First Solar’s thin film technology with an optimized structural design to deliver improved efficiency, enhanced installation velocity, and lifetime energy performance. They are characterized by reliable performance in high temperature and humidity (IEC 61215, 61730; UL 61730), extreme desert (IEC 60068-2-68), and coastal applications (IEC 61701). Series 7 modules have glass/glass construction with anti-reflective coating; back rail mount; warranted against power loss from cell cracking; global PV module recycling services.

Product specification:

Rated output: 505-540 Wp; yearly degradation rate: 0.3%/yr; warranty: 30 year linear performance; technology: thin film CdTe

Materials	USA (%)	India (%)
Glass	79.0%	84.2%
Galvanized steel backrail	17.5%	12.1%
Encapsulant	2.7%	2.9%
Frame adhesive	0.4%	0.4%
Thin film CdTe semiconductor	0.1%	0.1%
Junction box	0.3%	0.3%

Technical data:

Module area: 2.80 m²; Module weight: 36.8 | 39.7 kg for India | USA; Average module conversion efficiency: 0.187 Wp/m² or 18.7% (18.1-19.3% conversion efficiency for 505-540 Wp); Manufactured under one roof with 100% traceable QA/QC (Semiconductor deposition, cell definition, and module finishing). <https://www.firstsolar.com/Products/Series-7>

Market:

Europe

Reference service life, product:

30 years (First Solar, 2023)

Reference service life, building: n/a

LCA: Calculation rules

Declared unit:

Wp

Data quality:

Primary data is from First Solar manufacturing facilities in year 2022-2023. Background data source: SimaPro 9.5.0.1 w/ Ecoinvent 3.9.1 (2023) "allocation, cut-off by classification - unit" database. Inventory quantities have good or better data quality using pedigree matrix approach, and the Ecoinvent unit processes representing the quantities generally have fair or better data quality.

Allocation:

The allocation is made in accordance with the provisions of EN 15804. Allocation among multiple products is not necessary as the manufacturing facility only produces one product. Effects of primary production of recycled materials allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

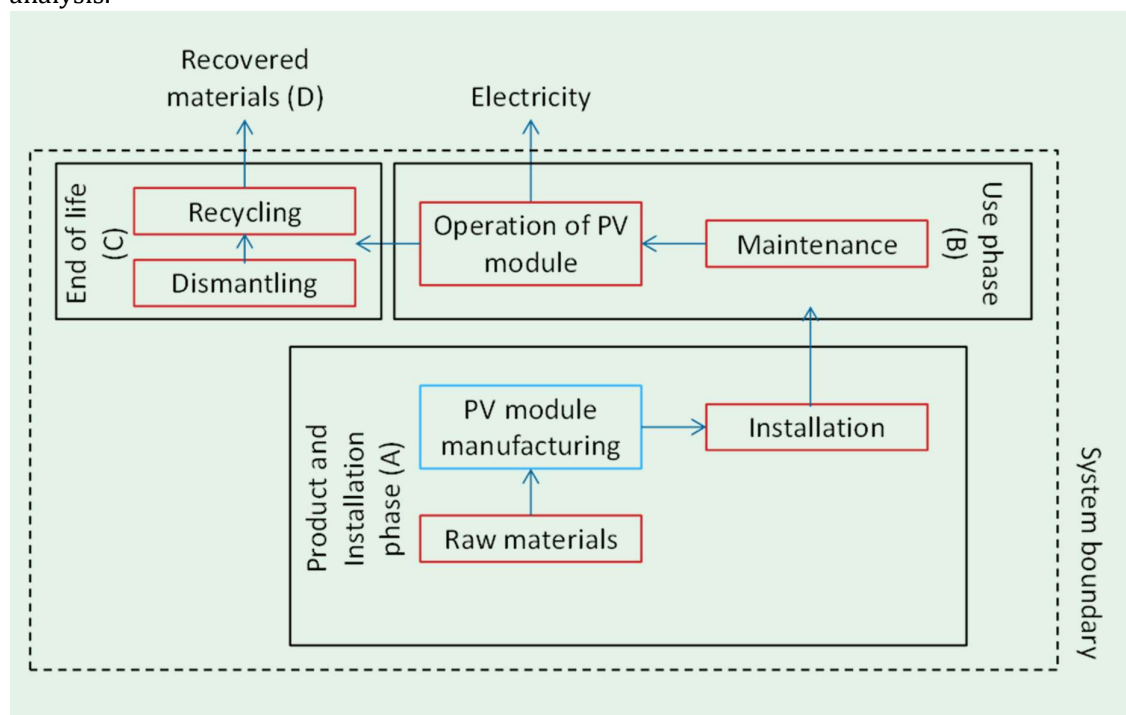


Figure 1. Product system of a First Solar Series 7 PV module

System boundary:

A1 – D (cradle-to-grave)

Cut-off criteria:

All materials and energy used have been included and all waste and emissions to air and water, with the exception of long-term emissions (>100 years).

LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

Raw materials to manufacturing (A1-A3)

Production location	Proportion of Production	Electricity usage (kWh/m ²)	Natural gas usage (MJ/m ²)	Water usage (kg/m ²)
India	50%	18.1	0	22.0
USA	50%		5.23	55.1

The modules A1-A3 are the product stage from raw materials to manufacturing (cradle-to-gate).

Transport from production place to assembly/user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value
Truck	50%	Euro6 16-32 MT lorry	1886	kg/tkm	0.04
Boat (India production)	100%	Container ship	13540	kg/tkm	14
Boat (USA production)	100%	Container ship	6469	kg/tkm	14

The module A4 refers to transport from the manufacturer to the European market via Rotterdam as receiving port.

Assembly (A5)

	Unit/m ²	Value
Auxiliary	kg	0
Water consumption	m ³	0
Electricity consumption	kWh	0.008
Other energy carriers	MJ	0
Material loss	m ²	0.0036
Output materials from waste treatment	kg	0.38
Dust in the air	kg	0

There is minimal energy and material use during PV module installation (A5), as balance of system components such as inverters, mounting, and cabling are not included in scope. Electricity use for power tools and lifting equipment is included, an installation breakage rate of 0.36% is assumed, and waste treatment of wood pallet is modeled as 75% recycling/25% incineration.

Use (B1)

	Unit/m ²	Value
None		

There are no material or energy requirements during the use phase (B1) of the PV module.

Maintenance (B2)/Repair (B3)

	Unit/m ²	Value
Maintenance cycle*	/yr	1
Auxiliary	kg	0

Other resources	kg	0
Water consumption	kg	20
Electricity consumption	kWh	0
Other energy carriers	MJ	0
Material loss	Kg	0

All modules in the use stage (B1-B7) have been assessed, but there are no impacts associated with this stage, except for maintenance (B2) and replacement (B4). There is typically no use of water for cleaning in the European market but water use for cleaning and associated wastewater treatment of the cleaning water is considered.

Replacement (B4)/Refurbishment (B5)

	Unit/m ²	Value
Replacement cycle*	/yr	0.0333
Electricity consumption	kWh	0.008
Replacement of worn parts	m ²	0.0074

There are no parts with reference service life shorter than the declared product. However, to account for potential PV module breakage during use, a 0.74% replacement rate over the reference service life (30 yrs) is considered, based on warranty breakage statistics.

Operational energy (B6) and water consumption (B7)

	Unit	Value
Water consumption	m ³ /m ²	0
Electricity consumption	kWh/m ²	0
Other energy carriers	MJ/m ²	0
Power output of equipment	kWp	0.505-0.540
Average annual electricity production (France)	kWh/kWp/yr	1101
Average annual electricity production (Italy)	kWh/kWp/yr	1314
Average annual electricity production (Norway)	kWh/kWp/yr	843

There is no operational electricity (B6) or water consumption (B7). Annual PV module electricity production is modeled over the reference service life (30 years) for an average European installation (1106 kWh/kWp), with values for some specific countries provided.

End of Life (C1, C3, C4)

	Unit/kg	Value
Hazardous waste disposed	Kg	0
Collected as mixed construction waste	Kg	0
Reuse	Kg	0
Recycling	Kg	1
Energy recovery	Kg	0

To landfill	Kg	0
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Disassembly of PV modules (C1) is based on installation (A5). The EU WEEE Directive mandates recycling and prohibits disposal of end-of-life PV modules. Therefore, 100% recycling and no waste disposal of end-of-life PV modules (C4) is considered. There was no significant difference in impacts based on sensitivity analysis of PV module recycling rate (85% compared to 100%).

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value
Truck (to collection point)	50%	Euro6 3.5-7.5 MT lorry	200	kg/tkm	0.11
Truck (to recycling facility)	50%	Euro6 16-32 MT lorry	2400	kg/tkm	0.04

Transport of end-of-life PV modules is modeled to First Solar's recycling facility in Frankfurt-Oder, Germany, which is an authorized waste management facility in accordance with the Ordinance on Specialized Waste Management Companies (EfbV). The products of recycling meet the depollution requirements in EN 50625-2-4:2017 and CLC/TS 50625-3-5:2017 under the collection, logistics & treatment requirements for the EU WEEE Directive, and therefore meet an end-of-waste state.

Benefits and loads beyond the system boundaries (D)

Scrap	Input (kg/m ²)	Primary content (%)	Input (primary kg/m ²)	Output (primary kg/m ²)	Net output (primary; %)*
Glass	11.2	100	11.2	10.1	90
Frame	2.41	66	1.59	1.59	100
Semiconductor	0.0214	100	0.0214	0.0193	90
Wood	0.194	25	0.0485	0.0363	75

The net avoided burdens related to glass, aluminum, semiconductor (PV module recycling) and wood (pallet recycling) are modeled, by accounting for the benefits of displacing primary production and the loads for secondary production (D).

LCA: Results

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

Product stage			Assembly stage		Use stage							End of life stage				Benefits & loads beyond system boundary
Raw materials	Transport	Manufacturing	Transport	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
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Core environmental impact indicators

Indicator	Unit	A1-A3 ³	A4 ³	A5	B2	B4	C1	C2 ⁴	C3 ⁴	D
GWP-total	kg CO2 eq.	2.35E-01	2.17E-02	1.69E-03	5.61E-05	2.40E-03	1.26E-04	4.36E-02	1.51E-02	-6.42E-02
GWP-fossil	kg CO2 eq.	2.33E-01	2.17E-02	1.29E-03	5.26E-05	2.38E-03	1.17E-04	4.34E-02	1.36E-02	-6.38E-02
GWP-biogenic	kg CO2 eq.	1.06E-03	1.86E-05	4.01E-04	3.43E-06	1.14E-05	8.57E-06	1.18E-04	1.46E-03	-2.99E-04
GWP-LULUC	kg CO2 eq.	2.35E-04	1.32E-05	1.38E-06	6.97E-08	2.20E-06	2.88E-07	2.19E-05	1.91E-05	-2.61E-05
ODP	kg CFC11 eq.	3.13E-09	3.30E-10	2.06E-11	1.16E-12	3.77E-11	2.20E-12	9.21E-10	5.83E-10	-1.04E-09

AP	mol H ⁺ eq.	1.59E-03	2.62E-04	8.34E-06	2.51E-07	1.57E-05	6.61E-07	9.20E-05	4.07E-05	-2.18E-04
EP-freshwater	kg P eq.	1.42E-05	1.60E-07	7.33E-08	2.88E-09	1.26E-07	1.14E-08	3.57E-07	2.17E-06	-1.61E-06
EP-marine	kg N eq.	3.01E-04	6.50E-05	1.67E-06	4.57E-08	3.21E-06	8.30E-08	2.23E-05	7.79E-06	-8.00E-05
EP-terrestrial	mol N eq.	3.56E-03	7.15E-04	1.92E-05	5.17E-07	3.70E-05	9.68E-07	2.32E-04	7.73E-05	-4.68E-04
POCP	kg NMVOC eq.	1.02E-03	2.15E-04	5.84E-06	1.87E-07	1.12E-05	3.11E-07	1.42E-04	2.60E-05	-1.79E-04
ADP-M&M ²	kg Sb eq.	2.94E-06	5.16E-08	1.30E-08	3.30E-10	2.38E-08	1.40E-09	1.48E-07	4.86E-08	-5.47E-07
ADP-fossil ²	MJ	2.83E+00	2.85E-01	1.73E-02	8.07E-04	3.00E-02	2.62E-03	6.00E-01	2.04E-01	-5.70E-01
WDP ²	m ³	4.63E-02	1.03E-03	2.41E-04	4.55E-03	4.31E-04	2.98E-05	2.42E-03	7.72E-03	-1.49E-02

GWP-total: Global Warming Potential; **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; See “additional requirements” for indicator given as PO₄ eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

Additional environmental impact indicators

Indicator	Unit	A1-A3 ³	A4 ³	A5	B2	B4	C1	C2 ⁴	C3 ⁴	D
PM	Disease incidence	1.34E-08	1.02E-09	6.64E-11	2.76E-12	1.31E-10	2.00E-12	2.36E-09	2.26E-10	-2.43E-09
IRP ¹	kBq U235 eq.	6.70E-03	8.78E-05	5.29E-05	5.09E-06	5.89E-05	2.37E-05	3.29E-04	7.18E-04	-5.77E-04
ETP-fw ²	CTUe	1.96E+00	1.62E-01	9.55E-03	2.05E-04	1.91E-02	2.62E-04	3.20E-01	7.23E-02	-4.42E-01
HTP-c ²	CTUh	2.82E-10	9.48E-12	1.23E-12	1.92E-13	2.39E-12	5.42E-14	1.97E-11	4.92E-12	-1.00E-10
HTP-nc	CTUh	5.18E-09	2.26E-10	2.64E-11	2.54E-12	4.86E-11	2.32E-12	5.40E-10	4.92E-10	-9.66E-10
SQP ²	Dimensionless	1.27E+00	1.23E-01	7.08E-03	2.53E-04	1.35E-02	5.11E-04	3.40E-01	3.19E-02	-1.94E-01

PM: Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

1 - 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.

2 - 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.

3 - The product stage (A1-A3) and product transport (A4) LCIA results are based on the proportion of production capacity in two manufacturing locations in year 2023 (50% U.S., 50%, India). Sensitivity analysis of these proportions indicates a median coefficient of variation of 16% and 14%, respectively, in the LCIA results. Apart from the variation due to grid mix, the variation due to the product itself between manufacturing locations is within $\pm 10\%$. In addition, sensitivity analysis of the product stage (A1-A3) to $\pm 20\%$ change in manufacturing electricity usage and regional vs. national grid mix indicates a median coefficient of variation of 6% and 1%, respectively.

4 - The end-of-life stage (C) considers 100% recycling and no disposal of end-of-life PV modules in accordance with the EU WEEE Directive. In sensitivity analysis of the recycling rate with 85% recycling/15% landfill disposal, median differences in LCIA results compared to 100% recycling were -14% and -11% for C2 and C3, respectively.

Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
	Acidification potential, Accumulated Exceedance (AP)	None
ILCD type / level 2	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
ILCD type / level 3	Potential Human exposure efficiency relative to U235 (IRP)	1
	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2

	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
<p>Disclaimer 1 – 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.</p> <p>Disclaimer 2 – 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</p>		

Resource use

Parameter	Unit	A1-A3 ³	A4 ³	A5	B2	B4	C1	C2 ⁴	C3 ⁴	D
RPEE	MJ	2.17E-01	3.14E-03	1.60E-03	1.29E-04	2.06E-03	5.88E-04	1.02E-02	3.36E-02	-3.52E-02
RPEM	MJ	3.55E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.51E-03
TPE	MJ	2.20E-01	3.14E-03	1.60E-03	1.29E-04	0.00E+00	5.88E-04	1.02E-02	3.36E-02	-4.07E-02
NRPE	MJ	2.71E+00	2.85E-01	1.73E-02	8.06E-04	3.00E-02	2.62E-03	6.00E-01	2.04E-01	-5.70E-01
NRPM	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
TRPE	MJ	2.71E+00	2.85E-01	1.73E-02	8.06E-04	3.00E-02	2.62E-03	6.00E-01	2.04E-01	-5.70E-01
SM	kg	3.83E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	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
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
W	m ³	1.43E-03	2.76E-05	8.54E-06	6.18E-07	1.39E-05	1.54E-06	7.19E-05	2.62E-04	-4.10E-04

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water

End of life - Waste

Parameter	Unit	A1-A3 ³	A4 ³	A5	B2	B4	C1	C2 ⁴	C3 ⁴	D
HW	KG	1.53E-05	1.70E-06	8.62E-08	2.40E-09	1.67E-07	4.61E-09	3.82E-06	3.11E-07	-4.37E-06
NHW	KG	3.43E-02	9.68E-03	3.00E-04	2.00E-05	5.91E-04	1.05E-05	2.77E-02	4.48E-03	-3.91E-03
RW	KG	3.75E-06	4.94E-08	3.76E-08	3.85E-09	3.77E-08	1.89E-08	2.17E-07	8.17E-07	-4.03E-07

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life – output flow

Parameter	Unit	A1-A3 ³	A4 ³	A5	B2	B4	C1	C2 ⁴	C3 ⁴	D
CR	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
MR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.63E-02	0.00E+00
MER	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
EEE	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	4.62E-04
ETE	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	9.29E-04

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Reading example: 9,0 E-03 = 9,0*10⁻³ = 0,009

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0.00E+00

Biogenic carbon content in the accompanying packaging	kg C	2.59E-04
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Indicator	Type	Electricity (A3)	Glass (A1)	Steel (A1)	CdTe semiconductor (A1)	Copper (A1)	EVA encapsulant (A1)	Junction box - glass fibre reinforced plastic (A1)	Silicone (A1)	Tin (A1)	Transport (A2, A4)	Solid waste disposal (A3)	Wastewater (A3)	PV panel factory (A1)	Pallet (A1)	Tap water (A1)
AP	Core	X	X	X							X					
GWP-total	Core	X	X	X							X					
GWP-biogenic	Core	X	X									X	X	X	X	
GWP-fossil	Core	X	X	X							X					
GWP-luluc	Core	X														
Eco-toxicity (freshwater)	Additional		X	X							X		X			
EP-freshwater	Core	X	X	X						X			X			
EP-marine	Core	X	X	X							X					
EP-terrestrial	Core	X	X	X							X					
Human toxicity, cancer	Additional	X		X												
Human toxicity, non-cancer effects	Additional	X	X	X		X	X						X			
Ionizing radiation, human health	Additional	X	X	X												
Land use related impacts/ Soil quality	Additional	X	X	X										X	X	
ODP	Core		X	X					X		X					
Particulate Matter emissions	Additional	X	X	X							X			X		
POCP	Core	X	X	X							X					
ADP-fossil	Core	X	X	X			X			X	X					
ADP-minerals&metals	Core	X	X	X	X	X				X				X		
WDP	Core	X	X	X			X	X				X				X

Figure 2. Main contributors to core and additional life cycle environmental impacts

Additional requirements

Greenhouse gas emission from the use of electricity in the manufacturing phase

National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing process (A3; source: Ecoinvent 3.9.1).

National electricity grid	Unit	Value
India	kg CO ₂ -eq/kWh	1.320
USA	kg CO ₂ -eq/kWh	0.473

Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator GWP-IOBC is required as it declares climate impacts calculated according to the principle of instantaneous oxidation. GWP-IOBC is also referred to as GWP-GHG in context to Swedish public procurement legislation.

Indicator	Unit	A1-A3 ³	A4 ³	A5	B2	B4	C1	C2 ⁴	C3 ⁴	D
GWP-IOBC	kg CO ₂ eq.	2.33E-01	2.17E-02	1.69E-03	4.03E-04	2.40E-03	1.26E-04	4.36E-02	1.51E-02	-6.42E-02

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation.

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- ✓ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
- The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.
- The product contains dangerous substances, more than 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.
- The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforkiften, Annex III), see table.

IEC 62474 declarable substances and substance groups	Amount
Cadmium compounds (>0.01% by weight)	0.1% by weight

Indoor environment




No tests have been carried out on the product concerning indoor climate - Not relevant.

Carbon footprint

The product stage (A1-A3) carbon footprint is 0.235 kg CO₂-eq/Wp.

Bibliography

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IEC 61701:2020	Photovoltaic (PV) modules - Salt mist corrosion testing
IEC 61730-1:2016	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction
IEC 62474:2018	Material Declaration for Products of and for the Electrotechnical Industry
ISO 14025:2010	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
NPCR (2020)	NPCR Product Category Rules 029:2020 Part B for photovoltaic modules used in the building and construction industry, including production of cell, wafer, ingot block, solar grade silicon, solar substrates, solar superstrates and other solar grade semiconductor materials, Version 1.1, The Norwegian EPD Foundation, November 2020.
NPCR (2021)	NPCR Product Category Rules, Part A: Construction products and services, Version 2.0, The Norwegian EPD Foundation, March 2021.
UL 61730	Standard for Photovoltaic (PV) Module Safety Qualification

 Global Program Operator	Program Operator	tlf	+47 23 08 80 00
	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-post: web:	post@epd-norge.no www.epd-norge.no
	Publisher	tlf	+47 23 08 80 00
 Global Program Operator	The Norwegian EPD Foundation Post Box 5250 Majorstuen, 0303 Oslo Norway	e-post: web:	post@epd-norge.no www.epd-norge.no
	Owner of the declaration	tlf	1.419.662.6899
	First Solar 350 W. Washington St., Suite 600 Tempe AZ 85281 USA	Fax: e-post: web:	1.602.414.9400 sustainability@firstsolar.com www.firstsolar.com
 First Solar.	Author of the life cycle assessment	tlf	1.480.619.3960
	Parikhith Sinha 350 W. Washington St., Suite 600 Tempe AZ 85281 USA	Fax: e-post: web:	 parikhith.sinha@firstsolar.com
	ECO PLATFORM EPD VERIFIED	web web	www.eco-platform.org ECO Portal