AEG SOLAR ENERGY SRL

ENVIRONMENTAL PRODUCT DECLARATION

Mono-crystalline Double glass,

N-Type,

solar photovoltaic modules

AEG SOLAR ENERGY SRL 22 DECEMBRIE NR.1, Oltenita, Romania

in compliance with ISO 14025 and EN15804

Program Operator	The Norwegian EPD Foundation
Publisher	EPDItaly

Declaration Number	NEPD-17979-22579
Registration Number	MR-EPDITALY0168

Issue Date	09/ 10/ 2026
Valid to	09/ 10 / 2031



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www.epditaly.it

Environmental Product Declaration

In accordance with ISO14025:2006 and EN15804:2012+A2:2019

Mono-crystalline Double glass, N-Type, solar photovoltaic



Owner of the declaration:
AEG SOLAR ENERGY SRL

Product name:
Mono-crystalline Double glass, N-Type, solar photovoltaic modules

Declared unit:
1m² of manufactured photovoltaic module

Product category /PCR:
NPCR 029:2022 Part B for photovoltaic modules 1.2

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-17979-22579

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Issue date: 09.10.2026

Valid to: 09.10.2031

General information

Product:
Mono-crystalline Double glass, N-Type, solar photovoltaic modules

Program operator:
EPD-Global
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Phone: +47 23 08 80 00
e-mail: post@epd-norge.no

Declaration number:
NEPD-17979-22579

This declaration is based on Product Category Rules:
NPCR 029:2022 Part B for photovoltaic modules 1.2
PCR review conducted by: Håkon Hauan

Statement of liability:
The owner of the declaration shall be liable for the underlying information and evidence. EPD-Global shall not be liable with respect to manufacturers, life cycle assessment data and evidence.

Declared unit:
1m² of manufactured photovoltaic module

Functional unit:
1 Wp of manufactured 720Wp photovoltaic module, from cradle-to-grave and module D, with activities needed for a study period for a defined reference service life (≥80% of the labelled power output

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

internal ☐ external ☒

Julie Lyslo Skullestad
Independent verifier approved by EPD-Global

Owner of the declaration:
AEG SOLAR ENERGY SRL
Contact person: Mark
Phone: +40754573323
e-mail: mark@alpssolar.eu

Manufacturer:
AEG SOLAR ENERGY SRL
22 DECEMBRIE NR.1, Oltenita, Romania
Phone: +40754573323
e-mail: mark@alpssolar.eu

Place of production:
Romania

Management system:
ISO 14001, ISO 9001, IEC 62941, OHSAS 18001:2007, ISO 45001

Organisation no:
VAT No. RO48776457

Issue date:
09.10.2026

Valid to:
09.10.2031

Year of study:
2025-2026

Comparability:
EPD of construction products may not be able to compare if they do not comply with EN 15804 and are seen in a building context.

The EPD has been worked out by:
Manuela OSORIO - Kapstan

Approved

Manager of EPD -Global

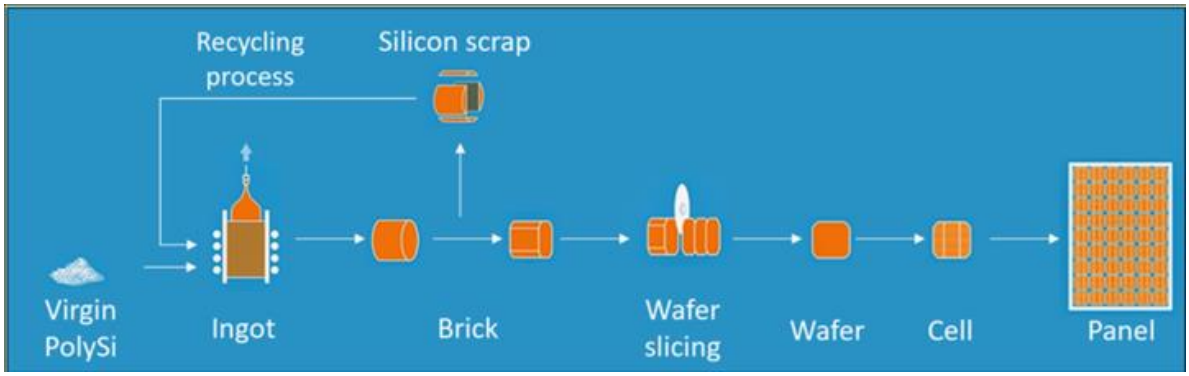
Product

Product description:

720Wp mono-crystalline solar photovoltaic module, designed to be installed on roofs or as stand-alone systems for local power production. Solar cells are assembled together with the EVA, glass, frame and electrical connections to produce the finished solar module in the production factory in Romania.

This EPD represents multiples modules with small variations over the size, the number of cells, power… (see table of module characteristics in "Technical details"). The results are calculated based on the maximum inventory amongst the modules. The variation between each module results is lower than 10 %.

The solar module production from silicon is explained in the figure below:



Step 1 - PolySi: The raw material used to produce the cells is a high purity silicon called "Solar grade silicon" or "PolySi".

Step 2 - Ingot: The PolySi is transformed into a monocrystalline ingot by heating up the silicon with a process called "Czochralski process".

Step 3 - Wafer: the ingot is then cut into bricks and sliced into wafers by diamond wire slicing.

Step 4 - Solar cell: the wafer is transformed into a cell through chemical treatments and screen-printing wiring.

Step 5 - Solar module: half cells are combined, 132 half cells per ALPS66D50-xxx/TP module. The different components of the panel are given below. Standard panels are made with a 2 mm glass front and a 2mm glass back sheet.

Product specification:

Sold as individual panels, with an effective surface area of 3,11 m^2 and a weight of 38,00 kg. The packaging consists of LDPE, HDPE and a cardboard box, and the panels are delivered on a wooden or plywood pallet

Materials	KG/DU	KG/FU	%
Cells	3,05E-01	7,06E-02	2%
Glass	1,12E+01	2,60E+00	77%
EVA	9,45E-01	2,19E-01	6%
Aluminium frame	1,00E+00	2,33E-01	7%
Junction box	9,28E-02	2,15E-02	1%
String connector	2,61E-02	6,06E-03	0%
Cell connector	6,38E-02	1,48E-02	0%
Silicone	1,19E-01	2,75E-02	1%
Soldering flux	1,53E-02	3,56E-03	0%
Packaging	**KG/DU**	**KG/FU**	**%**
Wooden pallet	2,36E-01	5,48E-02	2%
Cardboard	4,93E-01	1,14E-01	3%
Low density PE	2,57E-03	5,95E-04	0,02%
PP	2,31E-02	5,36E-03	0,2%
Paper	1,28E-05	2,98E-06	0,0001%

Technical data:

The modules are produced according to IEC 61215 / 61730, IEC 61701, IEC 61215, IEC 62782, IEC 62716, ISO 11925-2, IEC 62938, IEC 62804, AS 40404.2

IEC Certificate No. Z2 129618 0001 Rev. 04

This EPD is valid for the following module types:

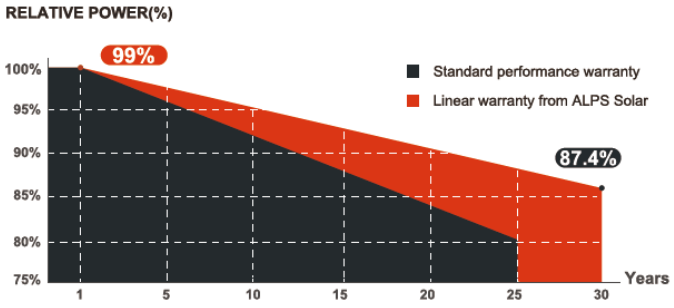
- ALPS48D60
- ALPS60D30
- ALPS72D30
- ALPS66D60
- ALPS66D50

This study has been conducted according to the requirements of:

- ISO 14044;
- ISO 14025;
- EN15804+A2:2019;
- NPCR part A “Construction products and services” version 2.0;
- NPCR 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 1.2.

Market:
Europe

Reference service life, product:
30 years



Reference service life, building:
30 years

Additional technical information
EPD Type: Cradle to grave at module D

LCA: Calculation rules

Declared unit:

1 m² of manufactured photovoltaic module

Cut-off criteria:

In case of insufficient input data or data gaps for a unit process, the cut-off criteria shall be 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass of that unit process. The total neglected input flows, e.g. per module A1-A3 were a maximum of 5 % of energy usage and mass.

No known significant flows have been excluded from the study.

Allocation:

The allocation is made in accordance with the provisions of EN 15804 and ISO 14044. Incoming energy and water and waste production in-house is allocated equally among all products through surface allocation. 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.

Data quality:

Specific data comes from actual consumption of the module assembly factory (June 2025 – May 2026). This data has been collected by the manufacturer and checked by the LCA practitioner.

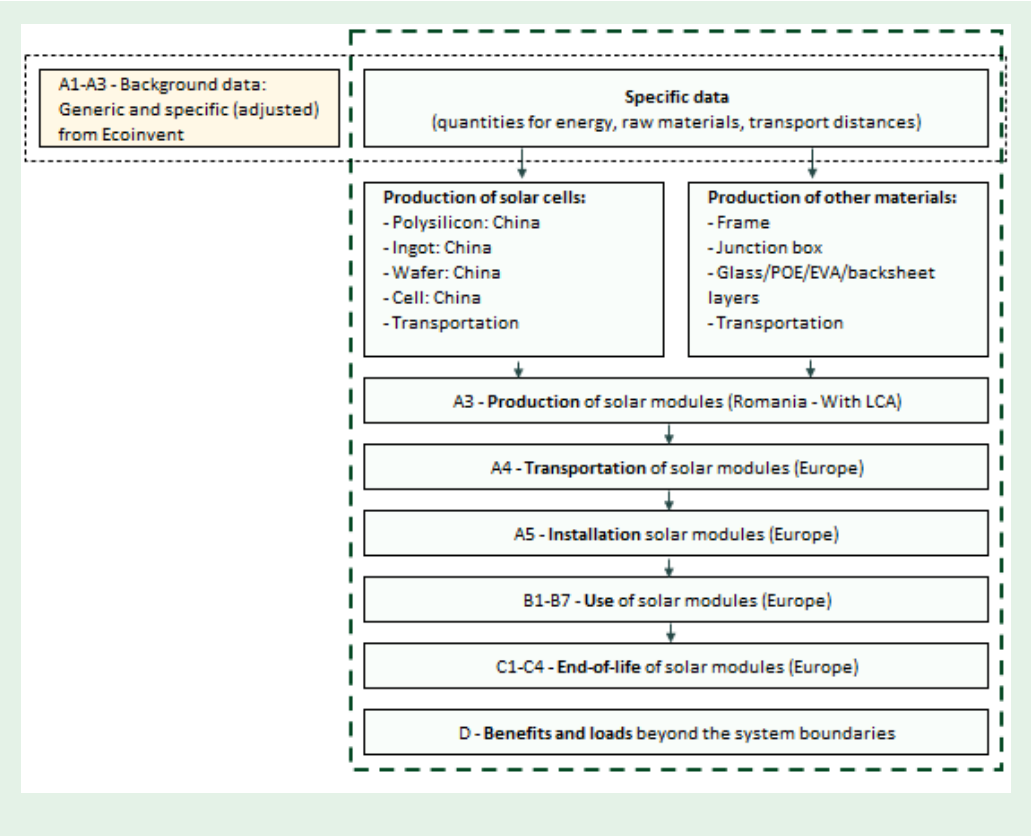
Generic data is from Ecoinvent v3.11 and Simapro v10. Characterization factors from EN15804:2012 + A2: 2019. Generic data <10 years old. Ecoinvent system model used: cut-off. This study follow the version EF 3.1.

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

System boundary:

The study is based on a cradle to grave analysis i.e., from raw material extraction to the disposal of waste. A summary of what is included and excluded is shown below:



The PolySi, ingots, wafers, and cells are manufactured in China, modules are manufactured I Romania. The supply chain is shown below:

Production	Site
Virgin Polysi	China
Ingot/brick	China
Wafer	China
Recycled Polysi	China
Cells TOPCON	China
Modules	Romania

LCA: Scenarios and additional technical information

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

All data is provided per functional unit.

Transport from production place to assembly/user (A4)

Transport from production place to assembly/user (A4)	Capacity utilisation (incl. return) [%]	Distance [km]	Fuel/Energy consumption	Unit	Value
Truck	50%	3 600	Diesel (4.44E-2 L/tkm)	tkm	47,04

The transport step A4 covers the transport from the factory in Romania to the installation site in Europe by road.

The calculation of fuel consumption is based on the weight of the product and packaging. It includes return freight.

Assembly (A5)

Packaging	Unit	Value
Wooden pallet	Kg	2,36E-01
Cardboard	Kg	4,93E-01
Low density PE	Kg	2,57E-03
PP	Kg	2,31E-02
Paper	Kg	1,28E-05
Transportation in lorry (Capacity utilisation incl. return: 50%)	Tkm	7,55E-01

The modules are installed by hand. The screwdriver electricity consumption is neglected. As in PCR part B, the fasteners (screws) are not included in the LCA. The only impact is the packaging waste given in the table.

Use (B1)

Photovoltaic modules harness solar energy throughout their entire lifecycle via the photovoltaic effect. The amount of electricity they produce is directly influenced by solar irradiance. The electricity production is calculated as below:

$$E_{year\ i} = I_{sun} \times S_{1kWp} \times Eff_{panel} \times PR \times D_{panel} \times (1 + b)$$

Where:

- I_{sun} is the sun irradiation received by the module in kWh. m^{-2}.$year^{-1}$, which depends on the site location.

- PR, or Performance Ratio, is the ratio between the energy produced by the panel and the final energy at the output of the photovoltaic system in order to consider the various losses (cables, inverter, etc.).
- Eff_{panel}, or panel efficiency, is the ratio between the energy produced and the solar radiation received.
- b is the bifacial gain (5% if bifacial and 0% if monofacial)
- S_{1kWp} is the surface area to get 1 kWp.
- D_{panel} corresponds to the degradation of the panel in year i. This degradation is 1% the first year and then 0.4% per year. $D_{panel}=0.99 \times (1-0.44\%)^{i-1}$

As a result, the following chart illustrates the electricity produced by the modules after 30 years:

Solar irradiance for electricity production	Unit	Value
1000 kWh/m²/year	kWh/m² (25 years)	5 258
1100 kWh/m²/year	kWh/m² (25 years)	6 309
1200 kWh/m²/year	kWh/m² (25 years)	6 835
1300 kWh/m²/year	kWh/m² (25 years)	6 835
1400 kWh/m²/year	kWh/m² (25 years)	7 361
1500 kWh/m²/year	kWh/m² (25 years)	7 886
1600 kWh/m²/year	kWh/m² (25 years)	8 412
1700 kWh/m²/year	kWh/m² (25 years)	8 938

Maintenance (B2)/Repair (B3)/ Replacement (B4)/Refurbishment (B5)

The modules are considered as self-cleaning materials via rainwater. No maintenance, repair, replacement, or refurbishment is required during the module lifetime.

Operational energy (B6) and water consumption (B7)

The products do not require any energy or water consumption.

End of Life (C1, C3, C4)

Waste process	Unit	Value
Recycling	Kg	1,24E+01
Incineration and energy recovery	Kg	1,08E+00

The modules are considered as removed by hand. Different parts are either recycled or incinerated with energy recovery, according to scenarios in PCR Part B for each product type. For the recycled parts, the following recycling rates are used:

- The laminate is shredded and recycled at 95%
- The frame is removed and recycled at 100%
- The cable and junction box are recycled at 100%

Transport to waste processing (C2)

Transport from production place to assembly/user (C2)	Capacity utilisation (incl. return) [%]	Distance [km]	Fuel/Energy consumption	Unit	Value
Truck	50%	50	Diesel (4.44E-2 l/tkm	Tkm	0,61

It has been assumed that the modules are collected by truck and sent for recycling. 50 km is considered from the site to the recycling factory as proposed in PCR part B.

Benefits and loads beyond the system boundaries (D)

Benefits and loads have been based on glass and aluminium frame recycling only. Energy recovery from A4-A5 and C1-C4 modules is included.

The benefits of exported energy from energy recovery in a treatment facility is calculated with substitution of Norwegian electricity market mix and heat production from wood chip burning plants in Norway. Conversion factors for efficiencies and losses from waste to delivered energy are included.

Item	Unit	Value
Glass	Kg	-6,61E+00
Aluminium	Kg	-7,53E-01
Copper	Kg	-7,41E-02
Substitution of electrical energy	kWh	3,37E-01
Substitution of thermal energy	MJ	4,34E+01

LCA: Results

The LCA results show the environmental impacts and resource input and output flows calculated according to ISO 14025 and EN 15804 +A2. The results are shown per functional unit, which for this declaration is 1Wp, as well as per declared unit, which for this declaration is 1 m². The LCA results have been calculated using the LCA software SimaPro 10.

The result tables are given using a *location-based approach* for foreground system (A3) More information about transparent reporting of electricity in the additional requirements section.

Core environmental impact indicators – per functional unit - Wp

Parameter	Unit	A1-A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	4,64E-01	4,11E-02	1,04E-02	0,00E+00	0,00E+00	2,78E-04	1,34E-02	5,64E-04	-6,19E-02
GWP-fossil	kg CO2 eq	4,67E-01	4,10E-02	6,18E-03	0,00E+00	0,00E+00	2,78E-04	1,30E-02	5,63E-04	-6,14E-02
GWP-biogenic	kg CO2 eq	-3,75E-03	1,02E-05	4,19E-03	0,00E+00	0,00E+00	6,36E-08	3,12E-04	5,95E-07	-2,77E-04
GWP-luluc	kg CO2 eq	4,65E-04	1,84E-05	5,08E-06	0,00E+00	0,00E+00	9,97E-08	1,81E-06	1,79E-07	-1,94E-04
ODP	kg CFC11 eq	6,11E-08	5,21E-10	6,30E-10	0,00E+00	0,00E+00	6,07E-12	1,75E-11	2,22E-12	-2,16E-10
AP	mol H+ eq	3,91E-03	1,40E-04	4,33E-05	0,00E+00	0,00E+00	9,18E-07	4,26E-05	1,91E-06	-5,89E-04
EP-freshwater	kg P eq	1,43E-04	4,50E-06	1,58E-06	0,00E+00	0,00E+00	1,96E-08	2,14E-06	1,64E-06	-3,18E-05
EP-marine	kg N eq	8,43E-04	4,44E-05	1,10E-05	0,00E+00	0,00E+00	3,12E-07	4,45E-06	5,93E-07	-7,66E-05
EP-terrestial	mol N eq	7,98E-03	4,83E-04	9,39E-05	0,00E+00	0,00E+00	3,39E-06	4,35E-05	6,45E-06	-8,60E-04
POCP	kg NMVOC eq	2,33E-03	1,90E-04	2,88E-05	0,00E+00	0,00E+00	1,46E-06	1,28E-05	1,84E-06	-2,58E-04
ADP-M&M²	kg Sb eq	1,25E-05	1,38E-07	1,33E-07	0,00E+00	0,00E+00	8,01E-10	4,37E-07	2,41E-09	-3,78E-06
ADP-fossil²	MJ	5,34E+00	5,68E-01	6,93E-02	0,00E+00	0,00E+00	4,06E-03	1,80E-02	3,76E-03	-6,29E-01
WDP²	m3	9,88E-02	2,68E-03	1,08E-03	0,00E+00	0,00E+00	1,87E-05	1,36E-03	6,43E-05	-8,40E-03

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 Norwegian 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*

Reading example: 9.0 E-03 = $9.0*10^{-3} = 9.0*\frac{1}{10}*\frac{1}{10}*\frac{1}{10}=0.009$ 9.0 E+03 = $9.0*10^{3} = 9.0*10*10*10=9000$

Additional environmental impact indicators – per functional unit - Wp

Parameter	Unit	A1-A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
PM	Disease incidence	4,16E-08	3,17E-09	5,09E-10	0,00E+00	0,00E+00	2,81E-11	7,48E-10	2,25E-11	-6,02E-09
IRP	kBq U235 eq.	2,15E-02	4,57E-04	2,67E-04	0,00E+00	0,00E+00	4,55E-06	1,90E-04	9,49E-06	-6,94E-04
ETP-fw	CTUe	2,67E+00	1,05E-01	3,16E-02	0,00E+00	0,00E+00	4,76E-04	5,16E-02	6,24E-03	-2,42E-01
HTP-c	CTUh	2,27E-10	6,86E-12	2,62E-12	0,00E+00	0,00E+00	4,53E-14	7,74E-12	5,85E-13	-3,45E-11
HTP-nc	CTUh	6,15E-09	3,51E-10	7,84E-11	0,00E+00	0,00E+00	2,61E-12	4,46E-10	1,14E-11	-1,65E-10
SQP	Dimension less	3,02E+00	3,34E-01	3,95E-02	0,00E+00	0,00E+00	4,08E-03	1,37E-02	3,82E-03	-4,48E-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

Resource use – per functional unit - Wp

Parameter	Unit	A1-A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
RPEE	MJ	8,80E-01	7,88E-03	9,19E-03	0,00E+00	0,00E+00	6,26E-05	8,42E-03	1,50E-04	-1,56E-01
RPEM	MJ	5,65E-02	0,00E+00	5,65E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TPE	MJ	8,80E-01	7,88E-03	9,19E-03	0,00E+00	0,00E+00	6,26E-05	8,42E-03	1,50E-04	-1,56E-01
NRPE	MJ	5,33E+00	5,67E-01	6,92E-02	0,00E+00	0,00E+00	4,06E-03	1,79E-02	3,76E-03	-6,28E-01
NRPM	MJ	1,71E-01	0,00E+00	1,71E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
TRPE	MJ	5,33E+00	5,67E-01	6,92E-02	0,00E+00	0,00E+00	4,06E-03	1,79E-02	3,76E-03	-6,28E-01
SM	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
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	m3	2,87E-03	7,84E-05	3,22E-05	0,00E+00	0,00E+00	5,66E-07	7,84E-05	1,66E-06	-4,11E-04

PERE *Renewable primary energy resources used as energy carrier;* ***PERM*** *Renewable primary energy resources used as raw materials;* ***PERT*** *Total use of renewable primary energy resources;* ***PENRE*** *Nonrenewable primary energy resources used as energy carrier;* ***PENRM*** *Nonrenewable primary energy resources used as materials;* ***PENRT*** *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;* ***FW*** *Use of net fresh water.*

End of life – Waste – per functional unit - Wp

Parameter	Unit	A1-A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
HW	KG	1,43E-03	1,43E-03	2,21E-04	2,21E-04	0,00E+00	0,00E+00	6,91E-04	6,91E-04	-3,69E-04
NHW	KG	5,80E-01	5,80E-01	8,07E-03	8,07E-03	0,00E+00	0,00E+00	1,23E-02	1,23E-02	-1,11E-01
RW	KG	5,44E-06	5,44E-06	6,95E-08	6,95E-08	0,00E+00	0,00E+00	5,50E-08	5,50E-08	1,38E-07

HWD *Hazardous waste disposed;* ***NHWD*** *Non-hazardous waste disposed;* ***RWD*** *Radioactive waste disposed.*

End of life – output flow – per functional unit - Wp

Parameter	Unit	A1-A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
CRU	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	3,24E-05	0,00E+00	2,70E-03	0,00E+00	0,00E+00	0,00E+00	5,35E-02	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	5,45E-04	0,00E+00	0,00E+00	0,00E+00	4,66E-03	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	2,73E-04	0,00E+00	0,00E+00	0,00E+00	3,81E-03	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	9,78E-03	0,00E+00	0,00E+00	0,00E+00	1,36E-01	0,00E+00	0,00E+00
Exported energy - gas and process	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

CRU *Components for reuse;* ***MFR*** *Materials for recycling;* ***MER*** *Materials for energy recovery;* ***EEE*** *Exported electric energy;* ***EET*** *Exported thermal energy.*

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	1,04E-03

Note: 1 kg biogenic carbon is equivalent to 44/12 (approx. 3.67) kg CO_2

Additional requirements

Transparent reporting of energy

The EPD provides in the main result tables environmental impact categories based on a *location based approach*. The information below is provided so EPD users are able to understand the effect of these methodological choices.

The table below shows calculation of GWP-total for energy resources used in the manufacturing process (A3) for each approach.

Energy source	Data source	Amount*	Unit	GWP_{total} [kg CO_2 - eq/unit]	SUM [kg CO_2 -eq]
Electricity, medium voltage {RO}| market for electricity, medium voltage | Cut-off, S	Module - LCA	2,14E0	kWh	0,347	0,743
Electricity, high voltage {CN}| market group for electricity, high voltage | Cut-off, S	PolySi – IEA 2026	54,51	kWh	0,839	45,7
Electricity, medium voltage {CN}| market group for electricity, medium voltage | Cut-off, S	Ingot to cell - IEA 2026	Brick: 5,66E-1 Wafer: 2,25 Cell: 16,59	kWh	0,850	Brick: 0,481 Wafer: 1,91 Cell: 14,10

Additional environmental impact indicators required 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.

Parameter	Unit	A1-A3	A4	A5	B1 - B7	C1	C2	C3	C4	D
GWP-IOBC	KG	4,67E-01	4,10E-02	6,18E-03	0,00E+00	0,00E+00	2,78E-04	1,30E-02	5,63E-04	-6,14E-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.
- ☒ The product contains substances given by the REACH Candidate list that are less than 0,1 % by weight.
- ☐ The product contains dangerous substances, more then 0,1% by weight, given by the REACH Candidate List, see table.
- ☐ The product contains no substances given by the REACH Candidate list.
- ☐ The product is classified as hazardous waste, see table.

Name	CAS no.	Amount

Indoor environment

No tests have been carried out on the product concerning indoor climate.

Carbon footprint

While a carbon footprint analysis has not been conducted for the product separately, the results section does include an evaluation of Global Warming Potential (GWP) with such an analysis. The GWP total results presented in this EPD document represents the carbon footprint of the product studied

The carbon footprint per kWh with a production in Norway (I_{rad}=1000 kWh. m^{-2}.$year^{-1}$) is 20.90 gCO2-eq / kWh.

The carbon footprint per kWh with a production in Italy (I_{rad}=1600 kWh. m^{-2}.$year^{-1}$) is 13.06 gCO2-eq / kWh.

Extrapolation rules

The environmental impacts are given for a specific module power peak. For example, $Wp/area_{EPD}$ = **236 Wp/m²** for the EPD based on module **ALPS60D30-xxx/TP**.

For a different Wp (for example $Wp_{project}$ = **174 Wp/m²** for module **ALPS48D60-xxx/TP**), the impacts can be re-calculated by applying to each impact the following ratio: $Wp/area_{EPD}$ / $Wp/area_{Project}$ = 236 Wp/m² / 174 Wp/m².

Therefore:

$$Impacts_{project\ (per\ Wp)} = \frac{impact_{per\ m^2}}{174} = \frac{Impact_{per\ m^2}}{236} \times \frac{236}{174} = Impacts_{EPD\ (per\ Wp)} \times \frac{236}{174}$$

Maximum power	
Wp / area	
EPD1	Unit
239	Wp/m2

		ALPS48D60-xxx/TP	ALPS60D30-xxx/TP	ALPS72D30-xxx/TP	ALPS66D60-xxx/TP	ALPS66D50-xxx/TP
Module area	m²	2,701	2,164	2,584	2,701	3,106
Power	Wp	470	510	610	645	720
Power/Area	Wp/m2	174,00	235,71	236,03	238,78	231,78

Table 1 : Wp/m² considered for each EPD

Bibliography

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
EN 15804:2012+A2:2019	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2017	Sustainability in building construction - Environmental declaration of building products
NPCR	Part A “Construction products and services” version 2.0
	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 1.2
Simapro	Version 10
Ecoinvent	Ecoinvent v3.11

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