



# Environmental Product Declaration

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

## **LONGI Photovoltaic Modules**

LR7-72HVH, LR7-54HVH, LR7-72HVD, LR7-54HVD, LR7-54HVB

from

**LONGI Green Energy Technology Co., Ltd.**



Programme:	The International EPD System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
Type of EPD:	EPD of multiple products from a company
EPD registration number:	EPD-IES-0025918:001
Version date:	2025-11-24
Validity date:	2030-11-23

*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](http://www.environdec.com).  
EPD of multiple products, based on representative product (LR7-72HVD-665Wp). The list of the products covers: LR7-72HVH (630-670 Wp), LR7-54HVH (470-500 Wp), LR7-72HVD (625-665 Wp), LR7-54HVD (465-495 Wp), LR7-54HVB (465-500 Wp).*



## GENERAL INFORMATION

Programme Information	
<b>Programme:</b>	The International EPD® System
<b>Address:</b>	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
<b>Website:</b>	<a href="http://www.environdec.com">www.environdec.com</a>
<b>E-mail:</b>	<a href="mailto:support@environdec.com">support@environdec.com</a>

Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): <i>PCR 2019:14 PCR Construction products v2.0.1 issue data 2025-06-05 valid until 2030-04-07</i>
PCR review was conducted by: <i>Technical Committee of the International EPD® System. A full list of members available on <a href="http://www.environdec.com">www.environdec.com</a>. The review panel may be contacted via <a href="mailto:info@environdec.com">info@environdec.com</a></i> <i>Chair of the PCR review: Rob Rouwette (chair), Noa Meron (co-chair)</i>
<i>c-PCR: c-PCR-016 Photovoltaic modules and parts thereof (adopted from EPD Norway NPCR 029 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, issue data 2022-03-31.</i>

Third-party Verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:
<input checked="" type="checkbox"/> <b>Individual EPD verification without a pre-verified LCA/EPD tool</b> Third-party verifier: <i>Niels Jungbluth, ESU-services Ltd.</i> <a href="mailto:jungbluth@esu-services.ch">jungbluth@esu-services.ch</a> Approved by: International EPD System
Procedure for follow-up of data during EPD validity involves third party verifier:
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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:**

LONGi Green Energy Technology Co., Ltd.

Address: Block B, No. 8989 Shangji Road, Economic & Technological Development Zone, Xi'an, Shaanxi, China

Website: [www.longi.com](http://www.longi.com)

Tel: +86 4008601012

Email: [market@longi.com](mailto:market@longi.com)

### **Description of the Company:**

Founded in 2000, LONGi Green Energy Technology Co., Ltd. (LONGi) is a global leader in solar technology dedicated to promoting sustainable energy development. The company specializes in the research, development, and manufacturing of monocrystalline silicon wafers, solar cells, and photovoltaic (PV) modules, providing products and services for utility-scale power plants, industrial applications, and residential systems worldwide. With an emphasis on technology development, responsible manufacturing, and continuous improvement, LONGi continuously advances the performance and reliability of solar technologies. The company operates manufacturing and service facilities worldwide, serving customers in more than 150 countries and regions. Through ongoing innovation in materials, cell design, and system integration, LONGi supports the transition toward a sustainable and low-carbon energy future.

### **Product-related or management system-related certifications:**

IEC 61215, IEC 61730, ISO9001:2015: ISO Quality Management System, ISO14001: 2015: ISO Environment Management System, ISO45001: 2018: Occupational Health and Safety, IEC62941: Guideline for module design qualification and type approval

## PRODUCT INFORMATION

### **Product name:**

- 1) LR7-72HVH (630-670 Wp)
- 2) LR7-54HVH (470-500 Wp)
- 3) LR7-72HVD (625-665 Wp)
- 4) LR7-54HVD (465-495 Wp)
- 5) LR7-54HVB (465-500 Wp)

As per Section 4.10.1 of the PCR, LR7-72HVD is selected as the representative model based on the highest production volume. Results are reported using LR7-72HVD-665Wp as the representative power output based on the highest production volume, and results for other power outputs are obtained via conversion factors presented in Table 12.

**UN CPC code:** 461 Electric motors, generators and transformers, and parts thereof.



**Product description:** LONGi's latest generation of photovoltaic modules is built on its self-developed HPBC (Hybrid Passivated Back Contact) cell technology. This breakthrough design eliminates front-side grid lines, presenting a sleek, pure black appearance that not only enhances aesthetics but also maximizes light absorption and photovoltaic conversion efficiency. Through refinements in internal cell structure and passivation processes, HPBC technology significantly increases module output power, with conventional HPBC cell efficiency exceeding 25.5%, and advanced HPBC+ cells surpassing 25.8%, setting new benchmarks for high-efficiency solar technology. LONGi's HPBC portfolio includes the Hi-MO X10, designed for utility-scale and distributed projects with high output and enhanced safety and reliability features, and the EcoLife series, tailored for residential rooftops with refined aesthetics, compact 54-cell design, and strong performance under challenging conditions such as shading, snow, or low light—both backed by industry-leading long-term warranties.

**Visual representation:**



*Figure 1 LONGi PV module*

**Name and location of production site(s):**

LONGi Photovoltaic Technology (Jiaxing) Co., Ltd.

Address : No.855 Zhongxin Road, Wangdian Township, Xiuzhou District, Jiaxing City, Zhejiang Province, P.R.China

LONGi Solar Technology (Wuhu) Co., Ltd.

Address: North of Wanxing Road and West of Yudai Road, Shenxiang Area, Economic Technology Development Zone, Wuhu City, Anhui Province, P.R.China

LONGi Photovoltaic Technology (Taizhou) Co., Ltd.

Address: No.8, Taikang Road, Hailing District, Taizhou City, Jiangsu Province, P.R.China

LONGi Solar Technology (Jiangsu) Co., Ltd.

Address: No. 288 Yaojia Road, Jiulong Town, Hailing District, 225300 Taizhou City, Jiangsu Province, P.R.China

**Product identification:**

*Table 1 Product technical specifications*

Series (brand name)	LR7-72HVH	LR7-54HVH	LR7-72HVD	LR7-54HVD	LR7-54HVB
Power output range (Wp)	630-670	470-500	625-665	465-495	465-500
Dimensions(mm <sup>3</sup> )	2382*1134*30	1800*1134*30	2382*1134*30	1800*1134*30	1800*1134*30
Area (m <sup>2</sup> )	2.70	2.04	2.15	2.04	2.04
Module efficiency (%)	22.0-23.3	22.0-23.0	22.2-23.0	22.1-23.0	22.3-23.3
Weight (kg)	28.5	21.6	33.5	23.5	21.6
Weight (incl. package)	30.0	23.0	34.8	24.8	22.8
First year degradation (%)	1	1	1	1	1
Annual degradation (%)	0.35	0.35	0.35	0.35	0.35
First year degradation (%)	1	1	1	1	1
Cells configuration	144 cells (6×24)	108 cells (6×18)	144 cells (6×24)	108 cells (6×18)	108 cells (6×18)
Cell technology	HPBC	HPBC	HPBC	HPBC	HPBC

HPBC: Hybrid Passivated Back Contact

## CONTENT DECLARATION

Raw materials of the different PV modules are mostly the same, including solar cells, solar glass, frame, silicone gel, junction box and packaging etc. The composition of LR7-72HVD is shown here as representative product.

*Table 2 Raw materials compositions- LR7-72HVD*

Product content	Mass, kg	Post-consumer recycled material, mass-% of product	Biogenic material, mass-% of product	Biogenic material, kg C/product or declared unit
Frame (aluminium alloy)	2.438	0%	0%	0
Glass	26.803	0%	0%	0
Cell (Single-Si)	0.769	0%	0%	0
Ribbon (Sn <sub>63</sub> Pb <sub>37</sub> )	0.359	0%	0%	0
EVA (Ethylene-vinyl acetate)	0.855	0%	0%	0
POE (Polyolefin Elastomer)	1.296	0%	0%	0
Junction box	0.237	0%	0%	0
Flux (1-propanol)	0.001	0%	0%	0
Silica gel	0.396	0%	0%	0
Solder paste (Sn <sub>63</sub> Pb <sub>37</sub> )	0.028	0%	0%	0
Adhesive (Resin)	0.014	0%	0%	0
<b>TOTAL</b>	<b>33.195</b>	<b>0%</b>	<b>0%</b>	<b>0</b>

Table 3 Packaging materials

Packaging materials	Mass, kg	Mass-% (versus the product)	Biogenic material, kg C/product or declared unit
Wood pallet	1.131	3.28%	4.72E-1
Corrugated board box	0.101	0.29%	4.50E-1
Packaging bag (PE)	0.00018	0.001%	0
Packaging film (PE)	0.032	0.09%	0
Corner Protector (PP polymer)	0.001	0.002%	0
Steel plate	0.014	0.04%	0
TOTAL	1.279	3.71%	0

1 kg biogenic carbon in the product/packaging is equivalent to the uptake of 44/12 kg of CO<sub>2</sub>.

No substance in the product greater than 0.10% by weight is present on the "List of Potentially Hazardous Substances" candidates for authorization under the REACH legislation.

## LCA INFORMATION

**Functional unit:** 1 Wp of manufactured photovoltaic module, with activities needed for a study period for a defined reference service life (≥80% of the labelled power output).

Table 4 Conversion factors between functional unit and declared unit

Series (brand name)	LR7-72HVH (670 Wp)	LR7-54HVH (500 Wp)	LR7-72HVD (665 Wp)	LR7-54HVD (495 Wp)	LR7-54HVB (500 Wp)
Conversion factors (Wp/m <sup>2</sup> )	248.1	245.1	246.3	242.6	245.1

**Reference service life:** 25 years as defined by the PCR. The product has a 30-year power warranty as per specified in the product specification.

**Time representativeness:** The study used primary data collected from Jun. 2024 to May. 2025.

**Geographical scope:** China for A1-A3, and Sweden for A4, A5, B1-B7, and C1-C4.

**Database(s) and LCA software used:**

Database: Ecoinvent v3.11, Ecoinvent 3 – allocation, cut-off by classification – unit; IEA PVPS Task 12 Life Cycle Inventory Dataset (2020), China PV Industry Development Roadmap (2024-2025)  
 LCA Software: SimaPro v10.2

**Description of system boundaries:**

System boundary of this study is cradle to grave with module D.

**Product Manufacturing:**

The manufacturing process of PV modules is illustrated in Figure 2. The main incoming materials delivered to the production sites include: monocrystalline silicon solar cells; tempered glass; aluminium frame, encapsulant (e.g. EVA, POE), backsheet (for single-glass modules), junction box, silicone sealants, etc.

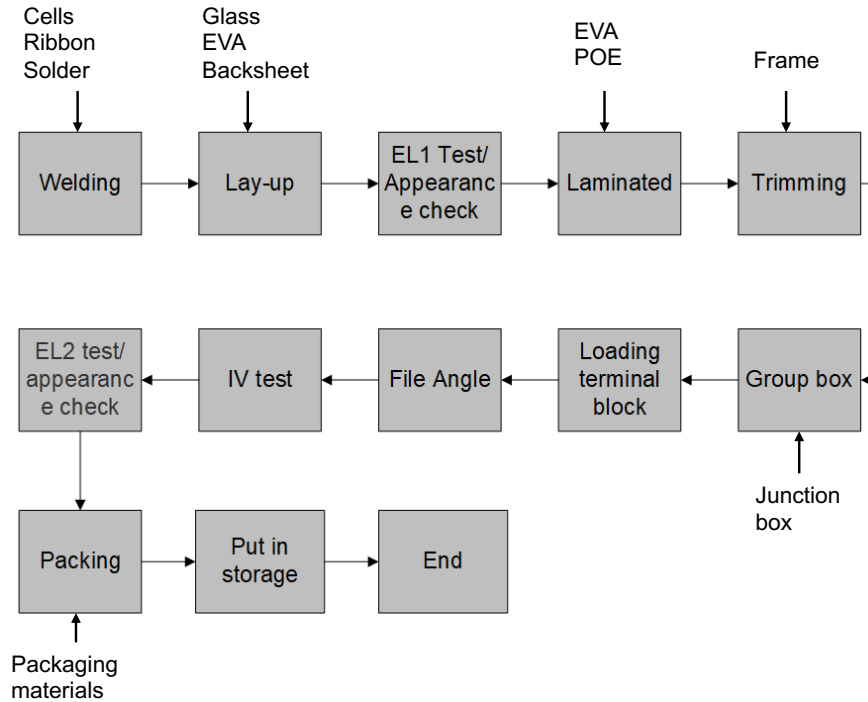


Figure 2 Manufacturing process

### Step 1: Welding

Positive and negative electrodes of single-welded solar cells are soldered together to form cell strings. Non-conforming strings are repaired as needed.

### Step 2: Lay-up

Soldered cell strings are connected with busbars. Glass, EVA film, and glass back plate are positioned to protect the cell assembly.

### Step 3: EL1 test/Appearance check

Appearance and Electroluminescent (EL) imaging inspections are conducted on the PV modules.

### Step 4: Laminated

EVA is melted and solidified at specific temperatures. This process significantly influences the final product quality.

### Step 5: Trimming

Laminated components are trimmed in preparation for framing.

### Step 6: Group box

Profiles and junction boxes are mounted with sealed silicone on laminates. Aluminum frames and junction boxes are installed to increase component strength, further seal the cell assembly, and extend service life.

### Step 7: Loading terminal block

Junction boxes are secured with silicone to the back of the assembly. Lead-out wires are welded to establish connectivity. Adhesive glue is applied for potting.

### Step 8: File Angle

Four corners of the component are fixed and polished.

**Step 9: IV test**

Output power of the cell component is verified, output characteristics are tested, and power levels are determined.

**Step 10: Insulation withstand voltage and ground continuity test**

Insulation is tested between current-carrying parts and the frame. Voltage withstand tests are performed on insulation materials and structures. Grounding is verified to ensure safety conductors can handle fault currents.

**Step 11: EL2 test/appearance check**

Solar cells are examined for issues such as hidden cracking, fragments, or black plates. Component EL levels are determined.

**Step 12: Packing**

Finished components are packaged in specified quantities for transportation and sale.

**Step 13: Put in storage**

Packaged components are transferred to warehouse storage.

**Distribution Process:**

Table 5 Information on the distribution stage

Vehicles	Capacity utilization (incl. return) %	Type of vehicle	Distance km	Fuel/energy consumption per tkm (kg/tkm)	Fuel/energy consumption per km (kg/km)
Truck (Within China)	36.7	EURO6 16-32 ton	366	Diesel: 0.0366	8.34E-4~1.27E-3
Ship (to Sweden)	70	Container ship	23324	Heavy oil: 0.0025	5.70E-5~8.69E-5
Truck (Within Sweden)	36.7	EURO6 16-32 ton	162	Diesel: 0.0366	8.34E-4~1.27E-3

Note: Range of fuel consumption per km (kg/km) due to different product+packaging weights

**Product installation:**

The PV module can be installed both as rooftop and ground-mounted type. According to the PCR, mounting structures like inverter, wiring, etc., are not considered in this study. The electricity and diesel consumption have been derived from theecoinvent database process for a photovoltaic plant installation with a capacity of 570 kWp, and these values have been downscaled to the power output of different modules analyzed in this study. Waste generation and treatment of packaging materials are considered in this stage. The waste generated from the product packaging, mainly consisting of waste wood pallets, is accounted for in this stage, transportation of waste is assumed as 200km. The treatment of the waste wood pallets is modelled as 75% recycling and 25% incineration. Other packaging materials, including paper and plastic film, are modelled as 100% incineration.

**Use & Maintenance:**

For the use stage (B1) of the PV products, no energy and materials inputs, or emissions are involved. As for the maintenance stage (B2), water used for cleaning to maintain the performance is considered,

0.23L water used per module each time, and 2 times in a year are assumed. During the operation of PV module, no repair (B3), replacement (B4), and refurbishment (B5) is required.

It is assumed that there is no operational electricity (B6) or water consumption (B7). To calculate the expected energy production over the lifetime of the modules, the following formula may be used:

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

Where:

$E_1$  = Energy produced in the first year of operation, kWh/year

$S_{rad}$  = Site specific annual average solar radiation on module (shadings not included), kWh/kWp/year.

The annual radiation must take into consideration the specific inclination (slope, tilt) and orientation.

$A$  = Area of module, m<sup>2</sup>.

$y$  = Module yield: electrical power, 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 1000 W/m<sup>2</sup>, 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.

Energy production second year of operation:

$$E_2 = E_1 * (1 - deg)$$

Energy production n year of operation:

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

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

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

### **End-of-Life:**

For end-of-life (EoL) stage, assumptions are made due to a lack of data. Decommissioning stage (C1) of PV modules is assumed to be taken with same energy and fuel consumption as for installation stage. Transportation distance from the plant site to the waste treatment site (C2) is assumed to be 50km. Waste processing (C3) stage is assumed to be mechanically treated to yield the bulk materials with an electricity consumption of 0.277kWh/kg module, based on data from the IEA.

This study refers to legal requirements issued by Waste Electrical and Electronic Equipment (WEEE) under the EU scenario. The required recycling rate for waste PV modules is 85% according to 2012/19/EU-Article 11 & ANNEX V. According to the IEA report, the recycling rate of PV modules is above 85% in the main EU countries. Therefore, it is safe to use 85% as a recycling rate for waste PV modules. 15% of the waste components (cells, glass, and waste plastics) end up at the disposal stage (C4). The plastic will be sent to incineration, while the cell and unrecovered glass will be treated as inert materials for landfilling. In this study, bulk materials (glass and aluminium frame) are recovered, while the cells and plastic components will be incinerated for energy recovery. Assuming the 100% metals (aluminium, silver, and copper) and 85% glass will be recycled (Latanussa et al. 2016). 15% of contaminated glass and other unrecyclable materials will go to the landfill stage, while the junction box will go to the incineration stage.

### **Benefits and loads beyond the system boundary:**

95% metal scrap (aluminium and silver) and 85% of glass scrap will be recycled. The plastic components are incinerated with energy recovery. Efforts required by secondary production, loss of materials and quality are considered.

## Process flow diagram:

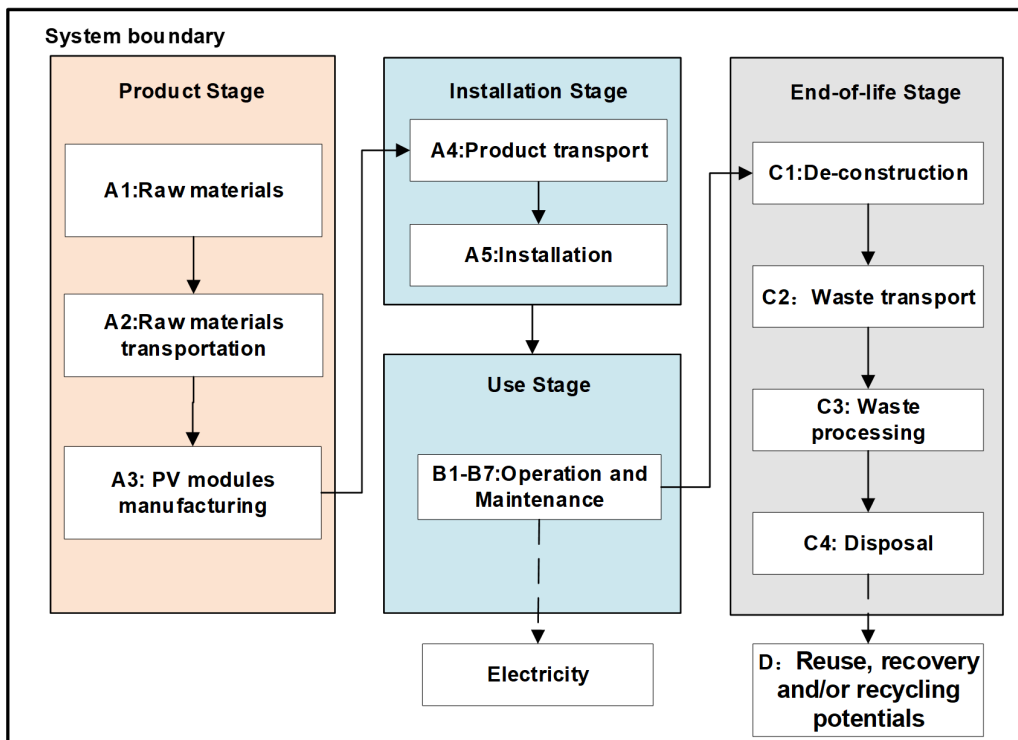


Figure 3 System boundary

### Excluded Processes:

The following steps/stages are not included in the system boundary due to the reason that the elements below are considered irrelevant or not within the boundary to the LCA study:

- Impacts related to the production, transportation and installation of capital goods (buildings, infrastructure, machinery, internal transport packaging) and general operations (staff travel, marketing and communication actions) that cannot be directly allocated to products are excluded from the LCA study.
- The packaging for silicon wafer and solar cells is reused internally and its impact was excluded from the system;
- Emissions during the PV module installation and operation due to no obvious emission observable.
- Storage phases and sales of PV products due to no observable impact. Product losses due to abnormal damage such as natural disasters or fire accidents would occur at a rather low frequency.
- Handling operations at the distribution center and retail outlet due to small contribution and negligible impact.
- Research and development activities.
- Long-term emissions are excluded due to high modelling uncertainty and limited data availability.

### Assumptions:

In general, this LCA study is subject to certain assumptions and limitations, which have been made in a conservative manner following the LCA standard and related specifications listed in the PCR. It should be noted that caution should be taken when comparing the results of PV modules in this report with those from other studies. The assumptions made are listed below:

Table 6 List of assumptions

Categories	Items	Assumptions
Manufacturing stage (A1-A3)	Solar cell, Silicon wafer, silicon ingot	Upstream processes for silicon ingot, wafer (thickness 135 μm), and cell manufacturing are modelled using the IEA PV LCI dataset and China PV Industry Development Roadmap (2024-2025). Parameters such as silicon input and electricity consumption are updated following the roadmap.
Transportation stage (A2 & A4)	Transportation vehicle type	For the vehicle used in raw materials and product transportation, CN6 type vehicles are used, which are aligned with the EURO6 standards, EURO 6 type vehicle with 16-32 ton capacity is assumed for modelling.
Installation stage (A5)	Electricity and materials use	The electricity and diesel consumption have been derived from the ecoinvent database process for a photovoltaic plant installation with a capacity of 570 kWp, and these values have been downscaled to the power output of different modules analysed in this study
Use & Maintenance	Use (B1)	The use stage requires no energy and materials inputs, and has no emissions.
	Maintenance (B2)	Water used for cleaning in 25 years is assumed with 0.23L per module per time and two times per year
	Replacement (B4)	No replacement for the module as the module has RSL>25 years
End-of-life (C1-C4)	De-construction (C1)	The de-construction of PV modules is assumed to be done manually, no electricity and materials use in this stage
	Waste transportation (C2)	Waste transportation distance from the de-installation plant to the waste treatment facilities is assumed to be 50 km for simplification purposes.
	Waste processing (C3)	The electricity consumption during this stage is 0.277kWh/kg module based on the data from IEA.
	Disposal (C4)	Disposal scenarios is based on the WEEE
Module D	Exported material and energy	The credits are accounted separately for the recovery of secondary materials (glass and metals) and for energy recovered from plastic incineration, based on the substitution of primary material production and conventional energy generation

### Allocation:

The allocation is made in accordance with the provisions of PCR. Allocation refers to the partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems. In this study, there are three types of allocation procedures considered:

#### Multi-input allocation

The allocation of electricity and emissions during the manufacturing stage of PV module are allocated by power output ratio. The transportation of raw materials is allocated by mass ratio.

#### Multi-output allocation

No other by-products are produced from the production, hence there is no production of by-products that need to be used to allocate the situation.

#### End-of-life allocation

For end-of-life allocation of background data (energy and materials), the model "allocation cut-off by classification" (ISO standard) is used. The underlying philosophy of this approach is that primary (first) production of materials is always allocated to the primary user of a material. If material is recycled, the primary producer does not receive any credit for the provision of any recyclable materials. Consequently, recyclable materials are available burden-free for recycling processes, and secondary (recycled) materials bear only the impacts of the recycling processes.

For end-of-life stage of the solar PV module products, polluter-pays-principle (PPP) is followed. As for the load and benefit of reuse, recycling, and recovery processes (Module D), it is reported separately

following the PCR's recommendation. End-of-life approach with 100/0 allocation is adopted in this analysis. This approach is based on the assumption that material recycled into secondary material at end-of-life substitutes an equivalent amount of virgin material (losses considered). Hence a credit is given to account for this material substitution. However, this also means that burdens equivalent to this credit should be assigned to scrap used as an input to the production process. which means that the environmental impact of the recycled material is the same as that of the virgin material. This approach rewards end-of-life recycling but does not reward the use of recycled content.

In cases where materials are sent to waste incineration, the study accounts for waste composition, heating value, and regional efficiencies, and assigns credits for power and heat outputs using the regional grid mix and thermal energy from natural gas, resulting in a conservative estimate of the benefits of energy recovery.

**Cut-off rules:**

The following procedure was followed for the exclusion of inputs and outputs:

- All inputs and outputs to a (unit) process will be included in the calculation for which data is available. Data gaps may be filled by conservative assumptions with average or generic data. Any assumptions for such choices will be documented;
- According to PCR, life cycle inventory data shall according to EN 15804 include a minimum of 95% of total inflows (mass and energy) per module. In addition, if less than 100% of the inflows are accounted for, proxy data or extrapolation should be used to achieve 100% completeness.

**Electricity mix:**

In this LCA study, it is important to note that different electricity grid mixes are used for different stages of the life cycle. Specifically, the production PV module takes place in four sites located in three provinces: Zhejiang Province, Jiangsu Province, and Anhui Province, where the East China Power grid is used. Electricity from on-site rooftop PV modules is also used during manufacturing. On the other hand, the installation stage and the end-of-life stage, taking Sweden market as a case study, where the Sweden grid electricity mix is used. The emission factors of the consumed electricity are listed below.

*Table 7 Electricity mix emission factor (GWP-GHG)*

Electricity mix	Unit	Value
Electricity, medium voltage {CN-ECGC}   market for electricity, medium voltage   Cut-off, U, ecoinvent 3.11	kg CO <sub>2</sub> eq/kWh	0.7640
Electricity, low voltage {CN-SH}   electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted   Cut-off, U	kg CO <sub>2</sub> eq/kWh	0.0879

It is worth noting that the use of different grid electricity mixes may impact the results of the LCA study, as the environmental impacts associated with electricity generation can vary significantly between different regions and grid mixes. Therefore, it is important to carefully consider the impact of grid mix differences when interpreting the results of the study, and to recognize that the results may not be directly comparable to studies that use different grid mixes.

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

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = MODULE NOT DECLARED)																	
	Product Stage			Construction process stage		Use Stage							End of life stage				Resource recovery stage
	Raw Material	Transport	Manufacturing	Transport	Assembly / Install	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction and demolition	Transport	Waste processing	disposal	Reuse-Recovery-Recycling-potential
<b>Module</b>	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	CN			SE		SE							SE				SE
Specific data used	8%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-sites	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8 Declaration of data sources, reference years, data categories, and share of A1-A3.

Process	Source type	Source	Reference year	Data category	Share of GWP-GHG results for A1-A3
Production of solar cell	Literature data/Database	IEA/Ecoinvent 3.11/ China PV Industry Development Roadmap (2024-2025)	2024	Secondary data	59.3%
Production of aluminium frame	Database	Ecoinvent 3.11	2024	Secondary data	14.6%
Production of glass	Database	Ecoinvent 3.11	2024	Secondary data	15.8%
Total share of GWP-GHG results for A1-A3					89.6%

Data Quality Assessment: All process-specific data was collected for the period from 2024 June to 2025 May and is therefore up to date. Manufacturing-related data is collected from the sites. Dataset selection considered geographic relevance, prioritizing regional and country-specific data where available to best reflect actual operational locations. From a technical perspective, when specific data was not available, the most representative proxy datasets were used, selected based on technological equivalence and process similarity. The overall data quality is good.

## ENVIRONMENTAL PERFORMANCE

### LCA results of the product(s) - main environmental performance results

The Life Cycle Assessment study has been performed in accordance with the requirements of EN15804+A2:2019 (version 1.03), PCR 2019:14 (v2.0.1 issue data 2025-06-05 valid until 2030-04-07). Results of LR7-72HVD-655Wp (as representative results) are selected to cover the all products in this EPD. Note that the results are relative expressions and do not predict impacts on endpoint categories, exceedance of certain levels, safety margins or risks.

### Mandatory impact category indicators according to EN 15804

Table 9 Environmental impact

Results per functional unit																
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-total	kg CO <sub>2</sub> eq.	3.21E-01	1.78E-02	4.51E-03	0	5.18E-06	0	0	0	0	0	1.36E-03	4.70E-04	1.13E-03	8.55E-03	-7.40E-02
GWP-fossil	kg CO <sub>2</sub> eq.	3.24E-01	1.78E-02	1.88E-03	0	5.17E-06	0	0	0	0	0	1.36E-03	4.70E-04	1.11E-03	8.55E-03	-7.39E-02
GWP-biogenic	kg CO <sub>2</sub> eq.	-2.64E-03	0.00E+00	2.64E-03	0	0.00E+00	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-luluc	kg CO <sub>2</sub> eq.	2.78E-04	8.95E-06	3.63E-07	0	1.02E-08	0	0	0	0	0	2.40E-07	1.58E-07	2.25E-05	4.18E-08	-1.35E-04
ODP	kg CFC 11 eq.	4.70E-08	2.61E-10	2.83E-11	0	7.68E-14	0	0	0	0	0	2.03E-11	1.03E-11	4.63E-11	4.02E-12	-1.48E-09
AP	mol H <sup>+</sup> eq.	2.02E-03	3.78E-04	1.30E-05	0	2.76E-08	0	0	0	0	0	1.21E-05	1.01E-06	6.24E-06	2.17E-06	-3.88E-04
EP-freshwater	kg P eq.	1.60E-05	1.07E-07	7.67E-09	0	3.57E-10	0	0	0	0	0	4.84E-09	3.50E-09	2.26E-08	2.40E-09	-2.42E-06
EP-marine	kg N eq.	4.54E-04	9.37E-05	5.88E-06	0	4.57E-09	0	0	0	0	0	5.64E-06	2.37E-07	1.60E-06	1.02E-06	-8.24E-05
EP-terrestrial	mol N eq.	4.37E-03	1.04E-03	6.44E-05	0	5.14E-08	0	0	0	0	0	6.18E-05	2.63E-06	2.31E-05	1.05E-05	-9.88E-04
POCP	kg NMVOC eq.	1.33E-03	2.92E-04	1.99E-05	0	1.68E-08	0	0	0	0	0	1.85E-05	1.60E-06	4.98E-06	2.77E-06	-2.88E-04
ADP-fossil*	MJ	3.87E+00	2.27E-01	2.33E-02	0	9.30E-05	0	0	0	0	0	1.81E-02	6.68E-03	9.39E-02	2.42E-03	-9.98E-01
ADP-M&M*	kg Sb eq.	2.03E-05	3.05E-08	1.77E-09	0	2.84E-11	0	0	0	0	0	5.20E-10	1.61E-09	8.03E-09	3.95E-10	-2.91E-06
WDP*	m <sup>3</sup>	3.69E-01	6.80E-04	6.43E-05	0	7.42E-04	0	0	0	0	0	4.23E-05	2.63E-05	1.02E-03	-1.08E-04	-1.03E-02
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP- M&M = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption															

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

## Additional mandatory and voluntary impact category indicators

Table 10 GWP-GHG

Results per functional unit																
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	3.24E-01	1.78E-02	1.88E-03	0	5.18E-06	0	0	0	0	0	1.36E-03	4.70E-04	1.13E-03	8.55E-03	-7.40E-02

## Resource use indicators

Table 11 Resource use

Results per functional unit																
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
PERE	MJ	3.40E-01	2.28E-03	3.41E-04	0	1.59E-05	0	0	0	0	0	2.53E-04	1.11E-04	3.13E-02	2.50E-02	-1.42E-01
PERM	MJ	2.49E-02	0.00E+00	0.00E+00	0	0.00E+00	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	-2.49E-02	0.00E+00
PERT	MJ	3.65E-01	2.28E-03	3.41E-04	0	1.59E-05	0	0	0	0	0	2.53E-04	1.11E-04	3.13E-02	1.01E-04	-1.42E-01
PENRE	MJ	2.96E+00	2.04E-02	1.47E-01	0	3.45E-05	0	0	0	0	0	8.87E-04	6.02E-04	2.93E-03	2.47E-04	-5.07E-01
PENRM	MJ	1.46E-01	0.00E+00	-1.46E-01	0	0.00E+00	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.11E+00	2.04E-02	1.37E-03	0	3.45E-05	0	0	0	0	0	8.87E-04	6.02E-04	2.93E-03	2.47E-04	-5.07E-01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0	0.00E+00	0	0	0	0	0	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	0.00E+00	0	0	0	0	0	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	0.00E+00	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m <sup>3</sup>	8.93E-03	2.11E-05	2.34E-06	0	1.73E-05	0	0	0	0	0	1.41E-06	8.39E-07	3.90E-05	7.49E-06	-3.65E-04
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water															

<sup>1</sup> 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<sub>2</sub> is set to zero.

## Waste indicators

Table 12 Waste production

Results per functional unit																
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD	kg	6.49E-04	1.30E-06	1.60E-07	0	4.43E-10	0	0	0	0	0	1.23E-07	4.55E-08	1.08E-07	4.20E-08	-2.99E-06
NHWD	kg	1.86E-02	3.70E-03	2.65E-04	0	7.90E-07	0	0	0	0	0	1.26E-05	3.26E-04	3.95E-02	1.08E-02	-3.85E-03
RWD	kg	3.94E-06	3.32E-08	9.68E-09	0	4.94E-10	0	0	0	0	0	8.10E-09	1.99E-09	1.38E-06	1.54E-09	-1.42E-06
Acronyms	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed															

## Output flow indicators

Table 13 Output flows

Results per functional or declared unit																
Indicator	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CRU	kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	1.28E-03	0	0	0	0	0	0	0	0	0	3.95E-02	0	0
MER	kg	5.65E-05	0	5.78E-04	0	0	0	0	0	0	0	0	0	0	3.59E-03	0
EEE	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.47E-02
EET	MJ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.65E-02
Acronyms	CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy															

## Additional LCA results (other environmental performance results) of the product(s)

The three scenarios of the End of life (100% landfill, 100% incineration, 100% recycling) have been declared in the EPD. Results are declared as per functional unit.

Table 14 Results (C1-C4, D) for 100% landfill scenario

Impact category	C1	C2	C3	C4	D
GWP- total	1.36E-03	4.70E-04	4.69E-04	1.71E-03	0.00E+00
GWP-fossil	1.36E-03	4.70E-04	4.19E-04	1.70E-03	0.00E+00
GWP-biogenic	0.00E+00	0.00E+00	0.00E+00	1.56E-06	0.00E+00
GWP- luluc	2.40E-07	1.58E-07	5.00E-05	5.42E-07	0.00E+00
ODP	2.03E-11	1.03E-11	4.10E-12	4.16E-13	0.00E+00
AP	1.21E-05	1.01E-06	2.50E-06	6.62E-06	0.00E+00
EP-freshwater	4.84E-09	3.50E-09	1.52E-08	2.02E-08	0.00E+00
EP-marine	5.64E-06	2.37E-07	5.57E-07	2.19E-06	0.00E+00
EP-terrestrial	6.18E-05	2.63E-06	7.19E-06	2.42E-05	0.00E+00
POCP	1.85E-05	1.60E-06	1.70E-06	7.66E-06	0.00E+00
ADP-fossil	1.81E-02	6.68E-03	6.06E-02	3.57E-03	0.00E+00
ADP- M&M	5.20E-10	1.61E-09	8.18E-09	4.11E-09	0.00E+00
WDP	4.23E-05	2.63E-05	8.19E-04	-5.70E-04	0.00E+00
PERE	2.53E-04	1.11E-04	3.91E-02	5.28E-04	0.00E+00
PERM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	2.53E-04	1.11E-04	3.91E-02	5.28E-04	0.00E+00
PENRE	8.87E-04	6.02E-04	1.49E-03	5.14E-03	0.00E+00
PENRM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	8.87E-04	6.02E-04	1.49E-03	5.14E-03	0.00E+00
SM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	1.41E-06	8.39E-07	6.64E-05	-6.34E-06	0.00E+00
HWD	1.23E-07	4.55E-08	3.60E-08	8.31E-08	0.00E+00
NHWD	1.26E-05	3.26E-04	3.95E-02	5.04E-02	0.00E+00
RWD	8.10E-09	1.99E-09	9.62E-07	4.96E-09	0.00E+00
CRU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 15 Results (C1-C4, D) for 100% incineration scenario

Impact category	C1	C2	C3	C4	D
GWP - total	1.36E-03	4.70E-04	4.69E-04	9.48E-03	-5.68E-03
GWP - fossil	1.36E-03	4.70E-04	4.19E-04	9.48E-03	-5.67E-03
GWP - biogenic	0.00E+00	0.00E+00	0.00E+00	1.40E-06	-1.36E-06
GWP - luluc	2.40E-07	1.58E-07	5.00E-05	7.33E-07	-1.21E-06
ODP	2.03E-11	1.03E-11	4.10E-12	1.91E-12	-2.14E-11
AP	1.21E-05	1.01E-06	2.50E-06	7.11E-06	-8.97E-06
EP- freshwater	4.84E-09	3.50E-09	1.52E-08	1.69E-08	-1.39E-08
EP -marine	5.64E-06	2.37E-07	5.57E-07	2.79E-06	-3.24E-06
EP - terrestrial	6.18E-05	2.63E-06	7.19E-06	3.00E-05	-4.09E-05
POCP	1.85E-05	1.60E-06	1.70E-06	9.71E-06	-1.20E-05
ADP-fossil*	1.81E-02	6.68E-03	6.06E-02	2.58E-03	-1.45E-03
ADP-M&M*	5.20E-10	1.61E-09	8.18E-09	2.94E-09	-3.97E-09
WDP2	4.23E-05	2.63E-05	8.19E-04	9.75E-05	-7.96E-04
PERE	2.53E-04	1.11E-04	3.91E-02	3.73E-04	-1.61E-02
PERM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	2.53E-04	1.11E-04	3.91E-02	3.73E-04	-1.61E-02
PENRE	8.87E-04	6.02E-04	1.49E-03	3.57E-03	-1.50E-03
PENRM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	8.87E-04	6.02E-04	1.49E-03	3.57E-03	-1.50E-03
SM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	1.41E-06	8.39E-07	6.64E-05	6.02E-06	-1.13E-05
HWD	1.23E-07	4.55E-08	3.60E-08	1.44E-07	-4.89E-07
NHWD	1.26E-05	3.26E-04	3.95E-02	5.04E-02	-1.02E-04
RWD	8.10E-09	1.99E-09	9.62E-07	4.83E-09	-6.35E-09
CRU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 16 Results (C1-C4, D) for 100% recycling scenario

Impact category	C1	C2	C3	C4	D
GWP - total	1.36E-03	4.70E-04	4.69E-04	0.00E+00	-7.80E-02
GWP - fossil	1.36E-03	4.70E-04	4.19E-04	0.00E+00	-7.74E-02
GWP - biogenic	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.11E-04
GWP - luluc	2.40E-07	1.58E-07	5.00E-05	0.00E+00	-1.44E-04
ODP	2.03E-11	1.03E-11	4.10E-12	0.00E+00	-8.21E-11
AP	1.21E-05	1.01E-06	2.50E-06	0.00E+00	-6.32E-04

EP- freshwater	4.84E-09	3.50E-09	1.52E-08	0.00E+00	-3.55E-06
EP -marine	5.64E-06	2.37E-07	5.57E-07	0.00E+00	-9.51E-05
EP - terrestrial	6.18E-05	2.63E-06	7.19E-06	0.00E+00	-1.17E-03
POCP	1.85E-05	1.60E-06	1.70E-06	0.00E+00	-3.39E-04
ADP-fossil*	1.81E-02	6.68E-03	6.06E-02	0.00E+00	-4.56E-01
ADP-M&M*	5.20E-10	1.61E-09	8.18E-09	0.00E+00	-6.10E-06
WDP2	4.23E-05	2.63E-05	8.19E-04	0.00E+00	-1.37E-02
PERE	2.53E-04	1.11E-04	3.91E-02	0.00E+00	-1.53E-01
PERM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	2.53E-04	1.11E-04	3.91E-02	0.00E+00	-1.53E-01
PENRE	8.87E-04	6.02E-04	1.49E-03	0.00E+00	-5.37E-01
PENRM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	8.87E-04	6.02E-04	1.49E-03	0.00E+00	-5.37E-01
SM	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	1.41E-06	8.39E-07	6.64E-05	0.00E+00	-4.51E-04
HWD	1.23E-07	4.55E-08	3.60E-08	0.00E+00	-3.18E-06
NHWD	1.26E-05	3.26E-04	3.95E-02	0.00E+00	-4.55E-03
RWD	8.10E-09	1.99E-09	9.62E-07	0.00E+00	-1.48E-06
CRU	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ETE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Results of other decalated products in this report are presented by its A1-A3 stage results and variation against LR7-72HVD (665 Wp) results.

Table 17 Environmental impacts of other products (expressed as A1-A3 variations to LR7-72HVD)

Parameter	Unit	A1-A3 Variations, %			
		LR7-72HVH	LR7-54HVH	LR7-54HVD	LR7-54HVB
GWP- total	kg CO <sub>2</sub> eq.	0.28%	3.50%	3.66%	6.98%
GWP-fossil	kg CO <sub>2</sub> eq.	0.44%	3.66%	3.81%	7.11%
GWP-biogenic	kg CO <sub>2</sub> eq.	20.02%	23.17%	23.22%	24.46%
GWP- luluc	kg CO <sub>2</sub> eq.	0.83%	9.96%	10.37%	12.81%
ODP	kg CFC11 eq	47.63%	63.14%	6.41%	63.31%
AP	mol H <sup>+</sup> eq	-1.66%	1.42%	2.21%	4.71%
EP-freshwater	kg P eq.	1.79%	3.72%	2.22%	8.38%
EP-marine	kg N eq	-0.77%	1.43%	1.50%	5.30%
EP-terrestrial	mol N eq	-1.19%	1.39%	2.09%	4.82%
POCP	kg NMVOC eq.	-0.53%	2.26%	3.10%	5.49%
ADP-fossil*	MJ	2.02%	5.18%	6.00%	8.44%
ADP-M&M*	Kg Sb eq.	0.83%	1.26%	0.55%	4.80%

WDP*	m <sup>3</sup>	0.64%	0.69%	-0.54%	6.13%
GWP-GHG	kg CO <sub>2</sub> eq.	0.44%	3.66%	3.82%	7.12%

Note: 1. Negative variations indicates lower results;

2. A significant variation in GWP-biogenic is attributed to different amount of packaging material used.

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

Table 18 Resource use of other products (expressed as A1-A3 variations to LR7-72HVD)

Indicators	Unit	A1-A3 Variations, %			
		LR7-72HVH	LR7-54HVH	LR7-54HVD	LR7-54HVB
PERE	MJ	3.92%	6.80%	6.50%	6.50%
PERM	MJ	18.28%	45.17%	21.39%	21.39%
PERT	MJ	4.91%	9.45%	7.53%	7.53%
PENRE	MJ	1.44%	3.07%	0.43%	0.43%
PENRM	MJ	21.68%	26.24%	66.06%	66.06%
PENRT	MJ	2.39%	4.17%	3.53%	3.53%
SM	kg	0.00%	0.00%	0.00%	0.00%
RSF	MJ	0.00%	0.00%	0.00%	0.00%
NRSF	MJ	0.00%	0.00%	0.00%	0.00%
FW	m <sup>3</sup>	0.63%	0.65%	-0.22%	-0.22%

Table 19 Waste production of other products (expressed as A1-A3 variations)

Indicators	Unit	A1-A3 Variations, %			
		LR7-72HVH	LR7-54HVH	LR7-54HVD	LR7-54HVB
HWD	kg	0.87%	0.30%	-1.62%	-1.62%
NHWD	kg	20.53%	0.99%	30.63%	30.63%
RWD	kg	4.63%	5.49%	3.91%	3.91%

Table 20 Output flows of other products (expressed as A1-A3 variations)

Indicators	Unit	A1-A3 Variations, %			
		LR7-72HVH	LR7-54HVH	LR7-54HVD	LR7-54HVB
CRU	kg	0.00%	0.00%	0.00%	0.00%
MFR	kg	0.00%	0.00%	0.00%	0.00%
MER	kg	0.00%	0.00%	0.00%	0.00%
EEE	MJ	0.00%	0.00%	0.00%	0.00%
EET	MJ	0.00%	0.00%	0.00%	0.00%

LR7-72HVD (665 Wp) has been chosen as representative products for its respective brand series. To obtain results across various power output ranges for the products, a list of conversion factors has been provided, accounting for different peak power ranges.

Table 21 EPD results conversion factors of various power output ranges for LR7-72HVD series

Rated power output range (Wp)	625	630	635	640	645	650	655	660
Conversion factor	1.064	1.056	1.047	1.039	1.031	1.023	1.015	1.008

## ABBREVIATIONS

Abbreviation	Definition
<b>General Abbreviations</b>	
EN	European Norm (Standard)
EF	Environmental Footprint
GPI	General Programme Instructions
ISO	International Organization for Standardization
CEN	European Committee for Standardization
CLC	Co-location centre
CPC	Central product classification
GHS	Globally harmonized system of classification and labelling of chemicals
GRI	Global Reporting Initiative
SVHC	Substances of Very High Concern
ND	Not Declared
<b>Environmental Impact Indicators (EN 15804)</b>	
GHG	Greenhouse gas
GWP	Global Warming Potential (kg CO <sub>2</sub> eq.)
GWP-fossil	Global Warming Potential from fossil sources (kg CO <sub>2</sub> eq.)
GWP-biogenic	Global Warming Potential from biogenic sources (kg CO <sub>2</sub> eq.)
GWP-luluc	Global Warming Potential from land use and land use change (kg CO <sub>2</sub> eq.)
GWP-total	Total Global Warming Potential (kg CO <sub>2</sub> eq.)
GWP-GHG	Global Warming Potential for greenhouse gases (kg CO <sub>2</sub> eq.)
ODP	Ozone Depletion Potential (kg CFC-11 eq.)
AP	Acidification Potential (mol H <sup>+</sup> eq.)
EP	Eutrophication Potential
EP-freshwater	Freshwater eutrophication potential (kg P eq.)
EP-marine	Marine eutrophication potential (kg N eq.)
EP-terrestrial	Terrestrial eutrophication potential (mol N eq.)
POCP	Photochemical Ozone Creation Potential (kg NMVOC eq.)
ADP	Abiotic Depletion Potential
ADP-M&M	Abiotic depletion potential for non-fossil resources (kg Sb eq.)
ADP-fossil	Abiotic depletion potential for fossil resources (MJ)
WDP	Water Deprivation Potential (m <sup>3</sup> )
<b>Other environmental performance indicators</b>	
PM	Particulate matter emissions (Disease incidence)
IRP	Ionising radiation, human health (kBq U235 eq.)
ETP-fW	Ecotoxicity, freshwater (CTUe)
HTP-c	Human toxicity, cancer effects (CTUh)
HTP-nc	Human toxicity, non-cancer effects (CTUh)
SQP	Land use related impacts / soil quality (Dimensionless)
<b>Resource Use Indicators</b>	
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials (MJ)
PERM	Use of renewable primary energy resources used as raw materials (MJ)
PERT	Total use of renewable primary energy resources (MJ)
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials (MJ)
PENRM	Use of non-renewable primary energy resources used as raw materials (MJ)
PENRT	Total use of non-renewable primary energy resources (MJ)
SM	Use of secondary material (kg)

RSF	Use of renewable secondary fuels (MJ)
NRSF	Use of non-renewable secondary fuels (MJ)
FW	Use of net fresh water (m <sup>3</sup> )
<b>Waste Indicators</b>	
HW	Hazardous Waste (disposed) (kg)
NHW	Non-Hazardous Waste (disposed) (kg)
RW	Radioactive Waste (disposed) (kg)
<b>Output Flow Indicators</b>	
CFR	Components for Reuse (kg)
MR	Material for Recycling (kg)
MER	Materials for Energy Recovery (kg)
EEE	Exported Energy, Electricity (MJ)
EET	Exported Energy, Thermal (MJ)

## REFERENCES

LCA for LONGi PV modules, version 1.3, 2025-11

China PV Industry Development Roadmap (2024-2025).

R. Frischknecht, P. Stolz, L. Krebs, M. de Wild-Scholten, P. Sinha, V. Fthenakis, H. C. Kim, M. Rauegi, M. Stucki, 2020, Life Cycle Inventories and Life Cycle Assessment of Photovoltaic Systems, International Energy Agency (IEA) PVPS Task 12, Report T12-19:2020.

### INTERNATIONAL EPD SYSTEM

General Programme Instructions of the International EPD® System. Version 5.0.1

PCR 2019:14 Construction Products, Version 2.0.1

c-PCR-016 Photovoltaic modules and parts thereof (adopted from EPD Norway 2022-04-27)

### INTERNATIONAL AND EUROPEAN STANDARDS

EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

ISO 14020:2022 Environmental statements and programmes for products: Principles and general requirements

ISO 14025:2011 Environmental labels and declarations - Type III environmental declarations -Principles and procedures

ISO 14040: 2006/Amd 1:2020 Environmental management - Life cycle assessment - Principles and framework Amendment 1 (ISO 2020)

ISO 14044: 2006/Amd 2:2020 Environmental management - Life cycle assessment - Requirements and guidelines Amendment 2 (ISO 2020)

WEEE Directive 2012/19/EU Article 4,11&15

### LCA SOFTWARE AND DATABASE

SimaPro v10.2, LCA software

Ecoinvent Database 3.11

## VERSION HISTORY

Original version of the EPD.

