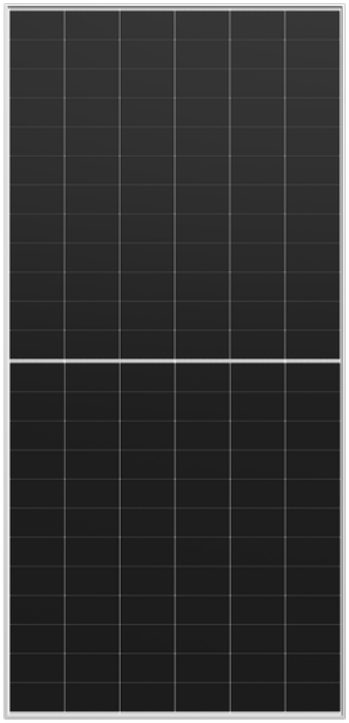
Product Environmental Profile (PEP)

LONGi LR7-54HVH



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Auditor authorization No.: VH42	Information and reference: www.pep-ecopassport.org
Issue date: 11/2025	Period of validity: 5 years
Independent verification of declaration and data in accordance with ISO 14025: 2006	
Internal: ☐ External: ☒	
Critical review of the PCR by a panel of experts chaired by Julie Orgelet (DDemain)	
PEPs comply with standard XP C08-100-1:2016 or EN 50693:2019 PEP elements cannot be compared with elements from another program.	
Document compliant with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations".	

GENERAL INFORMATION

Product(s) studied	**List of eligible entities**
The commercial reference(s) are as follows: LR7-54HVH (470-500 Wp)	Entities eligible to use the declaration are as follows: LONGi Green Energy Technology Co., Ltd.
Scope of Declaration	**Functional Unit (FU)**
This declaration and the accompanying report are representative of a monocrystalline photovoltaic (PV) module with 54 cells. The life cycle impact assessment is based on a model covering several power classes within the same product series. The results presented correspond to the representative module with the highest production volume. This PEP covers the extraction and transport of raw materials, manufacturing, transport to the installation site, installation, use, maintenance and end-of-life of the modules. Packaging of raw materials is not included. The PEP does not include the inverter, the structure or the cabling for the electrical connection of the system. Geographical representativeness: The modules assessed in this declaration are manufactured and assembled in Wuhu City, Anhui Province, China, by LONGi Solar Technology (Wuhu) Co., Ltd. (Address: North of Wanxing Road and West of Yudai Road, Shenxiang Area, Economic and Technological Development Zone, Wuhu City, Anhui Province, P.R. China), and are intended for use in France.	Production of 1 kilowatt-peak (kWp) power output of photovoltaic energy for 30 years by 2 panels of 500 Wp on a surface of 4.08 m² with an annual degradation of 0.35%/year. The FU includes the manufacture, transport, installation, maintenance and end-of-life of the panels.

Declared Unit (UD)

Photovoltaic energy production using 0.49 pcs of 500 Wp solar panels on a 1 m² surface for a reference lifetime of 30 years, with an annual degradation of 1% in the first year and 0.35%/year thereafter.

Mathematical relationship between the declared unit – the functional unit

A surface area of 4.08 m^2 is required to provide 1kWp of photovoltaic production capacity, so the functional unit corresponds to 4.08 declared units.

REFERENCE PRODUCT

All calculations are related to the functional unit, i.e. "1kWp of panels". The environmental values declared refer to a reference product with the characteristics defined below:

TECHNICAL DATA

Product	LR7-54HVH		
Function	Photovoltaic electricity generation		
Total weight (including packaging and additional components)	22.8	Total mass (including packaging and additional components) per UF	46.4
Total weight excluding packaging	21.6	Total mass excluding packaging per UF	43.2
Product characteristics	Photovoltaic panel: - Monocrystalline technology – Rated power: Ppep = 470-500 Wp Efficiency: 22.3~23.3% Annual degradation: 1% in the first year and 0.35%/year thereafter Dimensions: 1800mm*1134mm*30mm		
Main components	Aluminium frame Front solar glass Backsheet Encapsulant: Ethylvinylacetate (EVA) and Polyolefin Elastomer (POE) One junction box Monocrystalline cells welded together Packaging		

RAW MATERIALS

The constituent materials of the reference product are:

Plastics		**Metals**		**Others**	
Ethylvinylacetate (EVA)	3.62%	Aluminium	8.78%	Glass	68.12%
Polyolefin Elastomer (POE)	3.10%	Copper	1.23%	Silicon	2.47%
Backsheet	3.73%	Other metals	<1%	Packaging - Cardboard	0.86%
Silicone	1.33%			Packaging - Wood	5.39%
Junction box	0.88%			Adhesive	0.05%
Plastic packaging	0.22%				
Total:	**12.88%**	**Total:**	**10.23%**	**Total:**	**76.89%**

LIFE CYCLE ANALYSIS METHODOLOGY

The Life Cycle Assessment on which this Product Environmental Profile (PEP) is based complies with the criteria of PCR-ed4- EN-2021 09 06 of the ecopassport® PEP Program. The functional unit and the manufacturing, distribution, installation, use and end-of-life scenarios are based on the assumptions set out in the "International Energy Agency document on LCA of photovoltaic systems". The results were obtained using SimaPro 10.2 software, the EF3.1 method and the "Ecoinvent 3.11" database.

MANUFACTURING

The manufacturing stage covers the extraction, processing, and transport of raw materials, as well as the full photovoltaic (PV) module production process. This includes the consumption of energy and natural resources, and the treatment, emission, and transport of all process wastes.

For the production of silicon ingots, wafers, and solar cells, the most recent Life Cycle Inventory (LCI) data published by the International Energy Agency Photovoltaic Power Systems Programme (IEA PVPS, 2020) were adopted. This dataset was selected in preference to that of the Ecoinvent database, as the latter represents outdated manufacturing conditions and no longer reflects current industry practices.

Electricity inputs were modelled according to the national or regional grid mix corresponding to each manufacturing step:

-Upstream processes (Polysilicon, Ingot & Wafer, and Cell production): Electricity, medium voltage {CN} | market group for electricity, medium voltage | Cut-off, U

-Module assembly (Wuhu, Anhui Province): Electricity, medium voltage {CN-ECGC} | market for electricity, medium voltage | Cut-off, U

In addition, on-site rooftop PV electricity is partly used during module manufacturing. The factory's rooftop PV system generates electricity primarily for self-consumption, with surplus power fed into the grid. The following dataset was applied to represent this on-site renewable electricity: Electricity, low voltage {CN-SH} | electricity production, photovoltaic, 3 kWp slanted-roof installation, single-Si, panel, mounted | Cut-off, U.

DISTRIBUTION

The product is distributed from the producer in China to the installation site in France. A distance of 366 km by truck was considered between the factory and the port of Shanghai. A distance of 23224 km by ship was considered between Shanghai to the port of Le Havre, and a final distance of 1000 km was considered between the last logistical point and the final place of distribution according to PCR.

INSTALLATION

The PV module can be installed in both rooftop and ground-mounted applications. According to the PCR, auxiliary components such as mounting structures, inverters, wiring, transformers, and other electrical system elements (e.g., circuit breakers, switches, and meters) are excluded from the system boundaries of this study, as their contribution depends on site-specific installation conditions. The installation process mainly involves manual and mechanical handling of PV modules and packaging materials. The panels are lifted and positioned either manually or with light equipment such as cranes or forklifts. Fastening is carried out using small electric tools (e.g., screwdrivers), whose energy consumption is negligible compared with the overall life-cycle impact. Energy and fuel consumption during installation were modelled using a proxy dataset from Ecoinvent: Photovoltaic plant, 570 kWp, multi-Si, on open ground {GLO} | photovoltaic plant construction, 570 kWp, multi-Si, on open ground | Cut-off, U. This process includes the operation of on-site machinery and transportation activities. The dataset assumes 7,673 MJ of diesel and 36.03 kWh of electricity for the installation of a 570 kWp system. These values have been downscaled proportionally to the rated power of the module declared in this study. The installation waste consists mainly of packaging materials associated with module delivery. The treatment of packaging waste is included in this stage. The primary packaging materials are wood pallets, cardboard, and plastic film.

-Waste transportation to the nearest treatment facility is assumed to be 200 km by road (truck 16–32 t, EURO 6)

-Waste wood pallets are modelled as 75% recycled and 25% incinerated for energy recovery.

-Paper and plastic film packaging are 100% incinerated with energy recovery.

Other installation-related equipment and site construction activities (e.g., electrical connections, inverter setup, and cabling) are not included in the system boundary, consistent with the PCR rules and the limited contribution of these elements to the overall life-cycle impact.

USE

B1. Use for 30 years:

Not applicable. As the panels are used passively, no energy or material is consumed. There are no emissions to air, water or soil. The product's reference lifetime is 30 years according to PEP methodology.

B2. Maintenance:

Water used for cleaning in 30 years is assumed with 0.23L per module per time and two times per year

B6. Energy requirements during the use stage

No energy consumption, but energy production according to UF.

To quantify energy production for the first year of panel use, the following formula was used:

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

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 consider the specific inclination (slope, tilt) and orientation.

A = Area of module, from functional unit (FU), m^2.

y = Module yield: electrical power, kWp for standard test conditions (STC) of the module divided by the area of the module.

STC: 1The ratio is given for standard test conditions: irradiance 1000 W/m^2, cell temperature 25 °C, wind speed 1 m/s, AM1.5.

PR = Performance ratio, coefficient for losses. Site specific performance ratio can be modelled with PV simulation software tools, such as PVSYST or similar.

Deg: yearly degradation rate.

Energy production second year of operation:

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

Energy production n year of operation:

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

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

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

Modules B3. Replacement, B4 Repair, B5 Renovation; B7 Water requirements during use are not concerned.

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 (Latunussa 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 life cycle (D)

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.

Environmental impact of reference product per functional unit

The impact results presented below were obtained using the methods defined in PCR-ed4-EN-2021 09 06. The declared impacts are those of the reference product in life cycle, reduced to the functional unit (1 kWp). They are based on a conservative calculation including several modules of different sizes and number of cells. They can be extrapolated on the basis of the extrapolation rules defined below (see chapter "EXTRAPOLATION RULES").

Mandatory environmental impact indicators LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	3.34E+02	2.30E+01	2.91E+00	0.00E+00	6.88E-03	0.00E+00	1.36E+00	4.03E-01	9.52E-01	1.28E+01	-6.77E+01
GWP- fossil	kg CO2 eq	3.35E+02	2.30E+01	1.74E+00	0.00E+00	6.87E-03	0.00E+00	1.36E+00	4.03E-01	9.51E-01	1.28E+01	-6.75E+01
GWP - biogenic	kg CO2 eq	-1.17E+00	0.00E+00	1.17E+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
GWP-luluc	kg CO2 eq	3.03E-01	1.04E-02	1.54E-04	0.00E+00	1.36E-05	0.00E+00	1.40E-04	1.36E-04	3.05E-04	5.70E-05	-1.30E-01
ODP	kg CFC11 eq	7.66E-05	3.90E-07	2.12E-08	0.00E+00	1.02E-10	0.00E+00	2.03E-08	8.80E-09	2.85E-08	5.02E-09	-8.58E-07
AP	mol H+ eq	2.04E+00	3.50E-01	1.24E-02	0.00E+00	3.67E-05	0.00E+00	1.21E-02	8.66E-04	3.13E-03	3.03E-03	-3.68E-01
EP-Freshwater	kg P eq	1.66E-02	1.48E-04	5.31E-06	0.00E+00	4.75E-07	0.00E+00	4.80E-06	3.00E-06	1.09E-05	3.30E-06	-2.16E-03
EP-Marine	kg N eq	4.61E-01	8.66E-02	5.76E-03	0.00E+00	6.08E-06	0.00E+00	5.63E-03	2.04E-04	8.02E-04	1.44E-03	-7.73E-02
EP-Terrestrial	mol N eq	4.41E+00	9.62E-01	6.31E-02	0.00E+00	6.84E-05	0.00E+00	6.18E-02	2.25E-03	8.03E-03	1.49E-02	-9.39E-01
POCP	kg NMVOC eq	1.36E+00	2.83E-01	1.89E-02	0.00E+00	2.23E-05	0.00E+00	1.85E-02	1.37E-03	2.94E-03	3.83E-03	-2.72E-01
ADP-fossil	MJ	4.07E+03	3.04E+02	1.91E+01	0.00E+00	1.24E-01	0.00E+00	1.85E+01	5.73E+00	1.67E+02	2.89E+00	-9.02E+02
ADP- M&M	kg Sb eq	2.05E-02	5.19E-05	6.64E-07	0.00E+00	3.77E-08	0.00E+00	5.23E-07	1.38E-06	7.56E-06	5.55E-07	-3.17E-03
WDP	m3 depriv.	3.76E+02	1.01E+00	4.47E-02	0.00E+00	9.87E-01	0.00E+00	3.92E-02	2.25E-02	2.79E-01	-9.16E-02	-8.43E+00
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											

Optional environmental impact indicators LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	disease inc.	2.79E-05	7.19E-07	3.49E-07	0.00E+00	4.09E-10	0.00E+00	3.46E-07	3.27E-08	6.40E-08	1.92E-08	-4.20E-06

IRP	kBq U-235 eq	5.73E+00	4.97E-02	1.75E-02	0.00E+00	8.08E-04	0.00E+00	1.72E-02	2.73E-03	2.94E+00	3.05E-03	-2.47E+00
ETP-fw	CTUe	2.44E+03	2.22E+01	1.79E+00	0.00E+00	2.24E-02	0.00E+00	9.68E-01	8.37E-01	2.29E+00	2.81E+01	-2.08E+02
HTP-c	CTUh	1.32E-07	3.33E-09	1.77E-10	0.00E+00	8.30E-12	0.00E+00	1.40E-10	7.33E-11	4.34E-10	7.45E-10	-2.28E-08
HTP-nc	CTUh	2.89E-06	7.92E-08	4.16E-09	0.00E+00	3.82E-10	0.00E+00	2.25E-09	3.91E-09	1.73E-08	3.04E-08	-5.98E-07
SQP	Pt	1.40E+03	5.30E+01	1.68E+00	0.00E+00	2.66E-02	0.00E+00	1.45E+00	3.74E+00	5.76E+01	2.73E+00	-4.80E+02

Acronyms	**PM**: Particulate Matter emissions; I**RP**: Ionizing radiation – human health; **ETP-fw**: Eco toxicity – freshwater; **HTP-c** Human toxicity – cancer effects; **HTP-nc** Human toxicity – non cancer effects; **SQP**: Soil Quality (dimensionless)

Mandatory inventory flow indicators LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PERE	MJ	3.67E+02	3.72E+00	1.35E-01	0.00E+00	2.12E-02	0.00E+00	1.20E-01	9.48E-02	1.75E+00	4.25E+01	-1.39E+02
PERM	MJ	4.24E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.24E+01	0.00E+00
PERT	MJ	4.09E+02	3.72E+00	1.35E-01	0.00E+00	2.12E-02	0.00E+00	1.20E-01	9.48E-02	1.75E+00	1.36E-01	-1.39E+02
PENRE	MJ	3.09E+03	2.73E+01	1.87E+02	0.00E+00	4.59E-02	0.00E+00	8.81E-01	5.16E-01	1.40E+00	3.41E-01	-4.70E+02
PENRM	MJ	1.86E+02	0.00E+00	-1.86E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	3.28E+03	2.73E+01	9.58E-01	0.00E+00	4.59E-02	0.00E+00	8.81E-01	5.16E-01	1.40E+00	3.41E-01	-4.70E+02
SM	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	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	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	0.00E+00	0.00E+00
FW	m3	9.09E+00	3.16E-02	2.14E-03	0.00E+00	2.31E-02	0.00E+00	1.42E-03	7.19E-04	3.58E-02	1.21E-02	-3.27E-01
HWD	kg	6.59E-01	1.85E-03	1.30E-04	0.00E+00	5.89E-07	0.00E+00	1.23E-04	3.91E-05	9.17E-05	5.84E-05	-2.54E-03
NHWD	kg	1.84E+01	8.29E+00	3.98E-02	0.00E+00	1.05E-03	0.00E+00	1.23E-02	2.79E-01	3.18E+01	1.76E+01	-3.30E+00
RWD	kg	4.21E-03	6.01E-05	1.37E-05	0.00E+00	6.57E-07	0.00E+00	1.35E-05	1.71E-06	2.20E-03	2.13E-06	-1.25E-03
CRU	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	0.00E+00	0.00E+00
MFR	kg	7.65E-04	0.00E+00	4.45E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.17E+01	0.00E+00	0.00E+00
MER	kg	9.36E-05	0.00E+00	2.43E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.25E+02	0.00E+00
EET	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	0.00E+00	8.55E+02
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	0.00E+00	0.00E+00	1.54E+03

Acronyms	**PERE** = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; **PERM** = Use of renewable primary energy resources used as raw materials; **PERT** = Total use of renewable primary energy resources; **PENRE** = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; **PENRM** = Use of non-renewable primary energy resources used as raw materials; **PENRT** = Total **HWD** = Hazardous waste disposed; **NHWD** = Non-hazardous waste disposed; **RWD** = Radioactive waste disposed 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 **CRU** = Components for re-use; **MFR** = Materials for recycling; MER = Materials for energy recovery; **EEE** = Exported electrical energy; **EET** = Exported thermal energy

Biogenic carbon content LR7-54HVH

Biogenic carbon content	Unit	LR7-54HVH
Biogenic carbon content in product	kg C/FU	0
Biogenic carbon content in the accompanying packaging	kg C/FU	1.17E+00

To meet the requirements of French regulations corresponding to Appendix C of the RCP, additional impact indicators, for information purposes only, have been calculated:

Additional environmental impact indicators in the French regulatory framework

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
Global warming	kg CO2 eq	3.35E+02	2.29E+01	1.73E+00	0	6.86E-03	0	1.35E+00	4.01E-01	9.47E-01	1.28E+01	-6.77E+01
Ozone depletion	kg CFC-11 eq	7.05E-05	3.11E-07	1.69E-08	0	8.73E-11	0	1.61E-08	7.02E-09	2.25E-08	4.20E-09	-7.13E-07
Acidification of soils and water	kg SO2 eq	1.67E+00	2.80E-01	8.74E-03	0	3.06E-05	0	8.52E-03	6.95E-04	2.51E-03	2.15E-03	-2.93E-01
Water eutrophication	kg PO4--- eq	2.44E-01	3.03E-02	1.99E-03	0	3.75E-06	0	1.93E-03	8.88E-05	3.66E-04	7.03E-04	-3.67E-02
Photochemical ozone formation	kg C2H4 eq	8.53E-02	8.73E-03	2.44E-04	0	1.88E-06	0	2.35E-04	5.73E-05	1.40E-04	4.98E-05	-1.61E-02
Depletion of abiotic resources - elements	kg Sb eq	2.05E-02	5.19E-05	6.66E-07	0	3.78E-08	0	5.26E-07	1.38E-06	7.94E-06	5.55E-07	-3.17E-03
Depletion of abiotic resources – fossil fuels	MJ	3.77E+03	3.00E+02	1.82E+01	0	7.86E-02	0	1.76E+01	5.62E+00	1.40E+01	2.75E+00	-8.21E+02

Result for 1 m² photovoltaic panel (Declared Unit)

In the context of Life Cycle Assessment at building scale, the environmental impacts to be considered are those of the equipment over its reference lifetime, and not the main results of the PEP, which correspond to the functional unit and the reference product. The following results are presented for 1m² of photovoltaic panels:

Mandatory environmental impact indicators LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
GWP-total	kg CO2 eq	8.18E+01	5.64E+00	7.12E-01	0.00E+00	1.69E-03	0.00E+00	3.33E-01	9.89E-02	2.33E-01	3.14E+00	-1.66E+01
GWP- fossil	kg CO2 eq	8.20E+01	5.64E+00	4.26E-01	0.00E+00	1.68E-03	0.00E+00	3.33E-01	9.88E-02	2.33E-01	3.14E+00	-1.66E+01
GWP - biogenic	kg CO2 eq	-2.87E-01	0.00E+00	2.87E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GWP-luluc	kg CO2 eq	7.44E-02	2.54E-03	3.78E-05	0.00E+00	3.33E-06	0.00E+00	3.44E-05	3.33E-05	7.47E-05	1.40E-05	-3.20E-02
ODP	kg CFC11 eq	1.88E-05	9.55E-08	5.20E-09	0.00E+00	2.50E-11	0.00E+00	4.97E-09	2.16E-09	6.98E-09	1.23E-09	-2.10E-07
AP	mol H+ eq	5.00E-01	8.58E-02	3.05E-03	0.00E+00	9.01E-06	0.00E+00	2.97E-03	2.12E-04	7.67E-04	7.43E-04	-9.03E-02
EP-Freshwater	kg P eq	4.07E-03	3.64E-05	1.30E-06	0.00E+00	1.16E-07	0.00E+00	1.18E-06	7.35E-07	2.67E-06	8.08E-07	-5.28E-04
EP-Marine	kg N eq	1.13E-01	2.12E-02	1.41E-03	0.00E+00	1.49E-06	0.00E+00	1.38E-03	4.99E-05	1.97E-04	3.54E-04	-1.90E-02
EP-Terrestrial	mol N eq	1.08E+00	2.36E-01	1.55E-02	0.00E+00	1.68E-05	0.00E+00	1.51E-02	5.52E-04	1.97E-03	3.64E-03	-2.30E-01
POCP	kg NMVOC eq	3.32E-01	6.94E-02	4.63E-03	0.00E+00	5.46E-06	0.00E+00	4.53E-03	3.37E-04	7.21E-04	9.38E-04	-6.67E-02
ADP-fossil	MJ	9.98E+02	7.46E+01	4.68E+00	0.00E+00	3.03E-02	0.00E+00	4.54E+00	1.40E+00	4.10E+01	7.08E-01	-2.21E+02
ADP- M&M	kg Sb eq	5.03E-03	1.27E-05	1.63E-07	0.00E+00	9.25E-09	0.00E+00	1.28E-07	3.39E-07	1.85E-06	1.36E-07	-7.77E-04
WDP	m3 depriv.	9.20E+01	2.47E-01	1.10E-02	0.00E+00	2.42E-01	0.00E+00	9.60E-03	5.52E-03	6.83E-02	-2.25E-02	-2.07E+00
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											

Optional environmental impact indicators LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PM	disease inc.	6.84E-06	2.97E-07	8.58E-08	0.00E+00	1.00E-10	0.00E+00	8.48E-08	7.37E-09	4.66E-09	4.50E-09	-9.08E-07
IRP	kBq U-235 eq	1.45E+00	2.24E-02	2.96E-03	0.00E+00	1.98E-04	0.00E+00	2.88E-03	6.14E-04	4.08E-01	7.22E-04	-5.17E-01
ETP-fw	CTUe	6.01E+02	8.47E+00	4.73E-01	0.00E+00	5.50E-03	0.00E+00	2.37E-01	1.88E-01	4.75E-01	6.68E+00	-4.32E+01
HTP-c	CTUh	3.29E-08	1.06E-09	4.59E-11	0.00E+00	2.03E-12	0.00E+00	3.41E-11	1.65E-11	6.51E-11	1.77E-10	-5.13E-09
HTP-nc	CTUh	7.19E-07	3.40E-08	1.16E-09	0.00E+00	9.37E-11	0.00E+00	5.43E-10	8.82E-10	2.29E-09	7.23E-09	-1.36E-07
SQP	Pt	3.66E+02	2.73E+01	3.64E-01	0.00E+00	6.53E-03	0.00E+00	2.92E-01	8.43E-01	1.00E+00	6.28E-01	-1.07E+02
Acronyms	**PM**: Particulate Matter emissions; **IRP**: Ionizing radiation – human health; **ETP-fw**: Eco toxicity – freshwater; **HTP-c** Human toxicity – cancer effects; **HTP-nc** Human toxicity – non cancer effects; **SQP**: Soil Quality (dimensionless)											

Mandatory inventory flow indicators LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				Benefits
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
PERE	MJ	8.72E+01	5.30E-01	6.48E-02	0.00E+00	5.19E-03	0.00E+00	6.20E-02	2.53E-02	7.15E+00	7.78E+00	-3.75E+01
PERM	MJ	7.74E+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	-7.74E+00	0.00E+00
PERT	MJ	9.50E+01	5.30E-01	6.48E-02	0.00E+00	5.19E-03	0.00E+00	6.20E-02	2.53E-02	7.15E+00	3.46E-02	-3.75E+01
PENRE	MJ	7.23E+02	4.74E+00	6.03E+01	0.00E+00	1.13E-02	0.00E+00	2.17E-01	1.38E-01	6.70E-01	8.63E-02	-1.37E+02
PENRM	MJ	6.00E+01	0.00E+00	-6.00E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	7.83E+02	4.74E+00	2.32E-01	0.00E+00	1.13E-02	0.00E+00	2.17E-01	1.38E-01	6.70E-01	8.63E-02	-1.37E+02
SM	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	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	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	0.00E+00	0.00E+00

FW	m3	2.18E+00	4.91E-03	4.90E-04	0.00E+00	5.65E-03	0.00E+00	3.46E-04	1.92E-04	8.92E-03	3.12E-03	-9.80E-02
HWD	kg	1.56E-01	3.02E-04	3.15E-05	0.00E+00	1.44E-07	0.00E+00	3.02E-05	1.04E-05	2.47E-05	1.48E-05	-8.23E-04
NHWD	kg	4.71E+00	8.59E-01	8.24E-03	0.00E+00	2.58E-04	0.00E+00	3.08E-03	7.45E-02	8.65E+00	4.65E+00	-1.02E+00
RWD	kg	9.97E-04	7.72E-06	2.03E-06	0.00E+00	1.61E-07	0.00E+00	1.99E-06	4.55E-07	3.16E-04	5.40E-07	-3.66E-04
CRU	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	0.00E+00	0.00E+00
MFR	kg	1.81E-04	0.00E+00	7.35E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.62E+00	0.00E+00	0.00E+00
MER	kg	3.75E-06	0.00E+00	4.39E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.89E+01	0.00E+00
EET	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	0.00E+00	2.30E+02
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	0.00E+00	0.00E+00	4.14E+02

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 **HWD** = Hazardous waste disposed; **NHWD** = Non-hazardous waste disposed; **RWD** = Radioactive waste disposed 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 **CRU** = Components for re-use; **MFR** = Materials for recycling; MER = Materials for energy recovery; **EEE** = Exported electrical energy; **EET** = Exported thermal energy

Biogenic carbon content LR7-54HVH

Biogenic carbon content	Unit	LR7-54HJBB
Biogenic carbon content in product	kg C/DU	0
Biogenic carbon content in the accompanying packaging	kg C/DU	2.87E-01

Additional environmental impact indicators within the French regulatory framework LR7-54HVH

Impact category	Unit	Manufacture	Distribution	Installation	Use			End-of-Life				D
		A1-A3	A4	A5	B1	B2	B3-B7	C1	C2	C3	C4	D
Global warming	kg CO2 eq	8.20E+01	5.61E+00	4.24E-01	0.00E+00	1.68E-03	0.00E+00	3.32E-01	9.83E-02	2.32E-01	3.14E+00	-1.66E+01
Ozone depletion	kg CFC-11 eq	1.73E-05	7.62E-08	4.14E-09	0.00E+00	2.14E-11	0.00E+00	3.96E-09	1.72E-09	5.52E-09	1.03E-09	-1.75E-07
Acidification of soils and water	kg SO2 eq	4.10E-01	6.85E-02	2.14E-03	0.00E+00	7.51E-06	0.00E+00	2.09E-03	1.70E-04	6.14E-04	5.26E-04	-7.19E-02

Water eutrophication	kg PO4--- eq	5.97E-02	7.43E-03	4.88E-04	0.00E+00	9.18E-07	0.00E+00	4.72E-04	2.18E-05	8.97E-05	1.72E-04	-8.99E-03
Photochemical ozone formation	kg C2H4 eq	2.09E-02	2.14E-03	5.99E-05	0.00E+00	4.60E-07	0.00E+00	5.77E-05	1.41E-05	3.44E-05	1.22E-05	-3.95E-03
Depletion of abiotic resources - elements	kg Sb eq	5.03E-03	1.27E-05	1.63E-07	0.00E+00	9.28E-09	0.00E+00	1.29E-07	3.39E-07	1.95E-06	1.36E-07	-7.77E-04
Depletion of abiotic resources – fossil fuels	MJ	9.25E+02	7.36E+01	4.45E+00	0.00E+00	1.93E-02	0.00E+00	4.31E+00	1.38E+00	3.43E+00	6.74E-01	-2.01E+02

Rules for extrapolation to other products covered

For the same PV module with a different power output, environmental impacts can be recalculated by applying the conversion factors of various power output ranges for LR7-54HVH series

Rated power output range (Wp)	470	475	480	485	490	495
Conversion factor	1.064	1.053	1.042	1.031	1.020	1.010

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