Environmental Product Declaration

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

BOLD

from

midsummer

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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	An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
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Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR):
PCR 2019:14 Construction products Version 1.2.3; 2022-07-08
c-PCR-016 Photovoltaic modules and parts thereof (adopted from EPD Norway 2022-04-27)

PCR review was conducted by:
PCR 2019:14:
The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com
Chair of the PCR review: Claudia A. Peña, DDERE Research & Technology

c-PCR-016
Technical Committee of EPD International acting as PCR Review Panel for the adoption process
Chair of the PCR review: Claudia A. Peña, DDERE Research & Technology

Life Cycle Assessment (LCA)

LCA author: *Viktor Hakkarainen, Miljögiraff AB*
Contact:
Pär Lindman
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Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier

Third-party verifier: Niels Jungbluth, ESU-services Ltd, Rheinstrasse 20, CH-8200 Schaffhausen, www.esu-services.ch

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same 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 equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Contact information

EPD Owner	midsummer Midsummer AB https://midsummer.se/ Adress: Elektronikhöjden 6, 175 43 Järfälla **Contact:** Alex Witt Operations Manager alex.witt@midsummer.se
LCA Author	MILJÖGIRAFF Miljögiraff AB https://www.miljogiraff.se/ Adress: Bläsgatan 2, 414 63 Göteborg **Author:** Viktor Hakkarainen **Contact** Pär Lindman Email: Par@miljogiraff.se
Programme Operator	EPD® **EPD International AB** **info@environdec.com**

Company information

Description of the organisation:
Midsummer AB is a world leading supplier of turn key CIGS solar production lines and innovative light weight and flexible thin film solar panels. The machinery product portfolio contains the DUO, a compact mass production tool allowing customers to start production in smaller scale testing new markets and then scale fast. The UNO is designed for R&D on sputtering and thin film solar cells. The product portfolio of solar panels and integrated solar roofs contains the beautifully design integrated standing seam solar roofs, Midsummer SLIM. As well as Midsummer WAVE perfectly following the shape of the most popular 2-barrel tile roofs on the market as well as Midsummer BOLD for flat mount without penetration on roofs with low weight limits. The company has its headquarters, state of the art R&D center and production in Järfälla, Sweden. Midsummer is listed on Nasdaq First North Growth market in Stockholm.

Product-related or management system-related certifications:
IEC 61730
IEC 61215
Certified by TÜV Rheinland

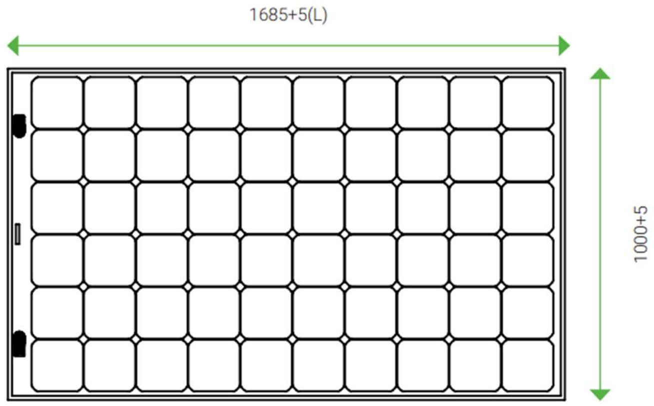
Name and location of production site(s):
Elektronikhöjden 6, 175 43 Järfälla

Product information

Product name:
Midsummer BOLD

Product identification:
BOLD is a CIGS photovoltaic solar module. CIGS stand for Copper-Indium-Gallium-Selenium, a tetrahedrally bonded semiconductor, with chalcopyrite crystal structure that converts the energy of light directly into electricity by the photovoltaic (PV) effect. The CIGS absorber and all other materials that form the finished solar cell are deposited on a stainless-steel substrate. The cells are then connected in series via bus bars screen printed on top of the cell.
CIGS solar cells are manufactured by sputtering the material onto 156×156 mm stainless steel substrates. The solar cells from Midsummer are free of cadmium, a toxic material usually used in CIGS and other thin film solar cells. Flexible CIGS solar modules are gaining increasing market share thanks to its high efficiency, low weight, flexibility and durability.

Information	Unit
Number of cells in one module	60
Weight for one module (kg)	5
Width for one module (mm)	1000
Length for one module (mm)	1685
Thickness (mm)	2
Minimum rood angle (°)	2
Lowest folding radius (m)	0,25
Efficiency after 10 years (%)	90
Efficiency after 25 years (%)	80
Colour	Black



Product description:
Midsummer BOLD is an ultralight and flexible solar panel which, among other things, is intended for cardboard and membranes such as substrate, where the end product becomes a discrete solar cell roof. Midsummer BOLD fits flat and sloping roofs and follows the shape of the roof, regardless of whether it is flat or vaulted.

Technical data:

Information	**Quantity**
Nominal power for one module, P_{max}[1](W)	190
Power per m² (W)	113
Power per kg (W)	38
Voltage at max power, V_{MPP} (V)	29,7
Current at max power, I_{MPP} (A)	6,4
Voltage, open circuit, V_{OC} (V)[1]	37,5
Short circuit current, I_{SC} (A)[1]	7,58
Max fuse capacity (A)	10
Max system voltage (V)	1000
Electrical insulation class	II

[1] Testing performed at Standard Testing Conditions (STC): solar radiation of 1000 W / m2 with perpendicular incidence towards module surface, module temperature 25 ° C, “Air mass” 1.5 (AM 1.5 spectrum). Tolerance
for the value is + -10%, plus-sorted modules + 5W / - 0W

Information	Quantity
Design Load (Pa)	+/- 3600[2]
Module working temperature span (°C)	-40 to +85
Temperature coefficient, P_{MAX} (W),γ (%/°C)	-0,408
Temperature coefficient, V_{OC} (V),β (%/°C)	-0,328
Temperature coefficient, I_{SC} (A),α (%/°C)	0,0006

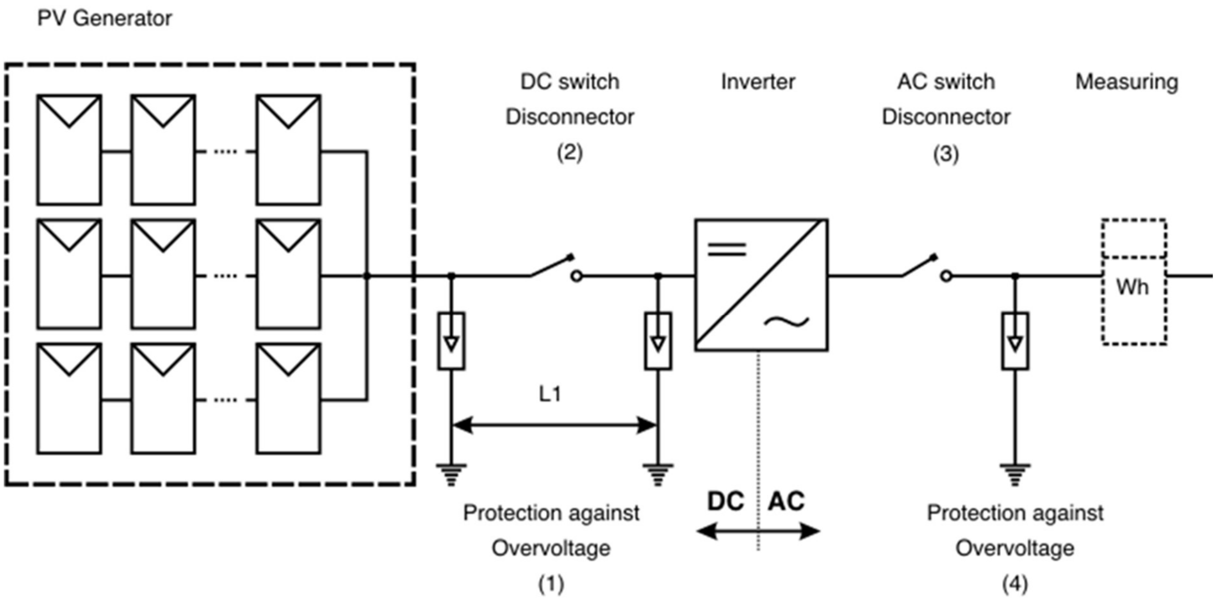
Geographical scope:
Sweden

[2] Tested at +/- 5400 Pa, max height 2000 m

Installation and balance of system

The building envelope is the physical barrier between the indoor conditions and the outdoor environment. The three main functions of the building envelop are to support the structure, provide climate control, and give an aesthetic finish to the building. Strictly speaking, Midsummer PV panels are classified as Building Applied Photovoltaics (BAPV) because they are applied onto the surface but don't fulfill the first two functions of the building envelop (structural support and climate control). However, they integrate with the aesthetic of the building, thus one could say they are "Building Aesthetically-Integrated Photovoltaics (BAIPV)". In order to achieve this aesthetic integration, the panels are designed to be very discrete and avoid as much as possible any additional mounting system. Depending on the roof material, BOLD panels are bonded to the surface using different types of adhesives (e.g. silicone glue or double side-tape).

Once the physical installation of the solar panels is done, it is necessary to do an electrical installation to be able to benefit from the electricity generated by the panels. First, the solar panels are connected with each other using cables to form so called "strings". The electrical wires are then run from the roof through the building until the place where the connection will be done. In order to protect the building and other components from any electrical discharge, the strings are usually protected with a fuse, an overvoltage protection device (SPD) and a DC switch which are all contained inside a combiner box. Photovoltaic panels generate direct current (DC), which needs to be turned into alternating current (AC) before being injected into the grid. This is done by the inverter which is connected after the combiner box. Besides changing from DC to AC, the inverters nowadays also include one or more Maximum Power Point Trackers (MPPT), which are electronic devices capable of finding the optimal electrical operating point for the solar panels at each moment of the day as the environmental conditions change. After the inverter, an AC switch is installed to be able to disconnect the system from the grid when necessary. Finally, the system is connected to a bidirectional meter that measures how much electricity is produced and consumed. More complex systems can also include batteries and their charge controllers, diverse sensors and monitoring devices.



Instructions on how to calculate environmental impact per kWh

The energy production of a solar cell is dependent on six factors deciding the total energy yield of the PV system during its lifetime:

- The solar irradiation (S_{rad}) [kWh/kWp,year]
- The module area (A) [m^2]
- The module yield (y) [Wp]
- The performance ratio (PR) [Factor]
- The degradation rate (deg) [Factor]
- Lifespan (RSL) [years]

Variable	Unit	Value per m2	Comment
Solar irradiation	kWh/kWp,year	Location dependent	Example of source for this is the Photovoltaic Geographical Information System (PVGIS): https://joint-research-centre.ec.europa.eu/pvgis-photovoltaic-geographical-information-system_en
Module area	m^2	1	
Module Yield	Wp	113	
Performance Ratio	Factor	Location & system dependent	Can be calculated with a PV simulation software such as PVSyst or similar
Degradation rate	Factor	0,007	Assumed degradation per year, in line with PCR default case
RSL	Years	25	As per PCR specifications

The energy yield for year 1 is calculated with the following formula:

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

The energy yield for the entire RSL is calculated with the following formula:

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

Where n = year of operation.

<u>**Calculation example**</u> for 1 m^2 BOLD with S_{rad} = 826 kWh/kWp,year and PR = 0,84

$$E_1 = S_{rad} \cdot A \cdot y \cdot PR \cdot (1 - \deg) \rightarrow 826 \cdot 1 \cdot \frac{113}{1000} \cdot 0{,}84 \cdot (1 - 0{,}007) = 77{,}85 \text{ kWh/m}^2$$

$$E_{RSL} = E_1 \cdot \left(1 + \sum_{n=1}^{RSL-1} (1 - \deg)^n\right) \rightarrow 77{,}85 \cdot \left(1 + \sum_{n=1}^{25-1} (1 - 0{,}007)^n\right)$$

For 25 years, this becomes 1791,33 kWh for 1 m^2 BOLD

Dividing by Wp, this becomes $\frac{1791{,}33}{113}$ = 15,85 kWh per Wp

To get the environmental impact per kWh, divide the specific impact result by 15,85

LCA information

Functional unit:

1 Wp of manufactured photovoltaic module, from cradle-to-grave, with activities needed for a study period for a RSL of 25 years.

Reference service life (RSL):

25 Years

Factor for conversion to m^2:

113 Wp/m2

Time representativeness:

Data collection is between 2019-2021, all used background datasets are valid for the entirety of 2021.

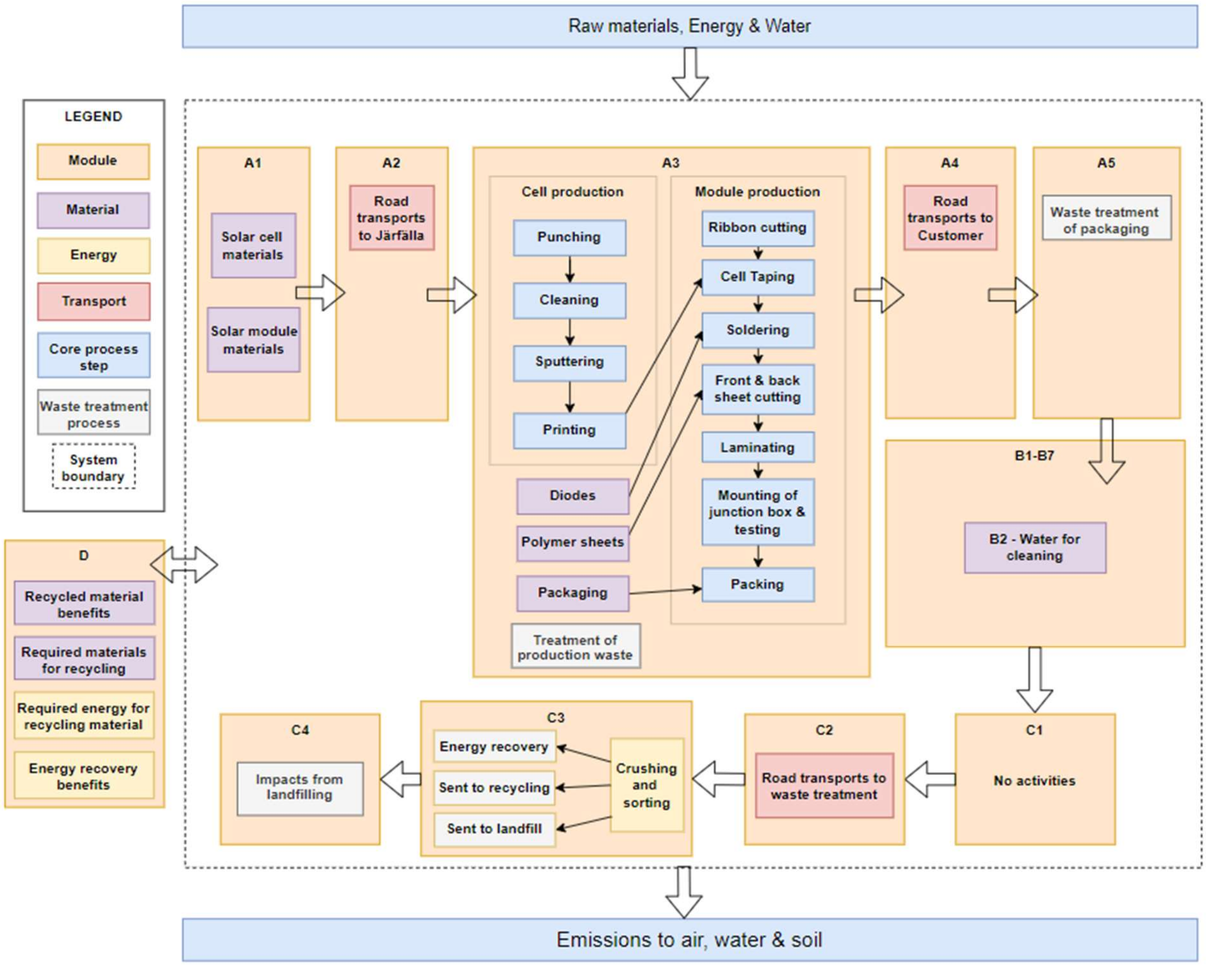
Database(s) and LCA software used:

Software: SimaPro 9.4.0.1
Database: ecoinvent 3.8, Cut-off model

Description of system boundaries:

c) Cradle to grave and module D (A + B + C + D)
Modules B1 and B3-B7 contains no activities and are therefore not declared in the result tables.

System diagram:



As per PCR specifications, the following are not included in the system boundary which is necessary to use the electricity:

• Materials for the mounting system of the module
• Microinverters
• Wiring
• Switches
• One or many solar inverters
• Battery bank
• Battery charger
• Other electrical components and systems necessary to connect the photovoltaic module to the electrical grid shall
• Personnel activities and transport of personnel
• Fasteners (screws) and other additional materials

Assumptions

The most general assumptions of the LCA were:

- Transport to production facility (A2) was assumed to be average 1000 km
- Transports were assumed to be performed by Euro 5 class vehicles.
- Waste resulting from unexpected processes such as reception of faulty material, accidents, mishandling, etc., were assumed to be 5%.

- Waste treatment and disposal is assumed to occur according to average Swedish waste treatment methods

The most relevant assumptions were checked in the sensitivity analysis (transport distance and accidental material waste).

Cut-off rules

The cut-off criteria are in accordance with the EN 15804 standard, meaning that max 1% of the renewable and non-renewable primary energy use and max 1% of the total mass input of a specific unit process are allowed to be cut-off (excluded).
The total of neglected input flows per module, e.g. per module A1-A3, A4-A5, B2, C1-C4 and module D is maximum 5% of energy usage and mass.

Data quality

The data quality assessment is divided by upstream (A1 & A2), core (A3) and downstream (A4-D).
The data quality assessment is based on the criteria of the UN Environment Global Guidance on LCA database development.

Data Quality	**Data Quality Assessment**
Time related coverage	**Upstream:** Good as all used datasets are currently valid, and the collected quantities are from 2019-2021. **Core:** Good as all used datasets are currently valid, and the collected quantities are from 2019-2021. **Downstream:** Good as all used datasets are currently valid, and the collected quantities are from 2019-2021.
Geographical coverage	**Upstream:** Good, quantities are from the area under study, datasets are from SE or the European region which can be consider similar to Swedish conditions. **Core:** Very good, quantities are from the area under study datasets are from SE or the European region which can be consider similar to Swedish conditions. **Downstream:** Fair, datasets are from SE or the European region which can be consider similar to Swedish conditions.
Technology coverage	**Upstream:** Good, all datasets are taken from the latest ecoinvent version (3.8) or from valid EPDs. Datasets have been chosen to closely relate to the actual conditions. **Core:** Good, all datasets are taken from the latest ecoinvent version (3.8) or from valid EPDs. Datasets have been chosen to closely relate to the actual conditions. **Downstream:** Good, all datasets are taken from the latest ecoinvent version (3.8) or from valid EPDs. Datasets have been chosen to closely relate to the actual conditions.
Other Data Quality	
Precision	The variance is shown in the uncertainty analysis. The variance is calculated by the SimaPro pedigree matrix as well as what is inherent to the ecoinvent database.
Completeness	All known flows are accounted for.
Representativeness	The data has been chosen to specifically reflect the true conditions; it is not within the scope of the project to verify the upstream value chain, but the chosen datasets should reflect this as accurately as possible within the scope of the project.
Consistency	The same methodology has been uniformly used (100% cut-off system library and no allocation has been required).
Reproducibility	The LCA is reproducible with all data reported in this report. No other data was used then what is reported in this document.

Data sources	Data collection method is described in the LCI chapter, and all datasets are referenced.
Data uncertainty	Uncertainty has been assessed through a sensitivity analysis for the most relevant assumptions and an uncertainty analysis for the variance of the datasets.

Allocation

In this EPD allocation is done on area of products. i.e., energy consumption and waste from the cells and modules are divided per area that is required for the specific product (step 2 allocation).

Scenarios

Only one scenario is presented in the EPD. The specifications around module A4 & B2 are presented below:

Transports to building site (A4)

Scenario information	Value
Fuel type, consumption, and vehicle type	0,048 l Diesel per tkm, Euro 5 16-32t freighter
Distance	300 km
Capacity utilization (empty returns included)	50%[3]

Use stage related consumption (B2)

Description	Unit (per m2,year)
Maintenance description	Cleaning
Maintenance cycle	1 per year
Water	20 litres per cycle
Electricity for pumping cleaning water	0,0011 kWh/m2 per cycle

[3] 20% of trips are expected to be empty as per specifications in EcoTransit 2010. (https://www.ecotransit.org/download/EcoTransIT_World_Methodology_Data_100521.pdf)

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

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	ND	X	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	SE	SE	SE	SE	ND	SE	ND	ND	ND	ND	ND	SE	SE	SE	SE	SE
Specific data used	0%	0%	>90%	0%	>90%	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%																0%
Variation – sites	0%																0%

X = module included, ND = Module not declared

Module B1 & B3-B7 are marked as ND as they do not contain any activities.

Content information

Amounts are presented per Wp, for amounts per m^2, multiply by 113

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Polymers	0,0156	-	-
Steel	0,0083	-	-
Other metals, elements & diodes	0,0012	-	-
Adhesives	0,00062	-	-
TOTAL	0,0257	-	-
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
Wooden pallet	0,00491	19,1	0,00243
Cardboard	0,00317	12,3	0,00157
Polyethylene wrap	0,00083	3,2	-
TOTAL	0,00891	34,6	0,00400

Dangerous substances from the candidate list of SVHC for Authorisation	EC No.	CAS No.	Weight-% per functional or declared unit
No SVHC in product			

Environmental Information

The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All results are presented per Wp.

Potential environmental impact – mandatory indicators according to EN 15804

Results per functional unit													
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B2**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	9,56E-02	7,07E-03	1,02E-02	**1,13E-01**	1,28E-03	8,56E-03	1,24E-05	0,00E+00	1,65E-03	1,87E-02	1,08E-04	-2,89E-02
GWP-fossil	kg CO_2 eq.	9,34E-02	7,06E-03	1,75E-02	**1,18E-01**	1,28E-03	3,69E-03	1,12E-05	0,00E+00	1,65E-03	1,87E-02	2,01E-05	-2,67E-02
GWP-biogenic	kg CO_2 eq.	2,09E-03	6,02E-06	-7,34E-03	**-5,24E-03**	1,09E-06	4,87E-03	3,88E-07	0,00E+00	1,50E-06	4,05E-06	8,25E-05	-1,74E-03
GWP-luluc	kg CO_2 eq.	1,06E-04	2,77E-06	3,83E-05	**1,48E-04**	5,02E-07	1,06E-07	7,90E-07	0,00E+00	7,76E-07	3,15E-06	2,48E-09	-1,91E-04
ODP	kg CFC 11 eq.	9,48E-08	1,63E-09	2,84E-09	**9,93E-08**	2,96E-10	2,32E-11	5,43E-13	0,00E+00	3,71E-10	1,79E-10	1,14E-12	-3,93E-09
AP	mol H^+ eq.	7,51E-04	2,86E-05	1,11E-04	**8,90E-04**	5,19E-06	1,99E-06	7,79E-08	0,00E+00	6,55E-06	6,15E-06	3,74E-08	-7,05E-05
EP-freshwater	kg P eq.	1,23E-05	4,95E-08	9,26E-07	**1,33E-05**	8,96E-09	3,57E-09	6,09E-10	0,00E+00	1,34E-08	1,61E-08	3,97E-10	-7,01E-07
EP-marine	kg N eq.	1,48E-04	8,54E-06	2,13E-05	**1,78E-04**	1,55E-06	8,58E-07	1,31E-08	0,00E+00	1,88E-06	2,39E-06	1,28E-07	-2,48E-05
EP-terrestrial	mol N eq.	1,71E-03	9,43E-05	2,00E-04	**2,01E-03**	1,71E-05	9,03E-06	1,67E-07	0,00E+00	2,08E-05	2,60E-05	1,33E-07	-2,86E-04
POCP	kg NMVOC eq.	4,56E-04	2,89E-05	6,64E-05	**5,51E-04**	5,23E-06	2,28E-06	3,93E-08	0,00E+00	6,41E-06	6,85E-06	6,14E-08	-1,13E-04
ADP-minerals & metals*	kg Sb eq.	4,70E-05	2,45E-08	1,05E-06	**4,81E-05**	4,45E-09	6,65E-10	7,71E-10	0,00E+00	7,51E-09	6,50E-09	1,84E-11	7,60E-08
ADP-fossil*	MJ	1,99E+00	1,07E-01	2,74E-01	**2,37E+00**	1,93E-02	1,72E-03	1,53E-03	0,00E+00	2,46E-02	1,26E-02	9,37E-05	-6,42E-01
WDP*	m^3	5,73E-02	3,20E-04	2,61E-02	**8,38E-02**	5,79E-05	1,96E-04	1,95E-02	0,00E+00	8,15E-05	2,07E-04	1,18E-06	-3,16E-03
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption												

** 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.*

Potential environmental impact – additional mandatory and voluntary indicators

Results per functional unit													
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B2**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[4]	kg CO_2 eq.	9,16E-02	7,00E-03	1,72E-02	**1,16E-01**	1,27E-03	3,68E-03	1,19E-05	0,00E+00	1,64E-03	1,86E-02	7,37E-05	-2,65E-02

[4] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Use of resources

Results per functional unit													
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B2**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,08E-01	1,50E-03	1,10E+00	1,21E+00	2,72E-04	6,70E-05	6,33E-04	0,00E+00	4,16E-04	2,51E-03	1,04E-05	-3,30E-01
PERM	MJ	0,00E+00	0,00E+00	1,17E-01	1,17E-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
PERT	MJ	**1,08E-01**	**1,50E-03**	**1,22E+00**	**1,33E+00**	**2,72E-04**	**6,70E-05**	**6,33E-04**	**0,00E+00**	**4,16E-04**	**2,51E-03**	**1,04E-05**	**-3,30E-01**
PENRE	MJ	2,13E+00	1,13E-01	2,94E-01	2,54E+00	2,05E-02	1,85E-03	1,53E-03	0,00E+00	2,61E-02	1,31E-02	9,94E-05	-6,61E-01
PENRM	MJ	3,69E-01	0,00E+00	1,80E-02	3,87E-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
PENRT	MJ	**2,50E+00**	**1,13E-01**	**3,12E-01**	**2,93E+00**	**2,05E-02**	**1,85E-03**	**1,53E-03**	**0,00E+00**	**2,61E-02**	**1,31E-02**	**9,94E-05**	**-6,61E-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	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	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	0,00E+00
FW	m^3	2,65E-02	2,35E-04	4,09E-03	3,09E-02	4,26E-05	1,97E-05	4,42E-03	0,00E+00	1,01E-05	1,42E-04	4,35E-07	-3,49E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water												

Waste production and output flows

Waste production

This chapter presents all the waste that is generated in the product system. Since ecoinvent is used as the main database, treatment processes of all wastes generated in the system are considered within the system boundaries and modelled in the LCA following Swedish common treatment practices. Thus, no wastes are declared as outflows in any module.

Results per functional unit													
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B2**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	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	0,00E+00	0,00E+00	0,00E+00
Non-hazardous waste disposed	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	0,00E+00	0,00E+00	0,00E+00
Radioactive waste disposed	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	0,00E+00	0,00E+00	0,00E+00

Output flows

Results per functional unit													
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**	**A4**	**A5**	**B2**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	7,14E-04	7,14E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,14E-03	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	8,02E-04	8,02E-04	0,00E+00	8,82E-03	0,00E+00	0,00E+00	0,00E+00	1,60E-02	0,00E+00	0,00E+00
Exported energy, electricity	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	0,00E+00
Exported energy, thermal	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	0,00E+00

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