Environmental Product Declaration

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

SolarEdge Single Phase Inverter SE6000H

with HD-Wave Technology

Programme: The International EPD® System, www.environdec.com
Programme operator: EPD International AB
EPD registration number: EPD-IES-0017164
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General Information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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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): 2019:14, Construction products, version 1.3.4, UN CPC 462 c-PCR-024, version 2024-04-30
PCR review was conducted by: The Technical Committee of the International EPD® System. A full list of members is available on www.environdec.com. The review panel may be contacted via info@environdec.com Chair of the PCR review: Claudia A. Peña
Life Cycle Assessment (LCA)
LCA accountability: Shai Ben Aharon, KVS
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: *Anni Oviir* *LCA support* *https://www.lcasupport.com/* 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 characterization factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025. This EPD follows additional requirements for construction products considered as Electronic or Electric Equipment.

Company Information

Owner of the EPD: SolarEdge Technologies, Inc.

Contact: SolarEdge EHS & ESG Departments, please contact using sustainability@solaredge.com

Description of the organisation: Since introducing the DC-optimized inverter solution in 2010, SolarEdge has become a global leader in smart energy. By leveraging world-class engineering capabilities and with a relentless focus on innovation, SolarEdge creates smart energy solutions that power our lives and drive future progress. SolarEdge developed an intelligent inverter solution that changed the way power is harvested and managed in photovoltaic (PV) systems. The SolarEdge DC-optimized inverter seeks to maximize power generation while lowering the cost of energy produced by the PV system. Continuing to advance smart energy, SolarEdge addresses a broad range of energy market segments through its PV, storage, EV charging, batteries, and grid services solutions. Visit us at: solaredge.com

Our Global Impact

Climate change is widely considered one of the world's single most pressing challenges. This has led to a large-scale global prioritization of the creation of reliable, renewable, and carbon-free energy sources. Furthermore, energy independence has become even more critical with geopolitical crises and economic unrest across the globe. Fossil fuels are becoming more expensive and are environmentally destructive. Renewable energy is increasingly recognized as the "smarter choice", offering both cost savings and new opportunities for energy independence.

At SolarEdge, we are invested in being part of the solution to these challenges. We are dedicated to accelerating the move to a low-carbon world, powered by a decentralized, distributed, interconnected energy network where electricity is generated, stored, managed and used in the most optimal manner. Our solutions support the worldwide transition to renewable, low-carbon power generation and consumption. For more information on our climate strategy and practices, please visit https://corporate.solaredge.com/en/sustainability.

Management system-related certifications:

- ISO 9001
- ISO 14001
- ISO 45001

Product-related certifications:

Below are examples of certifications that apply to the manufacturing of the SolarEdge Single Phase Inverter SE6000H inverter. For the full list please see the Declaration of Conformity - CE.

- Radio Equipment Directive 2014/53/EU (RED)
- RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU
- EN 62109-1:2010
- EN 55011:2016/A11:2020
- EN 301 489-1 V2.1.1 EN 301 489-1 V2.1.1

Name and location of production site(s): SolarEdge's manufacturing sites represented in this study are located in Tsiporit Industrial Zone, Israel and Ho Chi Minh, Vietnam.

Product information

Product name: Single Phase Inverter with HD-Wave Technology SE6000H

Product identification: Single Phase Inverter

Product description: Our DC-to-AC inverters, which form an integral part of our DC optimized solar systems, contain advanced digital control technology with efficient power conversion architecture resulting in superior solar power harvesting and high reliability, and are designed to work exclusively with our DC Power Optimizers.

SolarEdge Home Wave Inverter – Single Phase

SolarEdge single phase inverter with Home Wave technology breaks the mold of traditional solar inverters. Winner of the prestigious 2016 Intersolar Award and the renowned 2018 Edison Award, the inverter is specifically designed to work with SolarEdge Power Optimizers. Featuring superior solar power harvesting and high reliability, it comes with a built-in DC safety switch, integrated rapid shutdown, and an extensive warranty period.

The specific inverter analyzed in this EPD is our single phase inverter with Home Wave technology, SE6000H, which has an output power of 6kW and an efficiency of up to 99%. This award-winning inverter has maximized performance (up to 200% DC oversizing, depending on the region), a built-in DC safety switch, and integrated shutdown. It is also small, lightweight and easy to install.

SolarEdge's smart energy solutions offer both design flexibility and performance reliability at the level of individual solar panels, ensuring operation at the highest efficiency at all times, independent of string length and temperature. SolarEdge module-level power electronics (MLPE) technology is designed to generate energy more efficiently over the system's lifetime than traditional string technology. This allows higher energy yields by overcoming module mismatch and shading losses.

Specifications:

Category	
Rated AC power output [VA]	6000
Maximum DC power [W]	9300
Weight [kg]	10.6
Dimensions (H x W x D) [mm]	280 x 370 x 142

UN CPC code: 462-Electricity distribution and control apparatus, and parts thereof.

Geographical scope: The study represents the manufacturing of an inverter in SolarEdge's manufacturing facilities in Tsiporit Industrial Zone, Israel and Ho Chi Minh, Vietnam. In addition, the construction process stage, use stage, end of life and recovery stages (modules A4-D) were modeled and analyzed in two of the most common geographies – the Netherlands and the USA (two scenarios).

LCA information

Functional unit / declared unit: The inverting functionality needed to be part of a reference PV system (with a service life of 25 years) that provides 1 kWh of AC energy output converted from DC energy generated from the panels.

1 FU = 1/227,609

Reference service life: 25 years, in accordance with the c-PCR-024, version 2024-04-30.

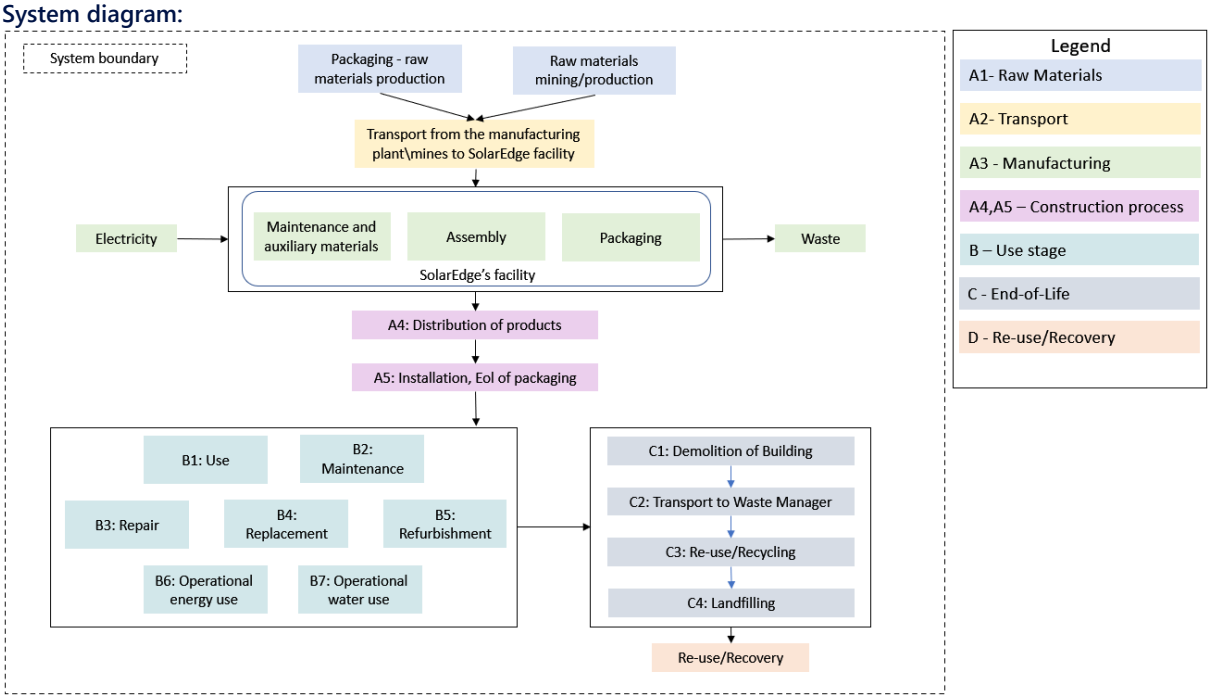
Time representativeness: The time coverage of the LCA's data is from January to December 2023.

Database(s) and LCA software used: The software used is SimaPro, Analyst 9.6.0.1. The database used is the Ecoinvent database v3.10 (2024) using the cut-off by classification approach and EF 3.1 normalization.

Description of system boundaries: Cradle to grave and module D (A + B + C + D).

Electricity grid CO2 coefficient: The electricity used by the analyzed facility in Israel is supplied by a private power provider located in Israel, with a CO_2 coefficient of 0.3427 kg CO_2-eq/kWh (2022), based on natural gas as its exclusive fuel source. The electricity used by the analyzed facility in Vietnam has a CO_2 coefficient of 0.43 kg CO_2-eq/kWh based on the following energy mix: wind/solar power 27%, coal power 32.2%, hydropower 28.4%, natural gas 10.3%, and other energy sources 2%.

System diagram:



Name and contact information of the LCA practitioner: Shai Ben Aharon of KVS, shai@kvs.co.il.

Assumptions:

- Assumptions were made regarding the transportation of all materials required for the manufacturing and packaging of the analyzed product. A distance-based approach was used in the calculation.
- Generic datasets, representing larger regions, have been used for some materials and process inputs.
- In cases of multiple suppliers for one raw material a proportional share of supply was taken into account.
- The used datasets were taken from the Ecoinvent database, additional LCI databases and open web research. For specific materials that were not found in these sources, approximated generic data has been used.
- Assumptions regarding the model of each module are explained in pages 9-11 of the declaration.
- The packaging material amounts that were allocated per each declared unit were calculated based on the amount of products included in each pallet.

Allocations: In this study, as per EN 15804, allocation is conducted in the following order:
1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

Overall and in general, allocations were avoided in the project as there are no by-products in the manufacturing process. Nevertheless, allocations were made regarding the distribution of the manufacturing sites' overall energy usage.

Allocation used in Ecoinvent 3.10 environmental data sources follows the methodology 'allocation, cut-off by classification', in addition to several manual calculations to fully comply with EN15804+A2.

Cut-off rules: The study does not exclude any modules or processes which are stated as mandatory in the EN 15804:2012+A2:2019 and the applied PCR of the EPD International Institution. The study does not exclude any hazardous materials or substances. During the life cycle of the product, no hazardous substance listed in the "Candidate List of Substances of Very High Concern (SVHC) for authorization" has been used in a percentage higher than 0.1% of the weight of the product. The study includes all major raw materials and energy consumption. All inputs and outputs of the unit processes with available data are included in the calculation. There is no neglected unit process that represents more than 1% of total mass or energy flows. The study excludes primary data on infrastructure/capital goods for upstream, core and downstream processes, this data is included as part of the Ecoinvent database.

Background database: The EPD is based on the primary production data of SolarEdge. The background database is Ecoinvent database v3.10 (2023). Since there are several missing datasets for Israel, background data for larger areas that include Israel was used for minor parts of the life cycle inventory. The electricity mix of the high voltage electricity grid represents 2022 data and was extracted from a formal report issued by the Israel Electricity Authority. The water grid data was modeled according to the water source mix in Israel.

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

	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	x	x	x	x	x	x	x	x	x	x	x	x
Geography-Scenario A	IL, VN Global	IL, VN Global	IL, VN	IL, USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA	USA
Geography-Scenario B	IL, VN Global	IL, VN Global	IL, VN	IL, EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR	EUR
Specific data used	41%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	<1%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that does not capture all relevant aspects of data quality. The indicator is not comparable across product categories.

Module A1 – Supply of raw materials: The declared SolarEdge inverter consists mainly of aluminum, copper, steel, plastic and electronic components (PCBA). The raw materials supply includes raw material extraction/production that are taken into account in this study.
The raw materials of the packaging i.e., wooden pallets, and polyethylene are also included in this module.

Module A2 – Transport of raw materials: The raw materials are produced mostly in Asia. Accordingly, transport is done by ships and trucks. Further raw materials are supplied from manufacturers within Israel, Europe and East Asia.

Module A3 – Manufacturing: The module includes the assembly of an inverter unit, packaging into boxes and compiling on wooden pallets. Electricity is consumed during the manufacturing process, in addition to maintenance procedures. At the Israeli facility, packaging scraps are collected by a recycling company.

Module A4 – Transport: The transportation route used for the calculations of this module was an average of the distances from the relevent manufacturing facilities in Israel and Vietnam to main distributers in the Netherlands or the USA. The distribution route used includes a 16-32 tonne lorry for land tranposrtion from the manufacturing sites and to their respective ports; shipment by a freight ship to ports in the USA or The Netherlands; followed by a lorry shipment from the destiniation ports to the end point distributers.

Scenario information	Unit per functional unit
Vehicle type	Lorry, 16-32 metric tons, Euro 6 fuel type Container ship
Capacity utilization	50% (empty returns)
Distance Inverters	USA – 1,593 km (truck), 16,946 km (container ship) NL – 129 km (truck), 11,385 km (container ship)

Module A5 – Construction installation: This module consists of manual installation, the use of additional materials and resources can be neglected. The packaging end-of-life was taken into account according to the waste and recycling management in each area, according to the table below.

		%		
Country	**Material**	**Recycling**	**Energy recovery**	**Landfill**
Netherlands	Polystyrene	50	20	30
	Carton	90	10	0
	Wood pallet	35	60	5
	Polyethylene	50	45	5
USA	Polystyrene	7	13	80
	Carton	80	4	16
	Wood pallet	25	15	60
	Polyethylene	13	17	70

Use stage (B1-B7):

Under normal circumstances the SolarEdge inverters require no replacements, repair or maintenance. Furthermore, the inverter consumes energy that is predominantly generated by the internal PV system and does not require operational water use.
Therefore, modules B1-B5, B7 are set to zero.

Module B6: The electricity consumption for the inverters was modeled as energy loss, according to the c-PCR-024, version 2024-04-30.
The calculation included the following parameters:
Solar radiation, as an average of solar irradiance in the USA and the NL: 1533 hrs/year.
RSL: 25 years

Product	**kW**	**Efficiency**	**Energy loss (kWh) - B6**	**Total electricity converted in service life (kWh)**
Single Phase Inverter	6	99.00%	2,299	227,609

End-of-Life stage (C1-C4):

Scenario A – USA

Module C1 – De-construction: The products are uninstalled manually. Thus, it is assumed that any energy used for their removal can be neglected and the environmental impact of this module is set to be zero.
At the end-of-life, in the de-construction phase, 80% of the waste is assumed to be collected as electronic waste, 20% is assumed to be collected as mixed municipal waste.

Module C2 – Transportation: Transportation distance to the closest disposal area is estimated as 300 km, by a 16-32 tonne lorry, which is the most common.

Module C3 – Waste processing: According to research on the waste sector in the USA, there is significant processing of electronic waste, that can be dismantled to raw materials in a processing facility. For the waste processing, an energy consumption of 0.01 kWh of electricity/kg of waste input was calculated, accounting only for sorting in preparation for recycling.

Module C4 – Disposal: The assumptions about the waste treatment of each material category are specified in the table below:

Material	Recycling %	Energy recovery %	Landfill %
Plastic	7	13	80
Aluminum	30	0	70
Steel	65	0	35
Copper	60	0	40
Electronics	30	0	70

This module includes the landfill and incineration process where the "end-of-waste" is reached.

Resource recovery stage (D):
Module D – Reuse-Recovery-Recycling potential: Module D calculates the potential environmental benefits of the recycling or reuse of materials. The majority of the product is assumed to be recycled to components that can be used for electronics, aluminum profiles, etc. The virgin material that is therefore avoided is assumed to correlate to average raw material consumption in the USA market. The calculations of this module were according to Annex D in EN 15804:2012+A2:2019 and include the recycling process and the benefits of the avoided virgin materials.

Scenario B –Netherlands, Europe

Module C1 – De-construction: The products are uninstalled manually. Thus, it is assumed that any energy used for their removal can be neglected and the environmental impact of this module is set to be zero.
At the end-of-life, in the de-construction phase, 100% of the waste is assumed to be collected as electronic waste.

Module C2 – Transportation: Transportation distance to the closest disposal area is estimated as 50 km by a 16-32 tonne lorry, which is the most common.

Module C3 – Waste processing: According to research on the waste sector in the Netherlands, there is significant processing of electronic waste, that is dismantled to raw materials in a processing facility. For the waste processing, an energy consumption of 0.01 kWh of electricity/kg of waste input was calculated, accounting only for sorting in preparation for recycling.

Module C4 – Disposal: The assumptions about the waste treatment of each material category are specified in the table below:

Material	Recycling %	Energy recovery %	Landfill %
Plastic	50	20	30
Aluminum	90	0	10
Steel	90	0	10
Copper	80	0	20
Electronics	80	0	20

This module includes the landfill and incineration process where the "end-of-waste" is reached.

Resource recovery stage (D):
Module D – Reuse-Recovery-Recycling potential: Module D calculates the potential environmental benefits of the recycling or reuse of materials. The majority of the product is assumed to be recycled to components that can be used for electronics, aluminum profiles, etc. The virgin material that is therefore avoided is assumed to correlate to average raw material consumption in the Netherlands market. The calculations of this module were according to Annex D in EN 15804:2012+A2:2019 and include the recycling process and the benefits of the avoided virgin materials.

Data quality information - share of specific data (in GWP-GHG results):

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG. Results for A1-A3
Production of aluminum raw material	Collected data, Database	EPD Owner, Ecoinvent 3.10	2024	Primary data	39%
Production of PCBA raw material	Database	Ecoinvent 3.10	2024	Representative secondary data	0%
production of capacitor film raw material	Database	Ecoinvent 3.10	2024	Representative secondary data	0%
Production of other raw materials	Database	Ecoinvent 3.10	2024	Representative secondary data, Proxy data	0%
Other processes	Database	Ecoinvent 3.10	2024	Representative secondary data	0%
Transport	Database	Ecoinvent 3.10	2023	Primary data	1%
Generation of electricity used in manufacturing of product	Database	Private electricity company (IL), Manufacturer data (VN)	2023	Primary data	2%
Total share of primary data, of GWP – GHG results for A1-A3					41%

Content Information

Product components	Weight, %	Post-consumer material, weight-%	Biogenic material, kg C/kg
Aluminum	41	0	0
Cooper	8	0	0
Stainless steel	7	0	0
Plastic/polymer	18	0	0
PCBA	12	0	0
Other	14	0	0
TOTAL	100	0	0
Packaging materials	**Weight, %**	**Post-consumer material, weight-%**	**Weight biogenic carbon, kg C/kg**
Wood pallet	2.4	0	0.208
Cardboard	4.8	0	0.471
Strech PE	0.1	0	0
Polystyrene	1.8	0	0
PE Sheet	0.1	0	0
Nylon bag	<0.1	0	0
TOTAL	<9.3	0	0.68

Results of the Environmental Performance Indicators

The EPD is for a specific product - Environmental impacts of a **Single-Phase Inverter with HD-Wave Technology SE6000H**. The results are an average of two manufacturing sites, with the main scenario for A4-D, **with USA geography.** For the conversion of the results per 1 unit of inverter multiply by 227,609.

1 FU = 1/227,609

Potential environmental impact [1,2] – mandatory indicators according to EN 15804

Results per functional or declared unit																
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	1.17 E-03	3.83 E-05	7.34 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.16 E-03	0.00 E+00	0.00 E+00	5.31 E-06	3.36 E-07	1.06 E-05	-9.18 E-05
GWP-biogenic	kg CO_2 eq.	-4.53 E-06	-1.67 E-09	5.25 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.01 E-05	0.00 E+00	0.00 E+00	3.68 E-09	3.68 E-09	0.00 E+00	3.42 E-07
GWP-luluc	kg CO_2 eq.	7.58 E-07	1.65 E-08	2.66 E-11	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.44 E-06	0.00 E+00	0.00 E+00	1.76 E-09	3.64 E-10	4.99 E-08	-6.88 E-07
GWP-total	kg CO_2 eq.	1.17 E-03	3.84 E-05	1.26 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.19 E-03	0.00 E+00	0.00 E+00	5.31 E-06	3.40 E-07	9.49 E-06	-9.21 E-05
ODP	kg CFC 11 eq.	2.17 E-11	5.64 E-13	7.56 E-16	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.27 E-11	0.00 E+00	0.00 E+00	1.06 E-13	2.48 E-15	4.15 E-14	-5.27 E-13
AP	mol H+ eq.	1.09 E-05	3.07 E-07	3.02 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	6.54 E-06	0.00 E+00	0.00 E+00	1.11 E-08	7.48 E-10	2.67 E-08	-2.45 E-06
EP-freshwater	kg P eq.	6.99 E-08	3.11 E-10	4.13 E-13	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.45 E-07	0.00 E+00	0.00 E+00	4.14 E-11	2.24 E-11	2.53 E-10	-1.88 E-08
EP-marine	kg N eq.	1.35 E-06	7.47 E-08	1.32 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.14 E-06	0.00 E+00	0.00 E+00	2.59 E-09	1.44 E-10	6.33 E-09	-2.23 E-07
EP-terrestrial	mol N eq.	1.54 E-05	8.30 E-07	1.40 E-09	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.29 E-05	0.00 E+00	0.00 E+00	2.87 E-08	1.64 E-09	6.93 E-08	-3.06 E-06
POCP	kg NMVOC eq.	5.56 E-06	2.75 E-07	4.14 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	5.17 E-06	0.00 E+00	0.00 E+00	1.84 E-08	6.92 E-10	2.42 E-08	-8.16 E-07
ADP-minerals & metals[3]	kg Sb eq.	7.56 E-08	1.07 E-10	6.26 E-14	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.31 E-08	0.00 E+00	0.00 E+00	1.73 E-11	5.58 E-13	1.12 E-11	-3.47 E-08
ADP-fossil[3]	MJ	1.29 E-02	5.24 E-04	6.06 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	4.15E-02	0.00 E+00	0.00 E+00	7.47 E-05	6.87 E-06	7.50 E-05	-9.86 E-04
WDP[3]	m^3	2.48 E-04	2.16 E-06	1.13 E-08	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	7.46E-04	0.00 E+00	0.00 E+00	3.10 E-07	9.24 E-08	1.63 E-06	-3.75 E-05
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:
1: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.
2: It is discouraged to use the results of module A1-A3 without considering the results of module C.
3: 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.

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	kg CO_2 eq.	1.17 E-03	3.84 E-05	7.34 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.17 E-03	0.00 E+00	0.00 E+00	5.31 E-06	3.37 E-07	1.06 E-05	-9.24 E-05

Resource use indicators[2]

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.30 E-03	6.14 E-06	8.01 E-09	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.73 E-02	0.00 E+00	0.00 E+00	1.24 E-06	1.32 E-06	2.13 E-05	-4.69 E-04
PERM	MJ	9.03 E-05	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
PERT	MJ	1.39 E-03	6.14 E-06	8.01 E-09	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.73 E-02	0.00 E+00	0.00 E+00	1.24 E-06	1.32 E-06	2.13 E-05	-4.69 E-04
PENRE	MJ	2.56 E-02	5.24 E-04	6.06 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	4.15 E-02	0.00 E+00	0.00 E+00	7.47 E-05	6.87 E-06	7.51 E-05	-9.86 E-04
PENRM	MJ	2.60 E-04	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
PENRT	MJ	2.58 E-02	5.24 E-04	6.06 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	4.15 E-02	0.00 E+00	0.00 E+00	7.47 E-05	6.87 E-06	7.51 E-05	-9.86 E-04
SM	kg	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.52 E-05
RSF	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
NRSF	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
FW	m^3	6.92 E-06	6.58 E-08	3.69 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.83 E-05	0.00 E+00	0.00 E+00	1.03 E-08	3.57 E-09	4.29 E-08	-2.42 E-06
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 indicators

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3.79 E-07	3.44 E-09	4.27 E-12	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.43 E-07	0.00 E+00	0.00 E+00	5.03 E-10	1.54 E-11	3.11 E-05	-7.12 E-09
Non-hazardous waste disposed	kg	4.91 E-05	2.05 E-05	2.95 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	8.21 E-05	0.00 E+00	0.00 E+00	3.61 E-06	1.14 E-08	8.80 E-07	-5.90 E-06
Radioactive waste disposed	kg	1.50 E-08	9.74 E-11	1.22 E-13	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.22 E-07	0.00 E+00	0.00 E+00	2.41 E-11	3.96 E-11	3.53 E-11	-1.21 E-09

[1] 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.

[2] The primary energy use indicators were calculated according to the PCR 2019:14 v1.3.4 Annex C option B.

Output flow indicators

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Material for recycling	kg	0.00 E+00	0.00 E+00	3.88 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.52 E-05	0.00 E+00	0.00 E+00
Materials for energy recovery	kg	0.00 E+00	0.00 E+00	6.37 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	8.66 E-07	0.00 E+00	0.00 E+00
Exported energy, electricity	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Exported energy, thermal	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00

Results for Secondary scenario - for A4-D, with NL geography.

Potential environmental impact [1,2] – mandatory indicators according to EN 15804

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	1.17 E-03	8.10 E-06	1.29 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.68 E-03	0.00 E+00	0.00 E+00	8.85 E-07	3.88 E-07	7.29 E-06	-2.30 E-04
GWP-biogenic	kg CO_2 eq.	-4.53 E-06	1.31 E-10	1.92 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.44 E-05	0.00 E+00	0.00 E+00	6.13 E-10	4.46E-09	0.00 E+00	5.45 E-07
GWP-luluc	kg CO_2 eq.	7.58 E-07	3.73 E-09	4.43 E-11	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.64 E-06	0.00 E+00	0.00 E+00	2.94 E-10	1.58E-10	7.82 E-09	-2.99 E-06
GWP-total	kg CO_2 eq.	1.17 E-03	8.10 E-06	3.20 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.70 E-03	0.00 E+00	0.00 E+00	8.86 E-07	3.92E-07	7.01 E-06	-2.32 E-04
ODP	kg CFC 11 eq.	2.17 E-11	1.31 E-13	6.35 E-16	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.04 E-10	0.00 E+00	0.00 E+00	1.76 E-14	1.31E-14	1.32 E-14	-2.27 E-12
AP	mol H+ eq.	1.09 E-05	1.65 E-07	4.58 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	7.64 E-06	0.00 E+00	0.00 E+00	1.84 E-09	6.36E-10	8.28 E-09	-5.85 E-06
EP-freshwater	kg P eq.	6.99 E-08	4.17 E-11	6.71 E-13	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	9.71 E-08	0.00 E+00	0.00 E+00	6.91 E-12	1.07E-11	6.53 E-11	-4.70 E-08
EP-marine	kg N eq.	1.35 E-06	4.10 E-08	2.13 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.58 E-06	0.00 E+00	0.00 E+00	4.31 E-10	1.81E-10	2.29 E-09	-5.01 E-07
EP-terrestrial	mol N eq.	1.54 E-05	4.56 E-07	2.25 E-09	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.85 E-05	0.00 E+00	0.00 E+00	4.78 E-09	2.17E-09	2.45 E-08	-6.86 E-06
POCP	kg NMVOC eq.	5.56 E-06	1.29 E-07	5.80 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	6.12 E-06	0.00 E+00	0.00 E+00	3.06 E-09	6.85E-10	8.00 E-09	-1.90 E-06
ADP-minerals & metals[3]	kg Sb eq.	7.56 E-08	1.39 E-11	8.75 E-14	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.74 E-08	0.00 E+00	0.00 E+00	2.88 E-12	6.75E-13	2.92 E-12	-8.91 E-08
ADP-fossil[3]	MJ	7.20 E-05	1.04 E-04	3.96 E-02	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.96 E-02	0.00 E+00	0.00 E+00	1.24 E-05	5.99E-06	2.03 E-05	-3.26 E-03
WDP[3]	m^3	2.48 E-04	3.09 E-07	3.36 E-08	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	7.05 E-04	0.00 E+00	0.00 E+00	5.17 E-08	5.38E-08	4.89 E-07	-6.15 E-05
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:
1: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.
2: It is discouraged to use the results of module A1-A3 without considering the results of module C.
3: 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.

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[3]	kg CO_2 eq.	1.17 E-03	8.10 E-06	1.29 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.68 E-03	0.00 E+00	0.00 E+00	8.85 E-07	3.88 E-07	7.30 E-06	-2.33 E-04

Resource use indicators[4]

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1.30 E-03	1.09 E-06	1.09 E-08	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.79 E-02	0.00 E+00	0.00 E+00	2.06 E-07	1.35 E-06	5.27 E-06	-1.01 E-03
PERM	MJ	9.03 E-05	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
PERT	MJ	1.39 E-03	1.09 E-06	1.09 E-08	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.79 E-02	0.00 E+00	0.00 E+00	2.06 E-07	1.35 E-06	5.27 E-06	-1.01 E-03
PENRE	MJ	2.56 E-02	1.04 E-04	4.64 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.96 E-02	0.00 E+00	0.00 E+00	1.24 E-05	5.99 E-06	2.04 E-05	-3.26 E-03
PENRM	MJ	2.60 E-04	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
PENRT	MJ	2.58 E-02	1.04 E-04	4.64 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.96 E-02	0.00 E+00	0.00 E+00	1.24 E-05	5.99 E-06	2.04 E-05	-3.26 E-03
SM	kg	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.71 E-05
RSF	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
NRSF	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
FW	m^3	6.92 E-06	1.01 E-08	9.99 E-10	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.82 E-05	0.00 E+00	0.00 E+00	1.72 E-09	4.26 E-09	1.35 E-08	-6.79 E-06
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 indicators

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3.79 E-07	5.94 E-10	3.82 E-12	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.80 E-07	0.00 E+00	0.00 E+00	8.38 E-11	2.06 E-11	7.66 E-06	7.66 E-06
Non-hazardous waste disposed	kg	4.91 E-05	1.91 E-06	6.17 E-07	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	9.69 E-05	0.00 E+00	0.00 E+00	6.01 E-07	1.15 E-08	4.00 E-07	-1.51 E-05
Radioactive waste disposed	kg	1.50 E-08	1.95 E-11	1.37 E-13	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	8.02 E-08	0.00 E+00	0.00 E+00	4.01 E-12	1.25 E-11	1.03 E-11	-1.14 E-08

[3] 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.

[4] The primary energy use indicators were calculated according to the PCR 2019:14 v1.3.4 Annex C option B.

Output flow indicators

Results per functional or declared unit															
Indicator	**Unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Material for recycling	kg	0.00 E+00	0.00 E+00	5.09 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	3.71 E-05	0.00 E+00	0.00 E+00
Materials for energy recovery	kg	0.00 E+00	0.00 E+00	1.85 E-06	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	1.79 E-06	0.00 E+00	0.00 E+00
Exported energy, electricity	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Exported energy, thermal	MJ	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00

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