Hoymiles Power Electronics Inc.

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME	SITE
Fully Liquid Cooling C&I Battery System HESS-261-2h	**No. 160, Yuanzhong Road, Bihu Town, Liandu District, Lishui, 323000 Zhejiang P.R.China**

In accordance with ISO 14025 and EN 50693

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	EPDHM_HESS2612h_2025_rev.1.0
Registration Number	EPDITALY1260

Issue Date	28/01/2026
Valid to	28/01/2031

1. GENERAL INFORMATION

EPD Owner

Company Name	Hoymiles Power Electronics Inc.
Company Address	No.18 Kangjing Road, Hangzhou, 310015 Zhejiang P.R.China
Company Contact	Xiaolong Wang xiaolong.wang@hoymiles.com
Program Operator	EPDItaly (www.epditaly.it) Via Gaetano De Castillia n° 10 - 20124 Milano, Italy

About The EPD

Product Name	Fully Liquid Cooling C&I Battery System (HESS-261-2h)
Production Site	Zhejiang Henghe New Energy Co., Ltd. No.160, Yuanzhong Road, Bihu Town, Liandu District, Lishui, 323000 Zhejiang P.R.China
CPC Code	CPC 464 “Accumulators, primary cells and primary batteries, and parts thereof”
Brief Description and Technical Information of the Product	Hoymiles HESS Series Fully Liquid Cooling C&I Battery System adopts an All-in-One design philosophy, combining batteries, energy storage converters, and local EMS into a single unit. Equipped with a fully liquid cooling heat dissipation solution, this design not only enhances the system safety but also significantly improves its overall efficiency.
Product Application Area	The Fully Liquid Cooling C&I Battery System (HESS-261-2h) is ideally designed for seamless integration into industrial-scale photovoltaic plants, effectively supporting a wide range of industrial power applications.

Verification Information

PCR	Core PCR: EPD Italy 007 - Electronic and Electrical Products and Systems, REV. 3.2 – 12/10/2025 Sub-category PCR: EPD Italy 021 - Electronic and electrical products and systems - Energy Storage, REV. 5 – 29/03/2021
EPDItaly Regulation	Regulations of the EPDItaly Programme Revision 7.0. Issue date 27.03.2025
LCA Consultant	This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by: TÜV Rheinland (Shanghai) Co., Ltd.
Independent Verification Statement	This declaration has been developed referring to EPDItaly, following the General Program Instruction; further information and the document itself are available at: www.epditaly.it. Independent verification of the declaration and data, according to EN ISO 14025:2006 and EN 150693: 2019 ☐ INTERNAL ☒ EXTERNAL Third party and verifier: ICMQ S.p.A., via Gaetano De Castillia n° 10 – 20124 Milano, Italy.
Statement Comparability	Environmental Product Declarations from different program operators, even for identical product categories, shall not be deemed comparable. Full conformance with a Product Category Rule establishes the precondition for comparability, which is only valid when an equivalent and complete set of life cycle stages has been applied. Consequently, underlying methodological choices, such as the selection of specific LCA software and background data sources, represent legitimate sources of deviation that can inherently

	affect the results across various life cycle phases.
Statement Liability	The EPD Owner assumes full and complete responsibility for the Life Cycle Assessment data, information, and supporting evidence. Consequently, EPDItaly is expressly relieved from any liabilities associated with non-compliance to environmental regulations. All information, data, and results provided by the EPD Owner remain their sole responsibility, for which EPDItaly disclaims all liability.

2. COMPANY INTRODUCTION

Hoymiles' mission is to become the leading choice for getting started with smart energy, making good technology more impactful by ensuring it's accessible to everyone, and bringing smart solar to the entire world with high-quality products.

Hoymiles is a clean energy solution provider, specializing in module-level inverters and storage systems. Our products cater to residential, commercial, industrial, and utility-scale applications.

With a vision of a clean, sustainable future, we strive to lead the smart energy industry through our rugged technology and reliable products.

3. SCOPE AND TYPE OF EPD

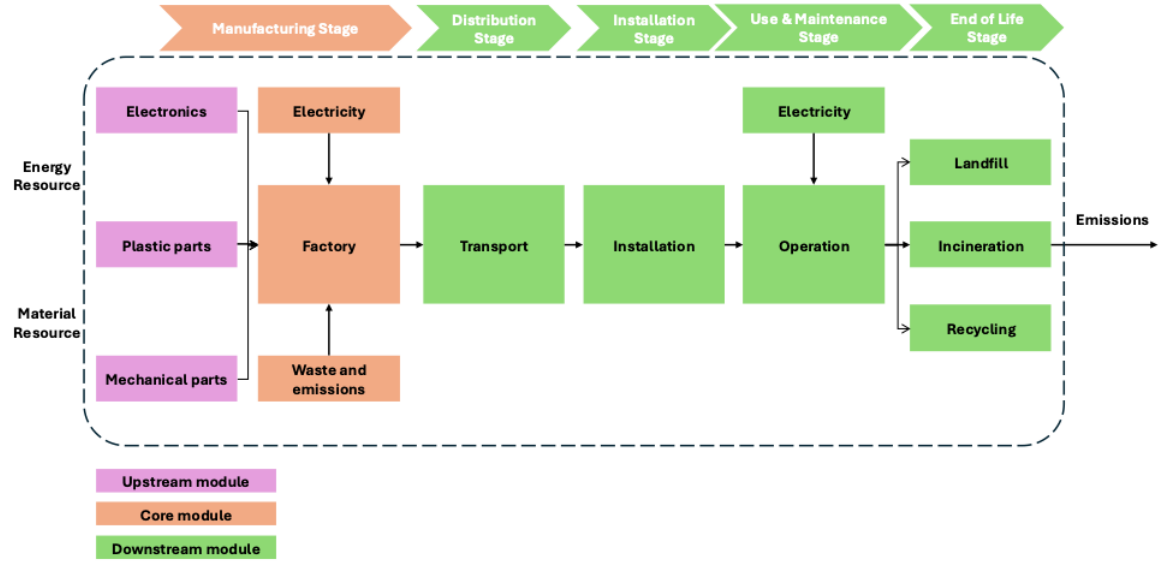
3.1. Scope of EPD

This product-specific Environmental Product Declaration, developed within the EPDItaly program, details the environmental profile of the Fully Liquid Cooling C&I Battery System (HESS-261-2h) for industrial use. The declaration, which complies with ISO 14025 and EN 50693, covers a product designed for integration with photovoltaic systems and energy storage. The underlying Life Cycle Assessment follows a "cradle-to-grave" approach, including the Manufacturing Stage, Distribution Stage, Installation Stage, Use & Maintenance Stage, and End of Life Stage, as defined in the PCR adhering to the methodological framework of ISO 14040 and 14044.

3.1.1 System Boundaries

The system boundary for this life cycle assessment encompasses the complete "cradle-to-grave" scope of the product. In accordance with EN 50693, the lifecycle is structured into five distinct modules: upstream, core, and downstream. These modules are further subdivided to represent specific stages, including manufacturing, distribution, installation, use and maintenance, and end-of-life.

The following figure lists and quantifies all the inflows and outflows of all declaration life cycle stages of the product within the system boundary related to the research scope.



- Upstream: This module covers the initial stages of the lifecycle, involving the extraction and processing of raw materials, along with their transport to the production facility. It therefore includes all activities prior to the product's manufacture.
- Core: This is the central phase of the lifecycle, encompassing the production, assembly, and manufacturing processes of the product itself. It constitutes the core process where the product is created or constructed.
- Downstream: This module involves the post-production stages, including transportation to the customer, use by the end-user, and end-of-life disposal or recycling. It focuses on the comprehensive lifecycle management after the product is manufactured and distributed.

These three modules collectively represent the complete product lifecycle from cradle to grave. A comprehensive description of the life cycle inventory, including all activities, simplification assumptions, and modeling scenarios, will be exhaustively detailed in the subsequent section.

Manufacturing Stage	Distribution Stage	Installation Stage	Use & Maintenance Stage	End of Life Stage
Upstream - Core	Downstream	Downstream	Downstream	Downstream
✔	✔	✔	✔	✔

3.2. Type of EPD

This product-specific Environmental Product Declaration encompasses the Fully Liquid Cooling C&I Battery System, specifically declaring the model HESS-261-2h.

3.3. Geographical Scope

The geographical scope of this LCA study is delineated as follows: Manufacturing Stage is located in Mainland China, while the Distribution Stage, Installation Stage, Use & Maintenance Stage, and End of Life Stage are modeled using projected sales data over the next three years.

It is important to note that these systems are designed for global installation and operation. Consequently, the interpretation of the LCA results should be contextualized with the specific geographical conditions of the product's installation and use phase.

3.4. Time Representativeness

All primary manufacturing data were provided by Hoymiles, sourced directly from its factory during the defined reference period from August 1, 2024, to July 31, 2025. The selection of background datasets was guided by the actual manufacturing processes employed. For generic upstream materials such as packaging, which lack specific supplier data, the corresponding manufacturing processes were modeled in accordance with prevailing industry standards.

3.5. Data and LCA Software Used

The background data for materials, energy, waste treatment, and transportation were sourced from the Ecoinvent 3.11 database. All modeling and computational work for the life cycle assessment were conducted using the SimaPro 10.2.0.0 software.

4. DETAILED PRODUCT DESCRIPTION

4.1. Description of the Product

The Energy Storage System (ESS) is a device or system capable of storing electrical energy and releasing it on demand. It is widely used in power systems, renewable energy, electric vehicles, and other fields. The basic components of an ESS include:

- Energy storage units (common types: batteries, supercapacitors, flywheels, etc.)
- Power Conversion System (PCS)

- Energy Management System (EMS)
- Thermal management system
- Safety system

Hoymiles HESS Series Fully Liquid Cooling C&I Battery System adopts an All-in-One design philosophy, combining batteries, energy storage converters, and local EMS into a single unit. Equipped with a fully liquid cooling heat dissipation solution, this design not only enhances the system safety but also significantly improves its overall efficiency.

Data	Value
Total Energy Storage System Capacity (kWh)	261kWh
Cell Type	Lithium Iron Phosphate (LFP) 3.2V / 314Ah
Product Application Area	Industrial applications with industrial-scale photovoltaic plants
Type of Coupling	AC
Type of Cell Technology	Lithium Iron Phosphate 3.2V / 314Ah
Type of Application	Industrial

4.2. Technical Specifications

Data	Value
Nominal Battery Energy	261kWh
Nominal Battery Charging Capacity	314Ah
DC Voltage Range	728V-936VDC
Maximum Continuous DC Power	130.6kW
Maximum Continuous DC Current	173A
Rated Grid Voltage Range	340-440VAC
Rated Grid Power	125kW
Maximum AC Current	198.5A
Rated Grid Frequency	50/60Hz
AC Connection Mode	3P3W / 3P4W
Auxiliary Supply Voltage	L/N/PE, 230V
Maximum Auxiliary Supply Current	24.5A
Auxiliary Supply Frequency	50/60Hz
Battery Designation	IFpP/74/176/207[(52S1P)5S]M/-30+50/95
Operating Temperature	-30°C to +50°C
IP Rating	IP55
Protective Class	Class I

Data	Value
Weight	< 2800kg
Dimensions (W*H*D)	1030*2450*1400mm

4.3. Composition

The Fully Liquid Cooling C&I Battery System (HESS-261-2h), with a 2800.72kg (exclude package), is composed of various materials. These include metallic elements such as steel and aluminum for structural and internal parts, in addition to electronic components and plastics.

IEC 62474 Classname	IEC 62474 ID	% by weight of tatal
Battery Cell	-	65.4357%
Other ferrous alloys, non-stainless steels	M-119	25.5873%
Stainless steel	M-100	3.1213%
Electronic components	-	1.4266%
Aluminum and its alloys	M-120	1.2233%
Copper and its alloys	M-121	0.7059%
PolyEthylene (PE)	M-201	0.5300%
PolyAmide (PA)	M-208	0.4946%
Acrylonitrile-Butadiene-Styrene (ABS)	M-206	0.4921%
Other organic materials	M-399	0.4520%
Paper	M-341	0.2877%
Other filled thermoplastics	M-299	0.0696%
Ethylene-Propylene-Diene-Rubber (EPDM)	M-324	0.0545%
Ceramics	M-160	0.0314%
Silicone	M-321	0.0306%
PolyButyleneTerephthalate (PBT)	M-211	0.0273%
Other non-ferrous metals and alloys	M-149	0.0080%
Epoxy resin (EP)	M-302	0.0059%
PolyPropylene (PP)	M-252	0.0052%
Polyphthalamide (PPA)	M-218	0.0039%
PolyAmide (PA)	M-258	0.0039%
PolyCarbonate (PC)	M-204	0.0008%
PolyEthyleneTerephthalate (PET)	M-209	0.0007%
PolyPropylene (PP)	M-202	0.0006%
Polymethylmethacrylate (PMMA)	M-220	0.0005%

IEC 62474 Classname	IEC 62474 ID	% by weight of tatal
Fiber	M-342	0.0004%
Thermoplastic Elastomeres (TPE)	M-327	0.0003%

4.4. Functional Unit

The functional unit for this LCA study is defined as 1 kWh of energy stored by the module.

4.5. Reference Service Life (RSL)

The reference service life of the product has been assumed to be 10 years.

5. LCA RESULTS

The life cycle assessment results, quantifying environmental impacts and resource flows, were calculated in alignment with the EN 15804: 2012 + A2: 2019 / AC: 2021 standard reference package (based on EF 3.1).

These results are normalized per declared unit of 1 kWh of energy stored by the module. The computations were performed utilizing the SimaPro 10.2.0.0 software in conjunction with the Ecoinvent 3.11 database

5.1. Environmental Impact

				Upstream - Core	Downstream			
Impact indicators	**Nomenclatures**	**Head**	**Total**	**Manufacturing**	**Distribution**	**Installation**	**Use & Maintenance**	**End of Life**
Global warming Potential - Total	GWP - Total	kg CO2 eq	1.27E+02	1.12E+02	8.01E+00	1.15E-01	1.44E-02	7.46E+00
Global warming Potential - Fossil	GWP - Fossil	kg CO2 eq	1.22E+02	1.11E+02	8.00E+00	6.24E-02	9.92E-03	2.73E+00
Global warming Potential – Biogenic	GWP - Biogenic	kg CO2 eq	5.06E+00	2.71E-01	1.41E-03	5.27E-02	4.51E-03	4.73E+00
Global warming Potential - Land use and LU change	GWP - Luluc	kg CO2 eq	9.65E-02	9.59E-02	3.89E-04	2.33E-06	2.41E-05	1.90E-04
Ozone depletion Potential	ODP	kg CFC11 eq	1.74E-06	1.59E-06	1.06E-07	1.08E-09	8.60E-11	4.13E-08
Acidification Potential	AP	mol H+ eq	2.11E+00	2.02E+00	8.25E-02	1.97E-04	5.56E-05	9.24E-03
Eutrophication Potential, freshwater	EP - freshwater	kg P eq	6.93E-03	6.78E-03	4.23E-05	3.37E-07	3.32E-05	7.03E-05
Eutrophication Potential, marine	EP - marine	kg N eq	2.06E-01	1.70E-01	2.34E-02	1.03E-04	1.92E-04	1.28E-02
Eutrophication Potential, terrestrial	EP - terrestrial	mol N eq	5.23E+00	4.93E+00	2.60E-01	8.61E-04	1.25E-04	3.97E-02
Photochemical ozone formation Potential	POCP	kg NMVOC eq	5.69E-01	4.79E-01	7.53E-02	3.10E-04	3.08E-05	1.43E-02
Resource use Potential, minerals and metals	ADP - minerals&metals	kg Sb eq	8.87E-03	8.87E-03	5.00E-07	2.65E-09	2.94E-08	1.07E-07
Resource use Potential, fossil	ADP - fossil	MJ	1.51E+03	1.37E+03	1.03E+02	7.46E-01	1.39E-01	2.88E+01
Water deprivation Potential	WDP	m3 depriv.	2.94E+01	3.00E+01	1.76E-01	-1.54E-02	1.43E-03	-7.75E-01

5.2. Resource Use

				Upstream - Core		Downstream		
Parameter	**Nomenclatures**	**Head**	**Total**	**Manufacturing**	**Distribution**	**Installation**	**Use & Maintenance**	**End of Life**
Renewable primary energy as energy carrier	PERE	MJ	1.10E+04	8.59E+00	2.04E-01	2.05E-03	1.10E+04	2.03E-01
Renewable primary energy resource as material utilization	PERM	MJ	1.14E+02	1.14E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	PERT	MJ	1.11E+04	1.23E+02	2.04E-01	2.05E-03	1.10E+04	2.03E-01
Non-renewable primary energy as energy carrier	PENRE	MJ	1.67E+02	3.45E+01	1.03E+02	7.46E-01	1.39E-01	2.88E+01
Non-renewable primary energy as material utilization	PENRM	MJ	1.36E+03	1.36E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	PENRT	MJ	1.53E+03	1.40E+03	1.03E+02	7.46E-01	1.39E-01	2.88E+01
Use of secondary material	SM	Kg	5.57E-01	5.57E-01	1.31E-04	1.54E-06	2.33E-05	1.09E-04
Use of renewable secondary fuels	RSF	MJ	1.31E-02	1.30E-02	8.01E-06	1.61E-07	1.05E-07	1.07E-05
Use of non-renewable secondary fuels	NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	FW	m3	7.63E-01	7.77E-01	4.20E-03	-3.59E-04	4.17E-05	-1.80E-02

5.3. Waste Production

			Upstream - Core			Downstream		
Parameter/indicator	**Nomenclatures**	**Head**	**Total**	**Manufacturing**	**Distribution**	**Installation**	**Use & Maintenance**	**End of Life**
Hazardous waste disposed	HWD	Kg	2.48E+01	2.47E+01	7.98E-02	2.83E-04	8.16E-04	1.87E-02
Non-hazardous waste disposed	NHWD	Kg	3.88E+02	3.56E+02	1.75E+00	2.78E-01	1.05E+01	2.01E+01
Radioactive waste disposed	RWD	Kg	1.24E-03	1.23E-03	4.34E-06	4.60E-08	4.99E-07	5.12E-06
Components for re-use	CRU	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	MFR	Kg	2.56E+00	3.07E-02	3.70E-06	1.40E-07	1.03E-05	2.53E+00
Materials for energy recovery	MER	Kg	1.23E-04	1.23E-04	1.46E-07	1.54E-09	2.39E-09	7.16E-08
Exported electricity energy	EEE	MJ	2.32E-01	2.02E-01	1.30E-03	2.50E-05	2.93E-04	2.87E-02
Exported thermal energy	EET	MJ	3.39E-01	3.18E-01	1.12E-03	5.05E-05	1.11E-05	2.05E-02

6. CALCULATION RULES

6.1. Functional Unit

The functional unit for this LCA study is defined as 1 kWh of energy stored by the module.

Other necessary information is listed below.

Data	Value
Total Energy Storage System Capacity (kWh)	261kWh
Type of Coupling	AC
Type of Cell Technology	Lithium Iron Phosphate 3.2V / 314Ah
Type of Application	Industrial

In this study, the Manufacturing Stage is geographically scoped to Mainland China, whereas the Use & Maintenance Stage and End of Life Stage treatment are modeled through a case study utilizing the enterprise's three-year production forecast.

6.2. Assumptions

Categories	Items	Assumptions
Manufacturing Stage	Transportation type and distance	For the upstream transportation of raw materials and packaging, it was assumed that all shipments were carried out by 4.7-meter trucks. Consequently, the emission factors for Euro 5 standard vehicles with a load capacity of 3.5 to 7.5t were applied. For modeling the transport of waste generated within the factory, owing to the unavailability of specific data on transport distance and vehicle type, a default scenario was adopted with reference to EN 50693. A local default distance of 1000 km by lorry (with 85% payload) was applied. The emission factor corresponded to a Euro 4 standard vehicle in the 3.5-7.5t gross weight category, aligning with both the actual situation and the default specifications stipulated in EPD Italy 021.
Distribution Stage	Transportation type and distance	Based on the Hoymiles's sales projections for the next three years, the primary markets for the HESS-261-2h product are Europe and other Asian countries. For the distribution phase, the transport was modeled using the international default scenario specified in EN 50693: a combination of 19,000 km by ship and 1,000 km by lorry (with 85% payload). The emission factors for a container ship and a Euro 4 standard lorry in the 16-32t gross weight category were applied, consistent with both practical considerations and the default provisions of EPD Italy 021.
Installation Stage	Packaging waste	For the transport of packaging waste arising from the installation phase, the local default values from EN 50693 were applied, namely 1,000 km by lorry (85% payload). The vehicle emission factor corresponded to a Euro 4, 3.5-7.5t lorry, aligning with EPD Italy 021 guidelines and practical assumptions. Additionally, the selection of emission factors for the distribution stage was based on the projected sales share of the HESS-261-2h product in EU and non-EU markets over the coming three years. As the market for the HESS-261-2h product is concentrated in the EU and other Asian countries, the disposal method for installation-phase packaging waste was therefore aligned with the geographical boundaries of these regions as defined in the database.
Use & Maintenance	Use	Based on the projected sales of the HESS-261-2h product over the next three years, the corresponding geographical boundaries within the database were selected according to the market share of different

Categories	Items	Assumptions
Stage		countries.
	Maintenance	The exclusion of energy carriers associated with maintenance activities, including manufacturer-specified spare parts and materials, is necessitated by the absence of reliable data concerning failure rates and maintenance intervals.
End-of-life Stage	Waste transportation type and distance	For the end-of-life phase of the HESS-261-2h product, manual dismantling is assumed. The transport of waste from the installation site to the treatment facility was modeled using the local default scenario from EN 50693, corresponding to 1,000 km by lorry with an 85% payload. The emission factor for a Euro 4 standard lorry in the 16-32t gross weight category was applied, consistent with both practical considerations and the default specifications of EPD Italy 021. Furthermore, emission factors for this stage were selected based on the projected sales share of the product in EU and non-EU markets over the next three years.
	Waste processing and disposal	The end-of-life modeling was primarily guided by the scenarios defined in the EN 50693 standard. For materials not covered by this standard, such as battery cell and electronic components, specific treatment processes from the Ecoinvent database were applied.

6.3. Cut-off Rules

All relevant energy and material flows associated with processes inside the system boundary have been accounted for in the LCA model. Furthermore, this study adheres to the principle of a 5% cut-off threshold, as specified in the Product Category Rules.

Flow name	Process stage	Mass %	Criteria to cut-off
Single-hole tube clip etc.	Manufacturing Stage	1.44	<2%
Devices external to the systems itself required for installation	Installation Stage	N/A	Cut-off due to small impact according to PCR
Any extraordinary maintenance done on the *product*	Use & Maintenance Stage	N/A	Specified in PCR
Total cut-off mass % estimated			<5%

6.4. Data Quality

The life cycle assessment utilizes a combination of primary and secondary data.

Site-specific primary data were obtained directly from Hoymiles and its factory, with documentation under company control (e.g., bills, invoices, shipping records, weighing data).

Secondary data, including generic and proxy data from international databases and other sources for scenario building and gap-filling, were modeled primarily using the Ecoinvent 3.11 (2025) database, with all sources duly referenced.

6.5. Allocations

An allocation procedure was applied to both electricity consumption and waste generation, utilizing the total annual production output in kWh (battery capacity) as the common basis. The allocation for electricity was derived from the total energy consumed by the production line, while the allocation for waste was based on the annual quantities of each waste type generated during the reference year.

7. SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

7.1. Manufacturing Stage

This cradle-to-gate life cycle assessment includes the 'upstream' stage and the 'core' production processes.

The upstream system boundary comprises the supply of semi-finished products and their transportation from an external supplier in Zhejiang, China, to the manufacturing plant.

The core system boundary includes all internal manufacturing steps for the product and its components within the factory. The primary data for the core processes, sourced from the corporate ERP system and invoices, served as the basis for modeling in SimaPro to determine the environmental impacts of the production lifecycle.

7.2. Distribution Stage

Data for the distribution stage is derived from the Hoymiles's sales projections for the 2026-2028 period. The specific percentage for each country is provided below.

For the distribution phase, the transport was modeled using the international default scenario: a combination of 19,000 km by ship and 1,000 km by lorry (with 85% payload). The emission factors for a container ship and a Euro 4 standard lorry in the 16-32t gross weight category were applied.

Country	Sales Percentage	Region
Malaysia	13.49%	Asia
Latvia, Lithuania, Estonia	12.07%	Europe
Poland	10.09%	Europe
Belgium, Netherlands, Luxembourg	9.23%	Europe
Germany	6.68%	Europe
Italy	5.68%	Europe
Thailand	5.54%	Asia
Bulgaria	4.97%	Europe
Ukraine	4.69%	Europe
Myanmar	3.98%	Asia
Hungary	3.98%	Europe
Spain	3.84%	Europe
Indonesia	3.84%	Asia
Vietnam	3.13%	Asia
United Kingdom	2.84%	Europe
Philippines	2.70%	Asia
France	1.99%	Europe
Greece	1.28%	Europe

7.3. Installation Stage

This module calculates the environmental impacts associated with the installation of the product. In this case, the product is manually installed, so there is no impact associated with it, while the

impact come from the discarding of the packaging.

For the transport of packaging waste arising from the installation phase, the local default values were applied, namely 1,000 km by lorry (85% payload). The vehicle emission factor corresponded to a Euro 4, 3.5-7.5t lorry. Additionally, the selection of emission factors for the distribution stage was based on the projected sales share of the HESS-261-2h product in EU and non-EU markets over the coming three years, details below.

As the market for the Fully Liquid Cooling C&I Battery System (HESS-261-2h) product is concentrated in the EU and other Asian countries, the disposal method for installation-phase packaging waste was therefore aligned with the geographical boundaries of these regions as defined in the database.

Region	Sales Percentage
Europe	67.33%
Asia	32.67%

7.4. Use & Installation Stage

This section assesses the environmental impact of the product during its use and maintenance phase. Impacts from energy carriers used in maintenance (e.g., manufacturer-specified spare parts and materials) are excluded due to a lack of reliable data on failure times and maintenance frequency.

The emission analysis for the use phase is based on information from the product datasheet and the calculation formulae stipulated in the relevant PCR and c-PCR. The total energy consumption value (in kWh per RSL) is calculated using the following formula:

$$E_{tot}\ [kWh] = E_{use} + E_{loss}$$

$$E_{use}\ [kWh] = \frac{P_{use} * 8760 * RSL}{1000}$$

$$E_{loss}\ [kWh] = \sum_{i=0}^{RSL} \frac{E_{useful\ i} * N_{cycles} * 365}{DC\ RTEi} * (1 - DC\ RTEi)$$

Applying the following formulas for an RSL of 10 years as reported by the corresponding c -PCR, the total energy consumption value is expected to be 746321.20 kWh.

To model this phase, a process from Ecoinvent describing the production of electric energy from photovoltaic (to which the inverter is connected, in this case in the “slanted-roof” configuration) has been used:

Based on the projected sales of the product over the next three years, the corresponding geographical boundaries within the database were selected according to the market share of different countries.

Item	Dataset Name
use-Malaysia	Electricity, low voltage {MY}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-lithuania	Electricity, low voltage {LT}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-poland	Electricity, low voltage {PL}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U

Item	Dataset Name
use-belgium+	Electricity, low voltage {RoW}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-germany	Electricity, low voltage {DE}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-italy	Electricity, low voltage {IT}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-thailand	Electricity, low voltage {TH}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-bulgaria	Electricity, low voltage {BG}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-ukraine	Electricity, low voltage {UA}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-myanmar	Electricity, low voltage {RoW}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-hungary	Electricity, low voltage {HU}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-spain	Electricity, low voltage {ES}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-indonesia	Electricity, low voltage {ID}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-vietnam	Electricity, low voltage {RoW}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-united kingdom	Electricity, low voltage {GB}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-philippines	Electricity, low voltage {RoW}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-france	Electricity, low voltage {FR}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U
use-greece	Electricity, low voltage {GR}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | EN15804, U

The relevant geographic area for the use phase is global-average value.

7.5. End of Life Stage

This section addresses the end-of-life phase of the product. Owing to the absence of company-specific primary data, the modeling is based on the standard scenarios prescribed in EN 50693. An exception is made for batteries and electronic components, for which a dedicated process from the Ecoinvent database was applied.

The transport distance to the Waste Treatment Plant was modeled as 1000km, using a 16-32 tonne EURO 4 truck. Environmental impacts for the various waste treatment processes were sourced from the Ecoinvent database.

Furthermore, emission factors for this stage were selected based on the projected sales share of the product in EU and non-EU markets over the next three years

8. REFERENCE

- Core PCR: EPD Italy 007 - Electronic and Electrical Products and Systems, REV. 3.2 – 12/10/2025
- Sub-category PCR: EPD Italy 021 - Electronic and electrical products and systems - Energy Storage, REV. 5 – 29/03/2021
- ISO 14040: 2006/ Amd 1: 2020 Environmental management - Life cycle assessment - Principles and framework Amendment 1 (ISO 2020).
- ISO 14044: 2006/ Amd 2: 2020 Environmental management - Life cycle assessment - Requirements and guidelines Amendment 2 (ISO 2020).
- UNI EN ISO 14025 :2010, Environmental labels and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006)
- EN 50693:2019 "Product category rules for life cycle assessments of electronic and electrical products and systems"
- Regulations of the EPDItaly Programme Revision 7.1. Issue date 05.09.2025
- LCA report of Fully Liquid Cooling C&I Battery System （HESS-261-2h） for Environmental Product Declaration （EPD）_rev.2.0_20251223