E-One Moli Energy Corporation

ENVIRONMENTAL PRODUCT DECLARATION

Lithium-ion Rechargeable Battery Cell

E-One Moli Energy Corporation, Tainan factory No. 10, Dali 2nd Road, Shanhua District, Tainan, Taiwan Province, China

in compliance with ISO 14025 and EN 50693

Program Operator	EPD China
Publisher	EPDItaly

Declaration Number	*EPD-CN-00056*
Registration Number	MR-EPDITALY0167

Issue Date	2026-10-08
Valid to	2031-10-07



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ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 for:

Lithium-ion Rechargeable Battery Cell

From

E-One Moli Energy Corporation

Declared product:



Programme operator:	EPD China
Registration number:	EPD-CN-00056
Issued date:	2026-10-08
Valid until:	2031-10-07
Environmental Product Declaration in accordance with ISO 14025	

Programme Information

EPD Owner	E-One Moli Energy Corporation 11/F, No. 96, Section 2, Zhongshan North Road, Zhongshan District, Taipei, Taiwan Province, China. www.molicel.com service@molicel.com
Product name	Lithium-ion Rechargeable Battery Cell
Production Site	E-One Moli Energy Corporation, Tainan factory No. 10, Dali 2nd Road, Shanhua District, Tainan, Taiwan Province, China
Identification of product	INR-18650-P22S Cylindrical cell 18650 Lithium-ion 46420
Field of Application	The product can be assembled into various types of energy storage products for industrial application, as a power supply module, in the form of either series or parallel connection.
Programme Operator	EPD China Address of Headquarter: Tianping Road, Xuhui District, Shanghai Website: www.epdchina.cn Email: info@epdchina.cn | secretary@epdchina.cn
LCA Practitioner	E-One Moli Energy Corporation
Responsibility	The EPD owner has the sole ownership, liability, and responsibility for the EPD
Comparability	EPDs within same category of product in different programme operator are not suggested to be compared. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible even applying the same PCR. EPD of construction products may not be comparable if they do not comply with EN 15804+A2
Liability	The EPD owner has the sole ownership, liability, and responsibility for the EPD.
Validity	The EPD is published on 2026-10-08 and valid to2031-10-07
LCA Software (version)	Environmental Improvement Made Easy (EIME) v6.3.4-11
LCI Dataset (version)	Ecoinvent v3.11.1 cut-off, EN 15804+A2
Year(s) of Primary Data	2024
PCR	Electronic and Electrical Products and Systems, PCR EPDItaly007, REV. 3.3, 2026-10-02, valid until: 2027-10-01
Other Reference Document	Electronic and Electrical Products and Systems - Energy Storage, PCR EPDItaly021, REV. 5, 2024-10-03, valid until: 2029-10-03 EN 15804: 2012+A2:2019 EN 50693:2019 ISO 14025:2026 Rules for the calculation of the Carbon Footprint of industrial Batteries without external

	storage (CFB-IND)
Verification statement according to EN50693:2019	
Independent verification of the declaration and data according to ISO 14025:2026 □ internal ☑ external Third-party institution verification: <Siyao Chen, Bureau Veritas LCIE China Company Limited > is an approved certification body accountable for third-party verification Approved by: EPD China	
Procedure for follow-up of data during EPD validity involves a third-party certification body: ☐ Yes ☑ No	

1 General Information

1.1 Company information

Contact Information of EPD Owner and Programme Operator:

- E-One Moli Energy Corporation
- 11/F, No. 96, Section 2, Zhongshan North Road, Zhongshan District, Taipei, Taiwan Province, China.
- www.molicel.com
- service@molicel.com

Name and location of production site:

- E-One Moli Energy Corporation, Tainan factory
- No. 10, Dali 2nd Road, Shanhua District, Tainan, Taiwan Province, China

Brief Description of the Company:

- E-One Moli Energy Corporation (hereinafter refers as "E-One Moli"), known as the first manufacturer of lithium metal rechargeable cells in the world and the first Li-ion cells in North America, is specialized in the manufacturing of rechargeable lithium-ion cells.
- E-One Moli ensures operational continuity, upholds customer commitments, and plans for the future in areas such as product life cycle management, low-carbon design, sustainable product development, process and product recycling, and energy, waste, and water resource management, while maintaining robust certifications like ISO 9001, ISO 14001, ISO 45001, and ISO 50001
- As E-One Moli's first battery to penetrate the BBU (Battery Backup Unit) market, the Lithium-ion Rechargeable Battery Cell (model no.: P22S) demonstrated exceptional performance in fire resistance testing, maintaining combustion resistance for over 10 minutes. Its safety and stability are on par with leading competitors, establishing a solid foundation of market trust.

1.2 Scope and type of EPD

Manufacturing Stage

1. Raw Material Acquisition

This stage involves:

- Production of all materials, intermediate products, auxiliary materials, and precursors,
- Cathode active material production,
- Anode active material production,
- Anode and cathode production,
- Electrolyte production, and
- Transportation of raw materials and intermediate products within, between and from extraction and pre-processing facilities until the first facility of the Lithium-ion Rechargeable Battery Cell (model no.: P22S) production site (E-One Moli's factory in Tainan).

Key materials of Lithium-ion Rechargeable Battery Cell include Nickel Cobalt Aluminium (NCA) as cathode material, graphite as anode material, polyethylene as separator, copper collector foil, aluminium components, electrolytes, and various plastic components as tabs and taps (e.g., polyimide and polypropylene). Data for raw material acquisition is sourced from product bill-of-material and modelled using the Ecoinvent 3.11.1 cut-off, EN 15804+A2, database. Upstream transportation data are sourced from the suppliers.

2. Manufacturing

The manufacturing stage includes:

- Assembling the cell components into P22S, including stacking/winding of electrodes and separator, assembly of electrode plates with separator, assembling into a cell housing or pouch, injection of electrolyte, closing of cell, testing and electrical formation.
- Energy and resource consumption during this stage includes electricity, natural gas, and tap water.
- Waste generation during the manufacturing, such as wastewater, leftovers, waste raw material packaging, and inorganic sludge generated during the fractionation of waste solvent.
- Waste primary packaging of raw materials and waste generated from production process on the P22S production site (E-One Moli's factory in Tainan).
- Transportation of waste primary packaging of raw materials and waste generated during the battery cell assembly processes from the P22S production site (E-One Moli's factory in Tainan) to the waste treatment facility, and the treatment of waste.

Distribution

P22S is designed as a power supply component of the industrial battery, therefore, the distribution in this study considers only the route from the P22S production site (E-One Moli's factory in Tainan) to the warehouse of their Malaysian customer (the industrial battery assembler/final product manufacturer). The following distribution processes are included:

- Transportation from the P22S production site to the Malaysian customer's warehouse.

The distribution is recorded by E-One Moli's shipping records.

Table 2: Distribution.

Route	Distribution type	Distribution data	Unit
From E-One Moli to the Malaysian customer's warehouse	>32t Truck	6.19E-01	t*km
	Sea transportation	6.44E+00	t*km

Installation Stage

The following process is included:

- The end-of-life of disposed packaging.

The transport of the waste packaging is also included in this stage and the transport distances from the assembly site of the Malaysian customer (the industrial battery assembler/final product manufacturer) into the waste treatment site are assumed to be 50 km, according to EN 50693.

Use & maintenance Stage

No applicable sub-PCR is available for the cell level, therefore, EPDItaly021 is referred to calculate the use stage, which breaks down the energy consumption of the whole energy storage system into different levels, including the energy absorbed by the modules (the storage equipment auxiliaries services that are not cycle related, to operate BMS, SCADA, fire protection system, etc.) and the energy loss of the cells due to charge/discharge cycles. In this study, no maintenance is required during use and maintenance stage, and only the energy loss of the cells due to charge/discharge cycles is recognized in this stage.

The DC RTEi is calculated based on the tested discharge energy/ the tested charge energy, which is 91.31%,

according to IEC 62620. The RSL is assumed to be 10 years, the number of full charge/discharge cycles per day is assumed to be 1, according to the EPDItaly021.The energy loss calculation formula and parameters per piece of studied product are as follows:

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

Where:

E_{loss}:	Energy dissipation occurs whenever the battery is charged and discharged.
DC RTEi:	(DC Round Trip efficiency in the year i) The battery efficiency during a complete discharge/charge cycle defined as energy discharged divided by energy charged measured on DC power terminal in the charging/discharging cycle at the maximum power that the energy storage system is able to keep constantly without rest time and at Nominal Operating Temperature.
E_{useful}:	The max energy dischargeable from the energy storage system (DC side) during discharge at the maximum power that the energy storage system is able to keep constantly during discharging process without rest time and Nominal Operating Temperature.
Nominal Operating Temperature:	Environmental temperature of energy storage system room in which the energy storage system minimizes the degradation phenomena providing the electrical performance required.
N_{cycles}:	The number of full charge/discharge cycles per day.
365:	The number of days in one year.

Table 3: Parameters used in Use and Maintenance stage.

Parameters	Values	Unit
DC RTEi	9.13E+01	%
$E_{useful\,i}$	6.77E-03	kWh
N_{cycles}	1	times/d
RSL	10	yr
E_{loss}	2.35E+00	kWh

Note：The data is only calculated based on typical application scenarios, and the values of specific energy storage system products need to be determined in combination with product design and application boundaries.

End-of-life Stage De-installation

The applied geographical area of the end-of-life stage in this LCA study is the European Union (EU). End-of-life stage assumes that discard products are sent for material recovery, according to the requirements of EU Regulation (EU) 2023/1542. Factors related to disassembly are utilized in the calculation of the waste processing stage. The materials' disposal rate and recycling rate for each material are based on specific data from the Rules for the calculation of the Carbon Footprint of industrial Batteries without external storage (CFB-IND), corresponding to (EU) 2023/1542. The transport distances from the disassembling to the battery cell recycling plant is assumed to be 130 km by truck (>32 t, EURO4), according to CFB-IND. Below is the table summarizing the disposal material

amounts for the target product during End-of-Life stage:

Table 4: Waste scenario in End-of-Life stage.

Material	Disposal rate	Disposal weight (g)	Recycling weight (g)	Total weight (g)
Aluminium metal	10%	4.70E+01	4.23E+02	4.70E+02
Copper metal	10%	1.48E+02	1.33E+03	1.48E+03
Cobalt compounds	10%	2.34E+01	2.11E+02	2.34E+02
Nickel compounds	10%	1.26E+02	1.14E+03	1.26E+03
Other metals and metal compounds	100%	1.03E+03	0.00E+00	1.03E+03
Graphite	100%	1.08E+03	0.00E+00	1.08E+03

Benefits & Loads beyond the system boundary

Benefits & Loads beyond the system boundary is not declared in this study.

Table 5: Process stages and EPD modules.

Phases	Manufacturing stage	Distribution stage	Installation stage	Use stage	End-of-life stage	Benefits & Loads
In accordance with EN50693						
Phases declared	X	X	X	X	X	ND

1.3 Other clarification matters

Electricity mix:

This study highlights the use of various power grid combinations at different stages of the life cycle. Specifically, the product is manufactured in Taiwan, China, utilizing the mixed power structure of both the Taiwan Power Grid and onsite photovoltaic electricity for modelling purposes. During the use and maintenance phase, the regional average electricity mix in the European Union is used. The location-based approach is used in this LCA study for the electricity during both the manufacturing phase and use and maintenance phase.

Table 6: Electricity mix and emission factor.

Consumption type	Electricity process type	Value	Secondary database
Electricity consumption in manufacturing phase – purchased from local grid	market for electricity, low voltage; TW // electricity, low voltage	7.63E-01 kg CO_2/kWh	Ecoinvent 3.11.1
Electricity consumption in manufacturing phase – onsite generated photovoltaic power	electricity production, photovoltaic, 3kWp slanted-roof installation, multi-Si, panel, mounted; TW // electricity, low voltage	7.49E-02 kg CO_2/kWh	Ecoinvent 3.11.1
Electricity consumption in use and maintenance phase – purchased from local grid	market group for electricity, low voltage; RER // electricity, low voltage	3.30E-01 kg CO_2/kWh	Ecoinvent 3.11.1

Statement on the type of EPD:

- The EPD for the E-One Moli Lithium-ion Rechargeable Battery Cell P22S is specific, as it pertains to a distinct product and its associated environmental performance data.

Background Database Description:

- The EPD incorporates background data using upstream and downstream generic data. These data represent processes and systems that lie beyond the manufacturer's direct influence (e.g., raw material extraction, supply chain effects, and end-of-life scenarios).
- Specific datasets used in this context are derived from the Ecoinvent 3.11.1 database cut-off, EN 15804+A2, for modelling the background system of the process.

Applied LCA Software/Tools:

- The Life Cycle Assessment (LCA) calculations and environmental analyses were performed using the Environmental Improvement Made Easy (EIME) v6.3.4-11 software with its integrated datasets and modelling tools.

2 Detailed Product Description

Description of the product

Lithium-ion Rechargeable Battery Cell adopts Nickel Cobalt Aluminium (NCA) chemistry as its cathode material, designed to meet the demanding requirements of cloud service providers (CSPs), hyperscale data centres, and generative artificial intelligence computing. Lithium-ion Rechargeable Battery Cell offers reliable backup time and long-term storage. With optimized thermal behaviour for enhanced safety and efficient performance even under high temperatures, Lithium-ion Rechargeable Battery Cell ensures exceptional reliability and operational stability in the most intensive environments. The products applying for EPD certification in this study: P22S with a minimum guaranteed energy of 7.20E-03 kWh.

Lithium-ion Rechargeable Battery Cell, designed as a power supply component, is primarily used as the battery cell components in the power supply modules of industrial batteries by assembling one or more pieces together. Lithium-ion Rechargeable Battery Cell is not designed to be separately used as a finished product, but to achieve its designed function through being connected as a power supply module and cooperating with the other corresponding modules (e.g., battery management system) of the industrial battery.

Lithium-ion Rechargeable Battery Cell demonstrates exceptional performance in fire resistance testing, maintaining combustion resistance for over 10 minutes. Its safety and stability are on par with leading competitors, establishing a solid foundation of market trust, representing a new generation of backup battery unit solutions and featuring a unique compact and high-powered design. Through innovative engineering, it significantly enhances discharge rate, safety, maintainability, flexibility, lifespan, and energy efficiency while obviously reducing unit weight, volume, energy consumption, costs, and physical footprint. With superior cell performance and ideal lifespan, it provides customers with efficient and reliable energy storage solutions that meet diversified energy supply needs. The detailed parameters are shown in Table 7.



Figure 1: Picture of the declared product.

Table 7: Information of Lithium-ion Rechargeable Battery Cell P22S.

Product	Lithium-ion Rechargeable Battery Cell
Model identifier	INR-18650-P22S
Battery chemistry	Lithium-ion
Dimensions	Diameter: 1.84E+01 ± 1.50E-01 mm Height: 6.51E+01 ± 1.50E-01mm
Net weight	4.70E+01 ± 2.00E+00 g
Gross weight	4.71E+01 ± 2.00E+00 g
Capacity	Typical: 2.20E+00 Ah / 7.92E-03 kWh Minimum: 2.00E+00 Ah / 7.20E-03 kWh
Cell voltage	Nominal: 3.60E+00 V Charge: 4.20E+00 V Discharge: 2.50E+00 V
Charge Current (70℃ cut off)	Standard: 2.00E+00 A Maximum: 4.00E+00 A
Discharge Current (80℃ cut off / 3.0 V cut off)	Standard: 2.00E+00 A Maximum: 3.60E+01 A
Minimum guaranteed energy	2.00E+00 Ah / 7.20E-03 kWh
UN CPC code	46420
Total energy storage system capacity	5.70E+00 kWh or 8.00E+00kWh
Type of coupling:	Series-parallel hybrid connection
Type of cell technology	Li-ion NCA
Type of application	Industrial

The flowchart of the production process stages for the Lithium-ion Rechargeable Battery Cell is shown in Figure 2. For simplicity, only the main manufacturing stages are presented.

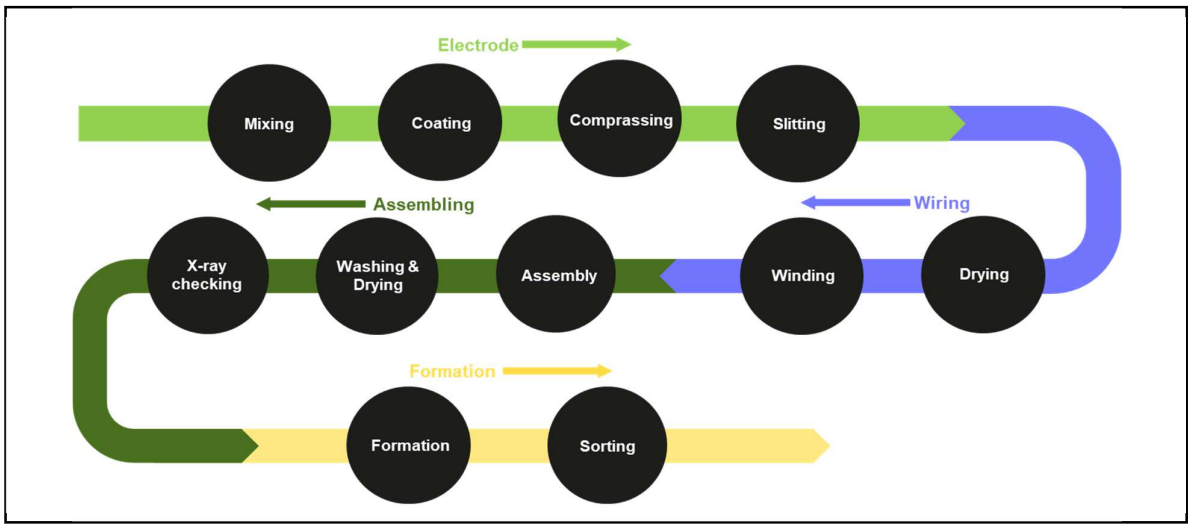


Figure 2: The production process in selected stages.

Product components, main product content, packaging materials, SVHC.

Product components:

- Anode materials: graphite, carboxymethyl cellulose (CMC), styrene butadiene rubber (SBR), and copper collector foil.
- Cathode materials: nickel cobalt aluminium (NCA), graphite, lithium carbonate, fluoropolymer, dicarboxylic acid, aluminium foil, and n-methyl pyrrolidone (NMP).
- Electrolyte: various materials such as fluoroethylene carbonate (FEC) and Lithium Hexafluorophosphate.
- Separator: polyethylene
- Outer shell: steel plate, polycarbonate, polyethylene terephthalate, and polypropylene
- Other components: various materials such as anode tab, cathode tab, adhesive tape, cathode cover tape, cathode cover tape, adhesive tape, top insulator, and bottom insulator for durability and functionality.

Main product content:

- Battery Chemistry: core components such as nickel cobalt aluminium (NCA), graphite, and electrolytes.
- Structural Metals: aluminium and copper are used extensively to maintain mechanical integrity and electrical performance. Steel is used for support and protection.
- Polymeric Materials: polycarbonate, polyethylene terephthalate, polyimide, and polypropylene are used for insulation, protection, and sealing.

Packaging materials:

- Corrugated board boxes as outer boxes (used for shock absorption).
- Paper boxes as inner boxes for protective grouping.
- Paperboard for securing and group separation.

SVHC:

- No SVHC substances are known to be present in the product components or packaging materials.
- Material safety compliance is ensured with periodic evaluation against EU standards and regulations.

Table 8: Main product components and packaging materials.

Product components	Weight, kg (per functional unit)	Weight-% (versus the product)
Activated solvent / Electrolyte	6.51E-01	9.67%
Aluminium and its compounds	3.92E-01	5.82%
Copper and its compounds	1.48E+00	22.00%
Graphite	1.02E+00	15.18%
NCA	1.56E+00	23.16%
Stainless steel	1.02E+00	15.14%
Other materials	6.07E-01	9.02%
TOTAL	**6.73E+00**	**100.00%**

Functional unit

1 kWh minimum guaranteed energy when the cell is installed, provided 10 years RSL with 365 days of operation per year and 1 full charge/discharge cycles per day by the Lithium-ion Rechargeable Battery Cell P22S.

1 kWh minimum guaranteed energy corresponds to 139 pieces of P22S.

The mass reference (in declared unit/functional unit)

7.20E-03 kWh (around 48.5g) / 1 kWh (around 6.73 kg)

Reference service life (RSL)

10 years.

When other substances causing indoor air pollution or radioactivity are dealt with.

Not applicable.

Representativeness of the average when an average EPD is declared. Useful information is:

Not applicable.

3 LCA results

3.1 Environmental Impacts

The results of the underlying LCA are provided in this section as environmental impacts, resource use, output flows and additional information on biogenic carbon, calculated according to EN15804:2012+A2:2019 reference package based on EF 3.1. All pre-set parameters of EN 50693 are required. The location-based approach is used for the electricity mix in this LCA study.

Table 9: Environmental impacts according to EN 50693.

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT PER FUNCTIONAL UNIT							
CORE INDICATOR	UNIT	MANUFACTURING STAGE	DISTRIBUTION STAGE	INSTALLATION STAGE	USE STAGE	END-OF-LIFE STAGE	BENEFITS & LOADS
Global Warming Potential fossil fuels (GWP-fossil)	[kg CO_2 eq.]	2.19E+02	1.14E-01	1.99E-02	1.08E+02	9.38E+00	ND
Global Warming Potential biogenic (GWP-biogenic)	[kg CO_2 eq.]	2.85E-01	1.06E-05	1.19E+00	3.45E+00	1.66E+00	ND
Global Warming Potential land use and land use change (GWP-luluc)	[kg CO_2 eq.]	3.13E-01	6.17E-05	1.29E-05	3.18E-01	1.15E-02	ND
Global Warming Potential total (GWP-total)	[kg CO_2 eq.]	2.19E+02	1.14E-01	1.21E+00	1.11E+02	1.11E+01	ND
Depletion potential of the stratospheric ozone layer (ODP)	[kg CFC 11 eq.]	4.65E-06	1.62E-09	3.71E-10	2.00E-06	7.87E-08	ND
Acidification potential, Accumulated Exceedance (AP)	[mol H^+ eq.]	2.60E+00	1.49E-03	2.86E-04	6.19E-01	7.52E-02	ND
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	[kg P eq.]	2.15E-01	9.31E-06	2.93E-06	1.03E-01	3.93E-03	ND
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	[kg N eq.]	2.77E-01	3.77E-04	5.24E-04	9.87E-02	1.57E-02	ND
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	[mol N eq.]	2.95E+00	4.18E-03	9.92E-04	8.74E-01	7.93E-02	ND
Formation potential of tropospheric ozone (POCP)	[kg NMVOC eq.]	8.95E-01	1.26E-03	6.84E-04	2.80E-01	2.74E-02	ND
Abiotic depletion potential for non-fossil resources (ADP-minerals & metals)	[kg Sb eq.]	2.30E-02	2.52E-07	5.25E-08	1.46E-03	1.65E-04	ND

Abiotic depletion potential for fossil resources (ADP-fossil)	MJ, net calorific value	3.17E+03	1.54E+00	3.08E-01	2.48E+03	8.90E+01	ND
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	[m3 world eq. deprived]	2.41E+02	7.70E-03	1.03E-02	6.94E+01	4.38E+00	ND

3.2 Resource use and waste categories

Information on resource use and waste categories which shall be included in the EPD as follows:

Table 10: Resource use and waste categories according to EN 50693.

RESULTS OF THE LCA - RESOURCE USE AND WASTE CATEGORIES PER FUNCTIONAL UNIT							
CORE INDICATOR	UNIT	MANUFACTURING STAGE	DISTRIBUTION STAGE	INSTALLATION STAGE	USE STAGE	END-OF-LIFE STAGE	BENEFITS & LOADS
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	7.79E+02	1.88E-02	-1.33E+01	6.70E+02	4.11E+00	ND
Use of renewable primary energy resources used as raw materials (PERM)	MJ	1.33E+01	0.00E+00	1.33E+01	0.00E+00	3.49E+01	ND
Total use of renewable primary energy resources (PERT) (primary energy and primary energy resources used as raw materials)	MJ	7.92E+02	1.88E-02	7.93E-03	6.70E+02	3.90E+01	ND
Use of non-renewable primary energy excluding non- renewable primary energy resources used as raw materials (PENRE)	MJ	2.94E+03	1.54E+00	3.08E-01	2.48E+03	3.35E+01	ND
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	2.34E+02	0.00E+00	6.60E-04	0.00E+00	5.55E+01	ND
Total use of non-renewable primary energy resources (PENRT) (primary energy and primary energy resources used as raw materials)	MJ	3.18E+03	1.54E+00	3.08E-01	2.48E+03	8.90E+01	ND
Use of secondary material (SM)	kg	2.32E+00	7.30E-04	1.30E-04	3.99E-01	7.67E-01	ND
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
Net use of fresh water (FW)	m3	5.37E+00	1.90E-04	-2.54E-03	1.62E+00	9.44E-02	ND
Hazardous waste disposed (HWD)	kg	3.72E+01	3.02E-03	7.18E-04	6.01E+00	1.05E+00	ND

Non-hazardous waste disposed (NHWD)	kg	1.39E+03	5.38E-02	1.90E+00	5.07E+02	2.74E+01	ND
Radioactive waste disposed (RWD)	kg	7.33E-03	2.78E-07	1.33E-07	1.78E-02	1.94E-04	ND
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND
Materials for recycling (MR)	kg	9.70E-01	6.54E-04	3.69E-02	4.24E-01	3.92E+00	ND
Materials for energy recovery (MER)	kg	3.91E-04	5.86E-08	2.19E-08	3.55E-05	1.11E-05	ND
Exported energy (EE)	MJ	3.08E+00	3.66E-04	1.13E-04	1.22E+01	1.27E-01	ND

3.3 Information on biogenic carbon content

Information on biogenic carbon content which shall be included in the EPD as follows:

Table 11: Biogenic carbon content.

Biogenic carbon content	Unit (expressed per functional unit)
Biogenic carbon content in product	1.04E-02 kg C
Biogenic carbon content in accompanying packaging	1.59E-01 kg C
NOTE: 1 kg biogenic carbon is equivalent to 44/12 kg of CO_2.	

3.4 Additional impact indicators

Optional additional impact indicators are as follows:

Table 12: Optional additional impact indicators.

RESULTS OF THE LCA - ADDITIONAL ENVIRONMENTAL IMPACT PER FUNCTIONAL UNIT							
CORE INDICATOR	UNIT	MANUFACTURING STAGE	DISTRIBUTION STAGE	INSTALLATION STAGE	USE STAGE	END-OF-LIFE STAGE	BENEFITS & LOADS
Particulate matter (PM)	disease inc.	1.36E-05	8.18E-09	2.42E-09	1.32E-06	6.67E-07	ND
Potential Human exposure efficiency relative to U235 (IRP)	[kBq U^{235} eq]	2.89E+01	1.14E-03	5.44E-04	4.16E+01	7.88E-01	ND
Ecotoxicity freshwater (ETP-fw)	CTUe	2.59E+03	2.03E-01	2.97E+01	2.12E+02	9.47E+01	ND
Human toxicity, cancer (HTP-c)	CTUh	2.48E-07	2.15E-11	1.72E-10	1.92E-08	6.41E-09	ND
Human toxicity, non-cancer (HTP-nc)	CTUh	1.72E-05	7.75E-10	1.75E-08	1.05E-06	1.60E-07	ND
Land use related impacts/Soil quality (SQP)	dimensionless	9.64E+02	1.02E+00	4.66E-01	2.91E+02	2.99E+01	ND

4 Supplementary information

4.1 Calculation rules

Assumptions

- Loss rates of raw materials are hypothesized based on empirical values.
- The waste treatment type and proportion of the waste packaging in Malaysia (the location of the industrial battery assembler/final product manufacturer) is hypothesized based on the research data, that 90% of the waste is landfill disposed, 5% of that is incinerated, and 5% of that is recycled, according to the research (Shakil et al., 2023).
- The use scenario in the study is assumed based on the default values, that: RSL is assumed to be 10 years; operation days per year is assumed to be 365 days; and 1 full charge/discharge cycles per day during the RSL is assumed.
- The materials' disposal rate and recycling rate during the end-of-life stage is hypothesized according to Rules for the calculation of the Carbon Footprint of industrial Batteries without external storage (CFB-IND).
- The classification of the disassembling components that will be treated in End-of-Life stage is defined according to the calculation rule (CFB-IND) under EU 2023/1542 Battery Regulation.
- Some of the metals and metal compounds and other materials are modelled with proxy.
- Electrolyte is modelled with proxy made of a similar composition mixed by organic solvents, such as ethylene carbonate (EC) and dimethyl carbonate (DMC), a lithium salt, such as lithium hexafluoro phosphate (LiPF6), and a small amount of additive.
- Default energy mix data were used for modelling (regional average electricity mix for Taiwan province, China in manufacturing stage and the regional average electricity mix in the European Union in use stage).

Cut off rules

According to the PCR, LCI data for a minimum of 99% of total inflows to the core phase should be included. On the input side all flows entering the system and comprising more than 1% in total mass or contributing more than 1% to primary energy consumption are considered. All inputs used as well as all process-specific waste and process emissions were assessed. For this reason, material streams which were below 1% (by mass) were captured as well. In this manner the cut-off criteria according to the PCR are fulfilled.

Data quality

Time Representativity

The data that has been the subject of data collection are representative of the period 1st January 2024 – 31st December 2024. Collection was conducted during 1st September 2025 – 17th November 2025. Data for the was analysed and processed in the December 2025 – January 2026.

The reference years of the LCI phases used are indicated in the EIME software. For the same geographical and technological representativeness, the most recent data is selected.

Geographic Representativity

The primary data are representative of Raw material acquisition and pre-processing, upstream transportation, and product manufacturing in China. The geographical area of the LCI phases used is indicated in the EIME software.

Technological Representativity

The primary data for the Lithium-ion Rechargeable Battery Cell (model no.: P22S) is representative of the Raw material acquisition and pre-processing, upstream transportation, product manufacturing, and distribution. The

technological application of the LCI phases used is indicated in the EIME software.

Representativeness

The primary data collected is representative of the production of Lithium-ion Rechargeable Battery Cell (model no.: P22S) during 1st January 2024 – 31st December 2024. The representativeness of the LCI modules of the EIME software is evaluated in 3 levels: temporal / technological / geographical representativeness.

Generic Inventory Database Used

The database used is the database Ecoinvent 3.11.1 (updated on 10th February 2025). The different inventories used in this study are available on request.

Traceability

Life Cycle Inventory was realized in December 2025 – January 2026 and the compilation of data results from the calculations made by EIME (Environmental Improvement Made Easy) v6.3.4-11 LCA software.

Allocations

According to EN 50693 and the core PCR, this study applies several allocation procedures for energy consumption and waste, with energy-related emissions allocated per P22S produced.

Input allocation

In this study, the raw materials and the packaging of the studied product are based on the BOM from E-One Moli, where no allocation was used, while the energy and resource consumption was allocated based on relevant underlying physical relationship (i.e., production share).

Output allocation

In this study, no by-products were produced during the manufacturing of P22S, therefore, no allocation of by-products was applied in this study. The wastes and the emissions generated during the P22S production were allocated based on relevant underlying physical relationship (i.e., production share).

End-of-life allocation

In this study, only the waste transportation and waste disposal are included, and no benefit or load for recycling purpose is included. The treatment of the materials' disposal rate and recycling rate during the end-of-life stage is hypothesized according to CFB-IND.

4.2 Scenarios and additional technical information

Additional assumptions:

- The distribution scenario of the route from battery assembler to the waste collection point is assumed based on EN50693
- The waste transportation scenario of the route from the P22S production site (E-One Moli's factory in Tainan) to the waste collection point and the route from their Malaysian customer (the industrial battery assembler/final product manufacturer) to the waste collection point are assumed based on EN50693.
- Assuming that all battery products will be recovered through a properly returned process during the End-of-Life stage.
- The distribution distance from the final product installation location to the waste collection point is assumed based on EN50693.
- No specific Chinese dataset was available for raw material transportation and manufacturing waste treatment; therefore, GLO or RoW datasets were used instead.
- No specific local dataset was available for distribution; therefore, GLO and RoW datasets were used instead.

- No EU average dataset was available for End-of-life stage; therefore, FR, SE, and GLO datasets were used instead.

4.3 Dangerous substances

Not applicable.

References

Detailed handbook of EIME version 6

Electronic and Electrical Products and Systems, PCR EPDItaly007, REV. 3.3, 2026-10-02, valid until: 2027-10-01 (Core PCR)

Electronic and Electrical Products and Systems - Energy Storage, PCR EPDItaly021, REV. 5, 2024-10-03, valid until: 2029-10-03 (Sub-category PCR)

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

EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems

EPD China General Programme Instructions, REV. 3.1, 2024-01-22

ISO 14040:2006 Environmental management -- Life cycle assessment -- Principles and framework

ISO 14025:2026 Environmental statements and programmes for products — Environmental product declarations (EPDs)

Rules for the calculation of the Carbon Footprint of industrial Batteries without external storage (CFB-IND)

Shakil, N., Azhar, M., and Zahide, A. (2023). Solid Waste Management in Malaysia: An overview. Information Management and Business Review, 15, pp. 86-93. Doi: 10.22610/imbr.v15i1(I)SI.3410.

Revision history

Original Version of the EPD, 2026-10-08

Revision not applicable.

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