Contemporary Amperex Technology Co., Limited

ENVIRONMENTAL PRODUCT DECLARATION

Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

No.1, Shidai Street, High-tech Industrial Development Zone, Zhaoqing City, Guangdong Province, China

No99. chunyi Road, Economic and Technological Development Zone, Yichun City, Jiangxi Province, China

In accordance with ISO 14025 and EN 50693

Program Operator	EPDItaly
Publisher	EPDItaly

Declaration Number	EPDItaly-CATL-003
Registration Number	EPDITALY0751

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Valid to	27 / 09 / 2029

1 General information

1.1 Programme information

Programme:	EPDItaly
Address	Via Gaetano De Castillia n° 10 - 20124 Milano, Italy
Website	www.epditaly.it
E-mail	info@epditaly.it
EPD Owner	Contemporary Amperex Technology Co., Limited https://www.catl.com/en/
Manufacturer address	No.1, Shidai Street, High-tech Industrial Development Zone, Zhaoqing City, Guangdong Province, China No99. chunyi Road, Economic and Technological Development Zone, Yichun City, Jiangxi Province, China
Product code	FC-FV5-71H4L4-004L FC-FX6-71H4L4-013L FC-FX6-71H4L4-012L
Functional unit	1 kWh minimum guaranteed energy when the cell is installed provided over 20 years RSL with 365 days of operation per year and 1 full charge/discharge cycles per day by the Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)
CPC code	46410 “Primary cells and primary batteries”
Independent verification	Independent verification of the declaration and data, carried out according to ISO 14025: 2010. ☐ Internal ☑ External Third party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n ° 10 - 20124 Milan, Italy. Accredited by Accredia.
Comparability Statement	Environmental statements published within the same product category, but from different programs, may not be comparable.
Liability Statement	The EPD Owner releases EPDItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence. EPDItaly disclaims any responsibility for the information, data and results provided by the EPD Owner for life cycle assessment.

Product category rules (PCR)	Core PCR: EPDItaly007 - PCR for Electronic and Electrical Products and Systems, (rev.3), January 2023
Other references	EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems Regulations of the EPDItaly Programme rev. 6.0 published on 2023/10/30
Product RSL description	20 years
LCA study	This EPD study is based on the LCA study described in the LCA report
EPD type	Product specific
EPD scope	Cradle to grave
Year of reported primary data	1 May 2023 to 30 April 2024
Technical support	Emily Zhao SGS-CSTC Standards Technical Services Co., Ltd.

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 50693, 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 50693 and ISO 14025.

1.2 Company information

Owner of the EPD: Contemporary Amperex Technology Co., Limited

Description of the organisation:

Contemporary Amperex Technology Co., Limited (CATL) is a global leader in new energy innovative technologies, committed to providing premier solutions and services for new energy applications worldwide. Adhering to the concept of circular economy, CATL is committed to producing carbon neutral battery cell products, reducing energy consumption and emissions. CATL implements the quality standard as ISO9001, and environment standards as ISO14001&ISO50001. In the future, CATL will actively fulfil corporate social responsibilities and make outstanding contributions to the cause of global new energy development.

Location of production site:

No.1, Shidai Street, High-tech Industrial Development Zone, Zhaoqing City, Guangdong

Province, China
No99. chunyi Road, Economic and Technological Development Zone, Yichun City, Jiangxi Province, China

1.3 Product information

Product name: Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

Product identification: Prismatic cell

Product description:
The Lithium iron phosphate battery cell can be assembled in different type of product, such as module, cabinet, container, etc. The photos below illustrate the representative product, but not all of the product.

The product can be used for the energy storage system. The major application field include: voltage regulation, frequency regulation, backup power supply, new energy power generation, peak shifting & peak shaving & demand response, micro grid, etc.

Technical data:

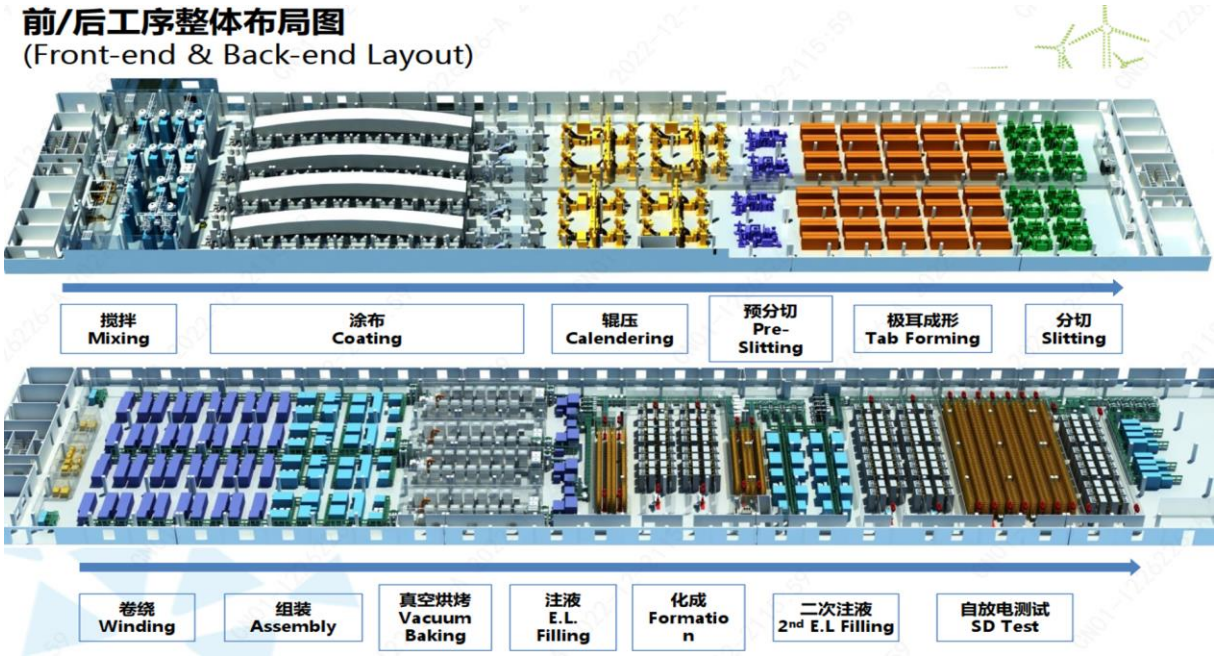
Table 1: Key technological data of Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

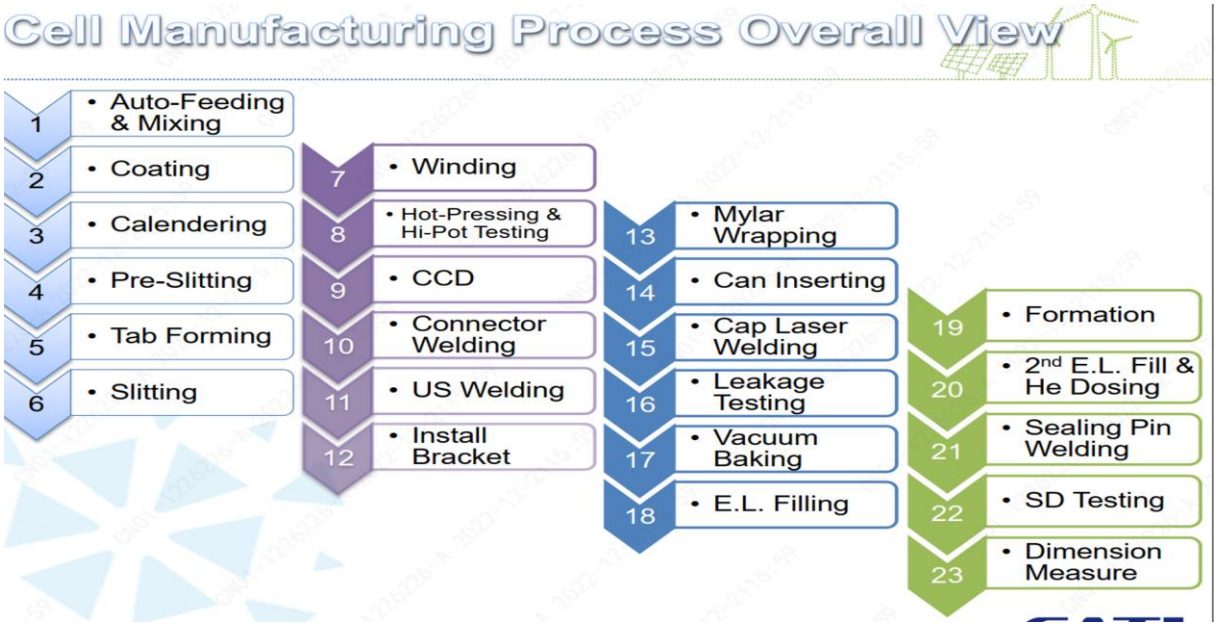
Characterization	Value			Unit
	FC-FV5-71H4L4-004L	FC-FX6-71H4L4-013L	FC-FX6-71H4L4-012L	
Dimension	174.04*207.31*71.55	174.04*207.31*71.55	173.79*71.55*207.20	mm*mm*mm
Weight of product	5.42±0.15	5.52±0.15	5.5±0.3	kg
Capacity	285	306	306	Ah
Voltage	3.2	3.2	3.2	V
Minimum guaranteed Energy	912	979.2	979.2	Wh

Geography: The products are manufactured in China and sold to Europe.

UN CPC code: 46410

Manufacturing process: The pictures below show the flow-chart of manufacturing process.




Cell Manufacturing Process Overall View
1 • Auto-Feeding & Mixing
2 • Coating
3 • Calendering
4 • Pre-Slitting
5 • Tab Forming
6 • Slitting
7 • Winding
8 • Hot-Pressing & Hi-Pot Testing
9 • CCD
10 • Connector Welding
11 • US Welding
12 • Install Bracket
13 • Mylar Wrapping
14 • Can Inserting
15 • Cap Laser Welding
16 • Leakage Testing
17 • Vacuum Baking
18 • E.L. Filling
19 • Formation
20 • 2nd E.L. Fill & He Dosing
21 • Sealing Pin Welding
22 • SD Testing
23 • Dimension Measure

2 Content information

Table 2: Content information of Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

Product components	Material classes	Share [in %]
LFP	M-199	35-47
Aluminum	M-120	3-15
Graphite	M-399	10-25
Copper	M-121	3-15
Separator	M-201	1-5
PP	M-202	0.1-5
PC	M-204	0.1-5
PET	M-209	0.1-5
Electrolyte	M-399	10-30
Carbon black	M-399	0.1-5
PolyVinylidene Fluoride	M-269	0.1-5
Other elastomers	M-339	0.1-5
Other organic materials	M-399	0.1-5
Packaging components	**Material classes**	**Share [in %]**
Wood	M-340	84.34
Paper	M-341	2.31
EPO plastics	M-299	13.35

3 LCA information

3.1 Overview

Functional unit and reference flow: The functional unit (FU) is the product or system main function(s) quantified, to which the inputs and outputs are related to. For lithium iron phosphate energy storage batteries cell, the functional unit is defined as 1 kWh minimum guaranteed energy when the cell is installed provided over 20 years RSL with 365 days of operation per year and 1 full charge/discharge cycles per day by the Lithium iron phosphate battery cell.

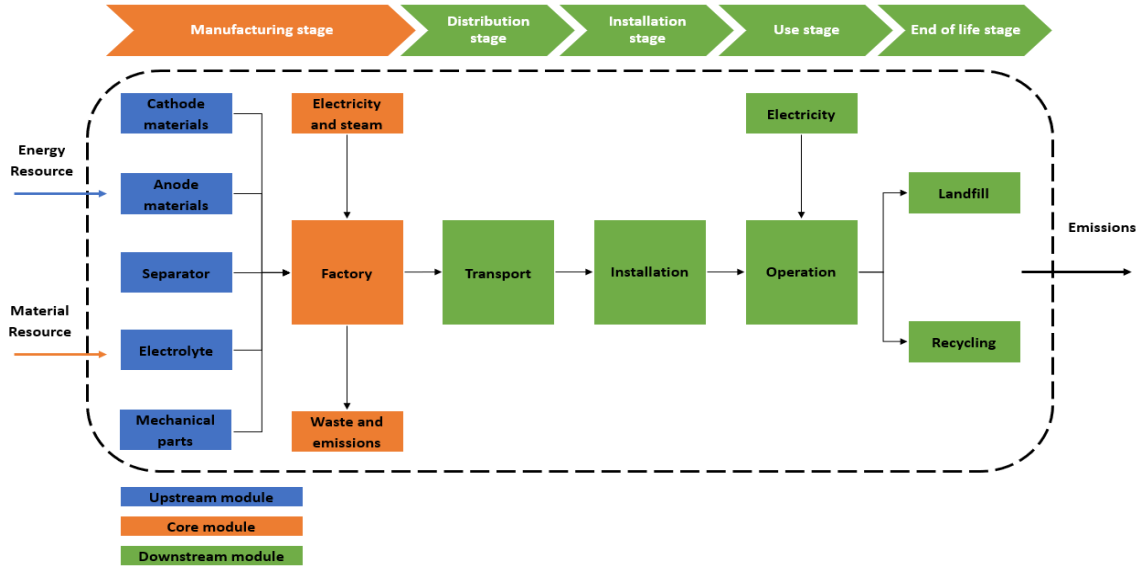
The reference flow describes all the needed flows to fulfil the functional unit.
The reference flow of FC-FV5-71H4L4-004L is 1.096 units product (Net weight: 6.039 kg, gross weight: 6.238 kg).
The reference flow of FC-FX6-71H4L4-013L is 1.021 units product (Net weight: 5.828 kg, gross weight: 6.014 kg).
The reference flow of FC-FX6-71H4L4-012L is 1.021 units product (Net weight: 5.661 kg, gross weight: 5.874 kg).

Reference service life: 20 years

Time representativeness: The primary data used has been obtained from the CATL plant from 1 May 2023 to 30 April 2024, being representative of the products and the production process.

Database(s) and LCA software used: SimaPro® software v.9.5 developed by PRé Consultants was used to create the product system model. The ecoinvent® database version 3.9.1 provided the life cycle background data for product system modelling.

System diagram: This EPD is from cradle to grave with Upstream module, core module and Downstream module. System diagram is as follow:



Declared life cycle stages:

Table 3: The declared life cycle stages of Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

	Manufacturing		Distribution	Installation	Use and maintenance	End-of-life
Module	**Upstream module**	**Core module**	**Downstream module**			
Supply chain processes	Extraction of raw materials and the production of semi-finished products and auxiliary items; Transport of raw materials to CATL plant.	Lithium iron phosphate battery cell assembling; Transport of solid waste; Waste treatment; Emissions to air; Emissions to water.	Lithium iron phosphate battery cell transport into the operation site; installation and packaging waste management; operating for 20 years (RSL); EoL, including collecting, transport of waste, material/energy recycling, hazardous waste for incineration and disposal of non-recyclable fractions at sanitary landfill.			
Modules declared	x	x	x	x	x	x
Geography	CN	CN	EU	EU	EU	EU

All declared life cycle stages are marked with" X" in below. Modules not declared will be marked with MND.

Allocation processes: Allocation is required when more than one input is needed to produce a product and the products are co-produced with other products. According to EN 50693, the following decision hierarchy shall be applied for allocation of co-products:

1.Subdivision
As per EN 50693:2009, wherever possible, subdivision should be used to avoid allocation. Subdivision refers to disaggregating multifunctional processes or facilities to isolate the input flows directly associated with each process or facility output.

2.Allocation based on a relevant underlying physical relationship
Where it is not possible to apply subdivision, allocation should be applied: the inputs and outputs of the system should be partitioned between its different products or functions in a way that reflects relevant underlying physical relationships between them. Examples of the physical parameter used to allocate input and output flows are the mass, area or unit quantity produced, as appropriate to the production system (production of materials and parts, product assembly).

3.Allocation based on some other relationship
If the physical parameter cannot be used, the allocation shall be based on economic aspects, such as working hours, operating hours or production cost.

In this study, the theoretical consumption of materials from BOM and there is no need for materials allocation. The energy consumption (electricity, steam, and natural gas), solid waste and emissions of manufacturing stage are based on annual output guaranteed Energy of battery cell from 1 May 2023 to 30 April 2024, and allocated to 1 kWh battery cell.

Cut-off rules and considerations: According to EN 50693 4.2.3.3, based on established LCA practice, the cut-off criteria are set to a maximum of 5% of the overall environmental impact of the analyzed product system given by its life cycle impact assessment (LCIA) results.
In this study, the fluororubber nails was cut off, which is 0.00006 kg and account for 0.001% of product.
In accordance with the cut-off rule, flows less than 1% of the total inventory were excluded, i.e.:

- construction of company plants and processing machinery (with a life of more than three years);
- staff travel and home-work transfers;
- research and development activities;
- some components of the kit of the products under study, such as: sensors, remote control and other operating tools; trays and other moving parts of the structures moved by the engines;
- the materials necessary for cleaning the machinery;

- long-term emissions (occurring beyond 100 years).

Calculation methodologies: In this study, EN 15804+A2:2019 method is selected as Impact assessment method. The EN 15804 standard covers Environmental Product Declarations (EPDs) of Construction Products. The 2019 EN 15804+A2 revision of this standard has aligned their methodology with the EF 3.0 method, except for their approach on biogenic carbon. According to the EN 15804, biogenic carbon emissions cause the same amount of Climate Change as fossil carbon, but can be neutralized by removing this carbon from the atmosphere. Temporary and permanent carbon storage is not allowed therefore the 15804 standard provides a set of requirements to prevent its accounting.

3.2 Raw material acquisition stage (Upstream module)

At this stage, the materials and components are manufactured by supplies, and transported to the CATL plant.
The Lithium iron phosphate battery cell can be divided into 5 parts: Cathode materials, Anode materials, Separator, Electrolyte and Mechanical parts. Because CATL has no financial control or operational control over the supplies manufacturing materials above, Upstream production data for materials (eg., Ferrous lithium phosphate, N-Methylpyrrolidone, Al foil, Electrolyte) refer to Ecoinvent database.
The mode of transportation of materials is by lorry and assumed was EURO 4, 16-32 t.

3.3 Manufacturing and assembling stage (Core module)

The CATL is responsible for the processing semi-finished products, assembling cells, testing cells performance.
The consumed electricity in No.1, Shidai Street, High-tech Industrial Development Zone, Zhaoqing City, Guangdong Province, P.R. China comes from three electricity source during 1 May 2023 to 30 April 2024 and each mix source was used in terms of its proportion to the total kWh of electricity consumed. 5.79% comes from on-site electricity generation (photovoltaic), 70.36% from hydro power plants and 23.85% from the grid. The consumed electricity in No99. chunyi Road, Economic and Technological Development Zone, Yichun City, Jiangxi Province, P.R. China comes from two electricity source during 1 May 2023 to 30 April 2024 and each mix source was used in terms of its proportion to the total kWh of electricity consumed. 67% comes from hydro power plants and 33% from the grid.
Waste is divided into ordinary solid waste and hazardous waste. Solid waste for recycling and hazardous waste for incineration in production process are entrusted to a third party, and trucked by EURO 4, 16-32t lorry. Water and air pollutants are discharged up to standard after being treated by factories, and pollutants were obtained from factory monitoring.

3.4 Distribution stage (Downstream module)

There are many places where products are sold, it is difficult to determine the distance and mode of transport. According to EN 50693 4.3.2, If no specific data are available, the following generic data shall be applied:

— International transport: 19 000 km by ship plus 1 000 km by lorry (85% payload);
— Intracontinental transport: 3 500 km by lorry (85% payload);
— Local transport: 1 000 km by lorry (85% payload);

This report selects 19 000 km by ship plus 1 000 km by lorry as assumption scenario.

Table 4: The transport way and its distances of Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

Name	Description	Value			Unit
		FC-FV5-71H4L4-004L	FC-FX6-71H4L4-013L	FC-FX6-71H4L4-012L	
Transport	Ship	6.238*19000	6.014*19000	5.847*19000	kg*km
Transport	Lorry, EURO4, 16-32t	6.238*1000	6.014*1000	5.847*1000	kg*km

3.5 Installation stage (Downstream module)

The product does not consume any energy and auxiliary materials during installation. In this stage, the transport and End-of-life of packaging waste is taken into account. The transport distance of packaging materials to the treatment plant is assumed to be 50 km. The End-of-life scenario of packaging materials was used according to EN 50693.

3.6 Use and Maintenance stage (Downstream module)

The Lithium iron phosphate battery cell does not require maintenance during use and maintenance stage, while there is a loss of energy due to charge/discharge cycles. The energy loss calculation formula is as follows according to EPDItaly021:

$$\mathrm{E_{loss}} = \sum_{i=0}^{RSL} \frac{E_{useful\,i} \times N_{cycles} \times 365 \times (1 - DC\ RTE\ i)}{DC\ RTE\ i \times 1000}$$

Where:

- E_{loss} = the energy dissipation occurring 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 battery system can keep constantly without rest time and at Nominal Operating Temperature.

- $E_{useful\ i}$= the max energy dischargeable from the battery system (DC side) during discharge at the maximum power that the battery system can keep constantly during discharging process without rest time and Nominal Operating Temperature.
- N_{cycles} = the number of full charge/discharge cycles per day.
- 365 = the number of days in one year.

Table 5: The parameter used in Use and Maintenance stage of one unit of Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L, FC-FX6-71H4L4-013L and FC-FX6-71H4L4-012L)

Parameters	Value			Unit
	FC-FV5-71H4L4-004L	FC-FX6-71H4L4-013L	FC-FX6-71H4L4-012L	
DC RTEi	See LCA report	See LCA report	See LCA report	%
$E_{useful\ i}$	See LCA report	See LCA report	See LCA report	Wh
N_{cycles}	1	1	1	/
RSL	20	20	20	year
E_{loss}	498.24	429.62	429.62	kWh

3.7 End of life stage (Downstream module)

End-of-life stage assumes that discard cell is sent for material recovering. Most valuable fractions (Aluminum, Copper and PP) are recycled within the default recycling recovering rate established in EN 50693. The Electrolyte are treated as hazardous waste (incineration). The remaining parts, based on mass balance, are sent to sanitary landfill. The transport distances from Installation Location into the disassembly facility is 100 km.

4 Environmental impacts

4.1 Potential environmental impact

Table 6-1: The environmental impact of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L) manufactured in Zhaoqing City, Guangdong Province, P.R. China

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	2.515E+02	4.606E+01	6.955E+00	2.445E+00	1.643E-01	1.862E+02	9.755E+00
GWP-fossil	kg CO_2 eq	2.410E+02	4.617E+01	6.965E+00	2.443E+00	5.716E-03	1.793E+02	6.148E+00
GWP-biogenic	kg CO_2 eq	9.985E+00	-1.844E-01	-1.226E-02	3.392E-04	1.586E-01	6.418E+00	3.605E+00
GWP-luluc	kg CO_2 eq	5.187E-01	7.203E-02	2.245E-03	1.562E-03	3.851E-06	4.401E-01	2.780E-03
ODP	kg CFC11 eq	5.266E-06	1.577E-06	7.494E-08	3.700E-08	6.483E-11	3.361E-06	2.158E-07
AP	mol H+ eq	1.659E+00	5.612E-01	2.811E-02	4.106E-02	2.971E-05	1.011E+00	1.686E-02
EP-freshwater	kg P eq	2.341E-02	5.725E-03	1.132E-04	1.600E-05	1.372E-07	1.742E-02	1.368E-04
EP-marine	kg N eq	2.337E-01	8.390E-02	4.618E-03	1.084E-02	1.812E-04	1.269E-01	7.234E-03
EP-terrestrial	mol N eq	2.372E+00	6.942E-01	5.050E-02	1.195E-01	8.763E-05	1.480E+00	2.761E-02
POCP	kg NMVOC eq	7.676E-01	2.304E-01	1.818E-02	3.379E-02	6.516E-05	4.752E-01	1.003E-02
ADP-minerals&metals	kg Sb eq	6.049E-03	3.861E-03	1.573E-05	4.987E-06	1.360E-08	2.137E-03	2.981E-05
ADP-fossil	MJ	4.724E+03	5.694E+02	8.147E+01	3.156E+01	6.490E-02	4.011E+03	2.990E+01
WDP	m^3 depriv.	6.736E+01	1.844E+01	2.066E+00	1.094E-01	1.374E-03	4.578E+01	9.607E-01

Table 6-2: The environmental impact of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FX6-71H4L4-013L) manufactured in Zhaoqing City, Guangdong Province, P.R. China

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	2.233E+02	4.385E+01	6.955E+00	2.358E+00	1.529E-01	1.605E+02	9.500E+00
GWP-fossil	kg CO_2 eq	2.139E+02	4.395E+01	6.965E+00	2.357E+00	5.249E-03	1.546E+02	5.975E+00
GWP-biogenic	kg CO_2 eq	9.023E+00	-1.698E-01	-1.226E-02	3.273E-04	1.476E-01	5.534E+00	3.523E+00
GWP-luluc	kg CO_2 eq	4.522E-01	6.642E-02	2.245E-03	1.507E-03	3.553E-06	3.794E-01	2.560E-03
ODP	kg CFC11 eq	4.751E-06	1.526E-06	7.494E-08	3.570E-08	5.940E-11	2.898E-06	2.161E-07
AP	mol H+ eq	1.468E+00	5.128E-01	2.811E-02	3.962E-02	2.739E-05	8.721E-01	1.524E-02
EP-freshwater	kg P eq	2.077E-02	5.491E-03	1.132E-04	1.544E-05	1.271E-07	1.502E-02	1.308E-04
EP-marine	kg N eq	2.121E-01	8.039E-02	4.618E-03	1.046E-02	1.686E-04	1.094E-01	7.018E-03
EP-terrestrial	mol N eq	2.118E+00	6.505E-01	5.050E-02	1.153E-01	8.053E-05	1.276E+00	2.608E-02
POCP	kg NMVOC eq	6.866E-01	2.166E-01	1.818E-02	3.260E-02	6.030E-05	4.097E-01	9.502E-03
ADP-minerals&metals	kg Sb eq	5.251E-03	3.361E-03	1.573E-05	4.811E-06	1.247E-08	1.843E-03	2.595E-05
ADP-fossil	MJ	4.147E+03	5.475E+02	8.147E+01	3.045E+01	5.955E-02	3.459E+03	2.845E+01
WDP	m^3 depriv.	6.013E+01	1.760E+01	2.066E+00	1.056E-01	1.275E-03	3.947E+01	8.871E-01

Table 6-3: The environmental impact of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FX6-71H4L4-012L) manufactured in Yichun City, Jiangxi Province, P.R. China

Impact category	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
GWP-total	kg CO_2 eq	2.223E+02	4.280E+01	7.508E+00	2.293E+00	1.529E-01	1.605E+02	9.069E+00
GWP-fossil	kg CO_2 eq	2.129E+02	4.291E+01	7.526E+00	2.291E+00	5.249E-03	1.546E+02	5.544E+00
GWP-biogenic	kg CO_2 eq	9.012E+00	-1.712E-01	-2.171E-02	3.182E-04	1.476E-01	5.534E+00	3.523E+00
GWP-luluc	kg CO_2 eq	4.525E-01	6.472E-02	4.457E-03	1.465E-03	3.553E-06	3.794E-01	2.410E-03
ODP	kg CFC11 eq	5.298E-06	2.108E-06	6.349E-08	3.470E-08	5.940E-11	2.898E-06	1.933E-07
AP	mol H+ eq	1.487E+00	5.328E-01	2.932E-02	3.852E-02	2.739E-05	8.721E-01	1.435E-02
EP-freshwater	kg P eq	2.092E-02	5.605E-03	1.522E-04	1.501E-05	1.271E-07	1.502E-02	1.218E-04
EP-marine	kg N eq	2.128E-01	8.047E-02	5.699E-03	1.017E-02	1.686E-04	1.094E-01	6.878E-03
EP-terrestrial	mol N eq	2.127E+00	6.514E-01	6.261E-02	1.121E-01	8.053E-05	1.276E+00	2.445E-02
POCP	kg NMVOC eq	6.849E-01	2.144E-01	2.006E-02	3.169E-02	6.030E-05	4.097E-01	8.938E-03
ADP-minerals&metals	kg Sb eq	5.627E-03	3.739E-03	1.619E-05	4.678E-06	1.247E-08	1.843E-03	2.459E-05
ADP-fossil	MJ	4.125E+03	5.315E+02	7.901E+01	2.960E+01	5.955E-02	3.459E+03	2.636E+01
WDP	m^3 depriv.	6.090E+01	1.784E+01	2.661E+00	1.026E-01	1.275E-03	3.947E+01	8.252E-01

Acronyms: GWP-total=Global Warming Potential total; GWP-biogenic=Global Warming Potential biogenic; GWP-fossil=Global Warming Potential fossil; GWP-luluc=Global Warming Potential land use and land use change; ODP=Ozone Depletion; AP=Acidification; E=Eutrophication; POCP=Photochemical ozone formation; ADPE=Depletion of abiotic resources-minerals and metals; ADPF=Depletion of abiotic resources-fossil fuels; WDP=Water resource deprivation.

4.2 Use of resources

Table 7-1: The use of resources of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L) manufactured in Zhaoqing City, Guangdong Province, P.R. China

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	9.912E+02	5.000E+01	3.668E+01	3.184E-01	2.477E-03	8.992E+02	5.029E+00
PERM	MJ, lower calorific value	3.000E+00	3.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	9.942E+02	5.300E+01	3.668E+01	3.184E-01	2.477E-03	8.992E+02	5.029E+00
PENRE	MJ, lower calorific value	4.714E+03	5.617E+02	8.147E+01	3.156E+01	6.490E-02	4.009E+03	2.990E+01
PENRM	MJ, lower calorific value	7.739E+00	7.739E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.722E+03	5.694E+02	8.147E+01	3.156E+01	6.490E-02	4.009E+03	2.990E+01
FW	cubic metres	3.819E+00	4.912E-01	5.148E-02	3.583E-03	3.694E-05	3.247E+00	2.636E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable primary energy resources used as raw material; PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw material; PENRM=Use of non-renewable primary energy resources used as raw material; PERM=Use of renewable primary energy resources used as raw material; PENRT=Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); PERT=Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); FW=Net use of fresh water; MS=Use of secondary materials; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-2: The use of resources of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FX6-71H4L4-013L) manufactured in Zhaoqing City, Guangdong Province, P.R. China

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	8.634E+02	4.667E+01	3.668E+01	3.072E-01	2.295E-03	7.754E+02	4.369E+00
PERM	MJ, lower calorific value	2.794E+00	2.794E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	8.662E+02	4.946E+01	3.668E+01	3.072E-01	2.295E-03	7.754E+02	4.369E+00
PENRE	MJ, lower calorific value	4.137E+03	5.399E+02	8.147E+01	3.045E+01	5.956E-02	3.457E+03	2.845E+01
PENRM	MJ, lower calorific value	7.582E+00	7.582E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.145E+03	5.475E+02	8.147E+01	3.045E+01	5.956E-02	3.457E+03	2.845E+01
FW	cubic metres	3.346E+00	4.670E-01	5.148E-02	3.457E-03	3.425E-05	2.799E+00	2.434E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable primary energy resources used as raw material; PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw material; PENRM=Use of non-renewable primary energy resources used as raw material; PERM=Use of renewable primary energy resources used as raw material; PENRT=Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); PERT=Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); FW=Net use of fresh water; MS=Use of secondary materials; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

Table 7-3: The use of resources of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FX6-71H4L4-012L) manufactured in Yichun City, Jiangxi Province, P.R. China

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
PERE	MJ, lower calorific value	8.613E+02	4.678E+01	3.472E+01	2.987E-01	2.295E-03	7.754E+02	4.145E+00
PERM	MJ, lower calorific value	2.794E+00	2.794E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ, lower calorific value	8.641E+02	4.957E+01	3.472E+01	2.987E-01	2.295E-03	7.754E+02	4.145E+00
PENRE	MJ, lower calorific value	4.116E+03	5.233E+02	7.901E+01	2.960E+01	5.956E-02	3.457E+03	2.637E+01
PENRM	MJ, lower calorific value	8.159E+00	8.159E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PENRT	MJ, lower calorific value	4.124E+03	5.315E+02	7.901E+01	2.960E+01	5.956E-02	3.457E+03	2.637E+01
FW	cubic metres	3.361E+00	4.707E-01	6.486E-02	3.361E-03	3.425E-05	2.799E+00	2.268E-02
MS	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NRSF	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: PENRE=Use of non-renewable primary energy excluding nonrenewable primary energy resources used as raw material; PERE=Use of renewable primary energy excluding renewable primary energy resources used as raw material; PENRM=Use of non-renewable primary energy resources used as raw material; PERM=Use of renewable primary energy resources used as raw material; PENRT=Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); PERT=Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); FW=Net use of fresh water; MS=Use of secondary materials; RSF= Use of renewable secondary fuels ; NRSF=Use of non-renewable secondary fuels

4.3 Waste production and output flows

Table 8-1: The waste production and output flows of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FV5-71H4L4-004L) manufactured in Zhaoqing City, Guangdong Province, P.R. China

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
HWD	kg	1.265E+00	0.000E+00	1.538E-02	0.000E+00	0.000E+00	0.000E+00	1.250E+00
NHWD	kg	3.941E+00	0.000E+00	0.000E+00	0.000E+00	1.000E-01	0.000E+00	3.841E+00
RWD	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	2.829E+00	0.000E+00	1.882E+00	0.000E+00	0.000E+00	0.000E+00	9.475E-01
MER	kg	1.000E-01	0.000E+00	0.000E+00	0.000E+00	1.000E-01	0.000E+00	0.000E+00
CRU	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ETE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EEE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; ETE = Exported thermal energy

Table 8-2: The waste production and output flows of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FX6-71H4L4-013L) manufactured in Zhaoqing City, Guangdong Province, P.R. China

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
HWD	kg	1.278E+00	0.000E+00	1.538E-02	0.000E+00	0.000E+00	0.000E+00	1.262E+00
NHWD	kg	3.872E+00	0.000E+00	0.000E+00	0.000E+00	9.300E-02	0.000E+00	3.779E+00
RWD	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	2.669E+00	0.000E+00	1.882E+00	0.000E+00	0.000E+00	0.000E+00	7.870E-01
MER	kg	9.300E-02	0.000E+00	0.000E+00	0.000E+00	9.300E-02	0.000E+00	0.000E+00
CRU	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ETE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EEE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; ETE = Exported thermal energy

Table 8-3: The waste production and output flows of 1 kWh minimum guaranteed energy by the Lithium iron phosphate battery cell (FC-FX6-71H4L4-012L) manufactured in Yichun City, Jiangxi Province, P.R. China

Parameter	Unit	Total	Upstream	Core	Downstream			
			Manufacturing stage		Distribution	Installation	Use and maintenance	End of life
HWD	kg	1.132E+00	0.000E+00	9.073E-03	0.000E+00	0.000E+00	0.000E+00	1.123E+00
NHWD	kg	3.879E+00	0.000E+00	0.000E+00	0.000E+00	9.300E-02	0.000E+00	3.786E+00
RWD	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	1.102E+00	0.000E+00	3.497E-01	0.000E+00	0.000E+00	0.000E+00	7.519E-01
MER	kg	9.300E-02	0.000E+00	0.000E+00	0.000E+00	9.300E-02	0.000E+00	0.000E+00
CRU	kg	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ETE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EEE	MJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Acronyms: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; ETE = Exported thermal energy

5 Reference

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- ISO 14040:2006: Environmental management — Life cycle assessment — Principles and framework
- ISO 14025:2006: Environmental labels and declarations — Type III environmental declarations — Principles and procedures
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