Disclaimer:

Contemporary Amperex Technology Co., Ltd. (CATL) has made this Brochure as comprehensive and accurate as possible on the basis of the existing information, but reserves the right to modify the data, parameters and other information without further notice! CATL reserves the right of final interpretation of this Brochure.

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CATL – ESS Brochure 202205

Official Website

Official WeChat

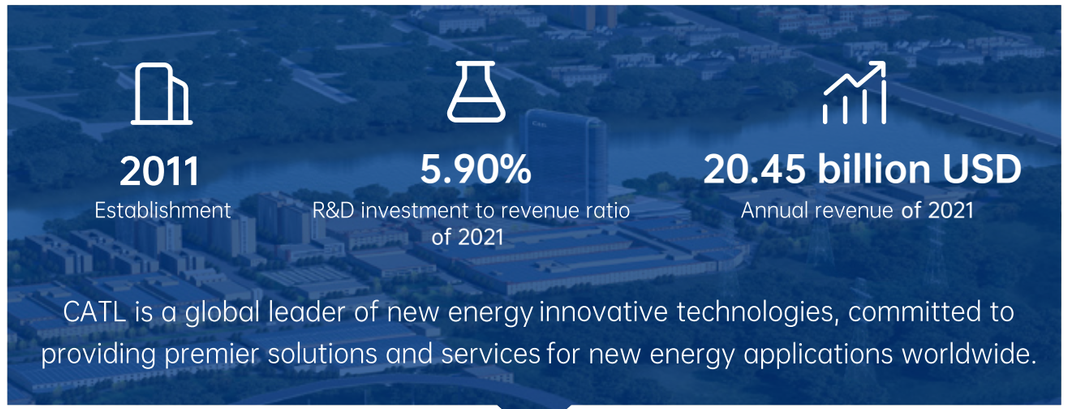
CATL

Storing Infinite Energy

Energy Storage System Solutions and Product Brochure

Contemporary Amperex Technology Co., Ltd.

About CATL



Main Business

Provide EV battery systems and services for green transportation

Cell → Module → Pack

Provide solutions and services for clean energy storage

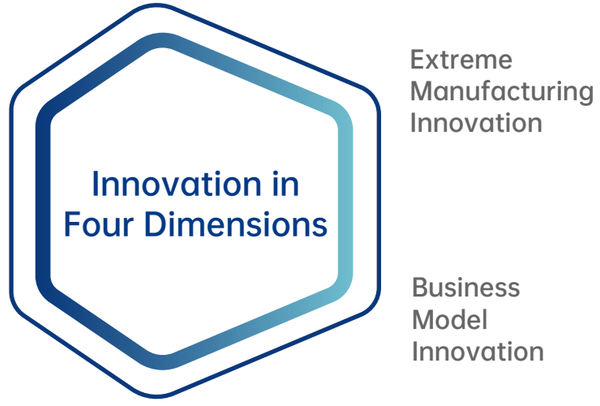
Rack → Container → Power Station

Development in Three Directions

Utilizing renewable energy generation + energy storage to replace stationary fossil energy

Utilizing EV batteries to replace mobile fossil energy

Utilizing electrification + intelligentization to real ize integrated innovation of market applications



World Economic Forum
The Member of Global Lighthouse Network

TIME
TIME100 Most Influential Companies of 2022

NAATBatt
Dr. Zeng was awarded the Lifetime Achievement Award

Automotive
INNOVATIONS Awards
The Most Innovative Automotive Supplier (2021)

Financial Times
Prospering in the pandemic: 2020's top 100 companies

Fortune
Future 50
(2019 - 2021)

MIT Technology Review
50 Smartest Companies in China (2019)

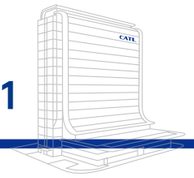
Forbes
Global 2000:
The World's Best Employers (2019)

Company Milestones

1999

The founding team established ATL, which is the world's leading company in the field of lithium-ion batteries for consumer electronics (CE).

2011



Establishment of CATL, a new endeavor started by the founding team.

Participated in the construction of Zhangbei energy storage project - the largest wind and solar energy storage and transmission project in the world at the time.

2012

Started strategic partnership with BMW.

2013

Established Xining production base.

Developed EV batteries for the world's largest commercial vehicle manufacturer, Yutong.

2014

Established CATG in Germany, the company's wholly-owned subsidiary.

2015

Acquired Brunp Recycling to start the development in battery recycling and regenerating.

2016

Established the CATL Academician and Specialist Workstation.

2017

Established wholly-owned subsidiaries in France, USA, Canada and Japan.

Established joint ventures with SAIC Motor.

2018

Listed on the Shenzhen Stock Exchange.

Established joint ventures with Dongfeng Motor and GAC Group respectively.

Put Liyang production base into operation.

2019

Established joint ventures with Geely Auto Group and FAW Group respectively.

Led the establishment of the National Engineering Research Center for Electrochemical Energy Storage Technology.

2020

Established two energy storage joint ventures with the State Grid Integrated Energy Service Group under the State Grid.

Successfully delivered phase Ⅰ of Jinjiang 100 MWh Energy Storage Power Station Project - the largest indoor stationary energy storage system in China.

Established 21C Lab.

2021

Ranked No.1 globally in EV battery consumption volume for five consecutive years.

Selected as a member of the Global Lighthouse Network.

Put Yibin and Lingang production bases into operation.

Established strategic cooperation with China Huadian Corporation, State Power Investment Corporation, China Three Gorges Corporation, China Energy, Energy China and other companies.

Participated in Europe's largest grid-side battery energy storage power station - Minety Battery Energy Storage System in the UK.

The 220MWh liquid-cooling energy storage project in Texas is connected to the grid, marking the world' s first large-scale application of its kind.

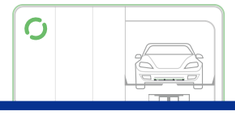
Released the first-generation sodium-ion battery with the highest energy density in the world.

Established a joint lab with the Institute of Physics, Chinese Academy of Sciences.

Co-founded the CATL Xiamen Institute of New Energy with Xiamen University

Deployed the Innovation Center and the Future Energy Research Institute in Shanghai.

2022



Yibin production base was certified as the world's first zero-carbon battery factory.

Rolled out its battery swap solution EVOGO featuring modular battery swapping.

Global Locations

Headquarters

Ningde, Fujian

5 R&D Centers

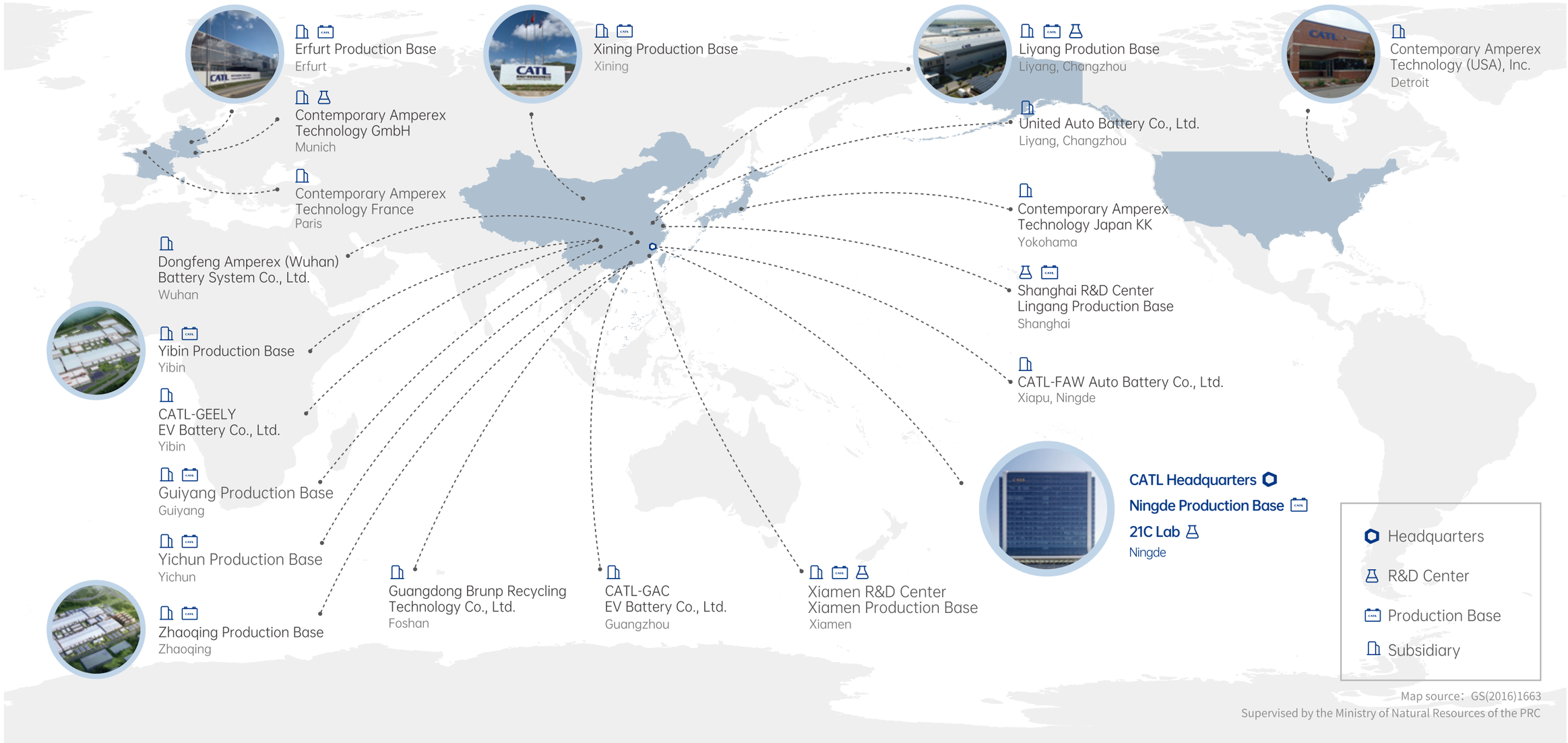
China | Ningde, Fujian / Liyang, Jiangsu / Shanghai
Xiamen, Fujian

Germany | Munich

10 Production Bases

China | Ningde , Fujian / Xining, Qinghai / Liyang, Jiangsu / Yibin, Sichuan / Zhaoqing, Guangdong
Shanghai / Yichun, Jiangxi / Xiamen, Fujian / Guiyang, Guizhou

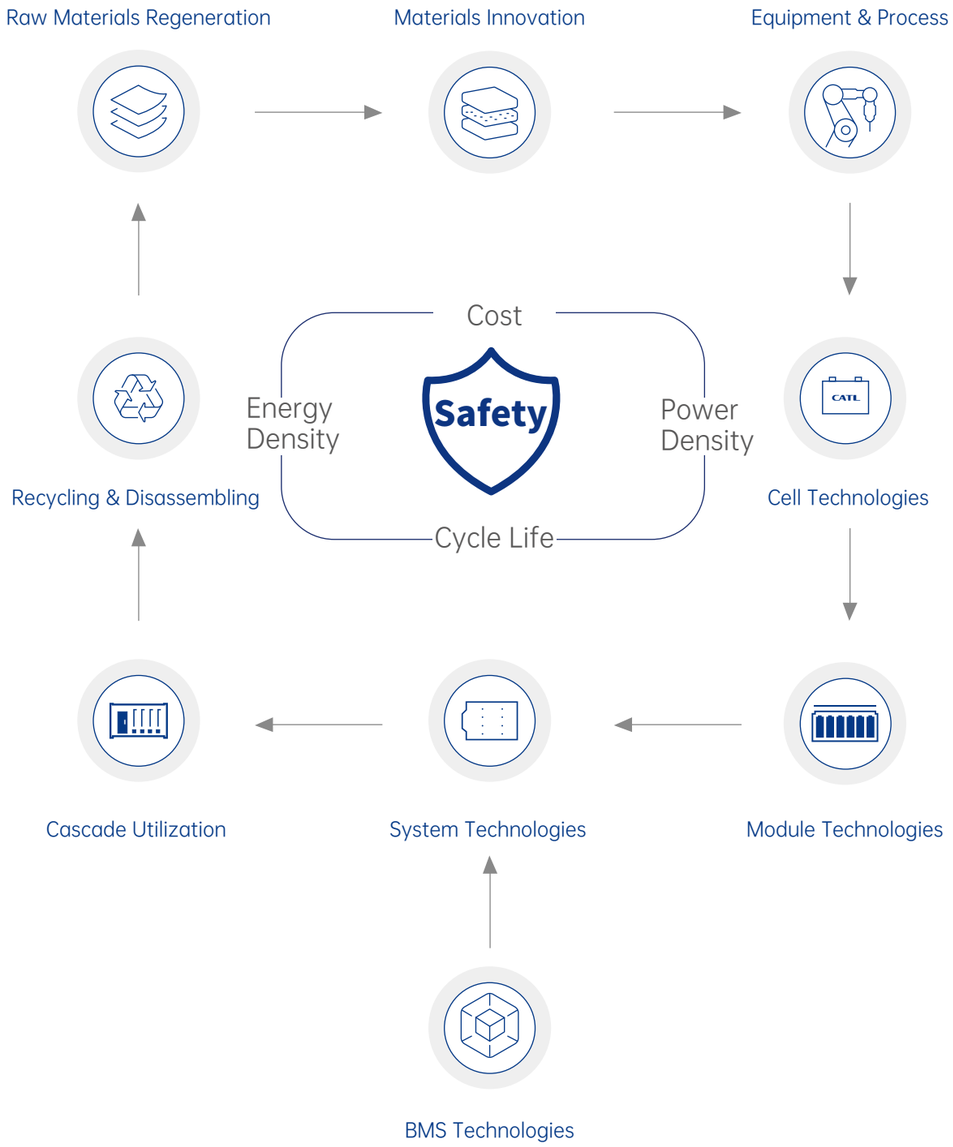
Germany | Erfurt



Map source：GS(2016)1663
Supervised by the Ministry of Natural Resources of the PRC

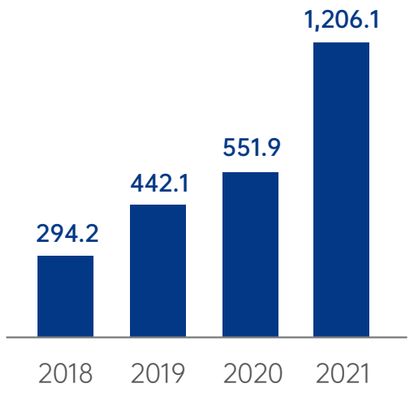
R&D Strength

R&D Scope



R&D Investment and Talents

Annual R&D investment (M USD)



10,079 R&D Talents

170 Doctors

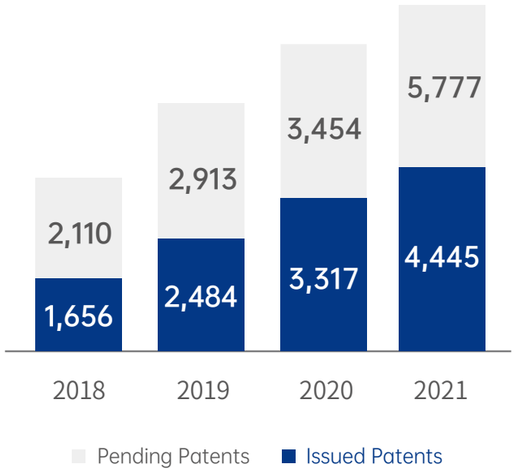
2,086 Masters

21C Innovation Lab

National Engineering Research Center for Electrochemical Energy Storage Technology

Key Laboratory of Lithium-ion Battery Enterprise of Fujian Province

Rapidly Increasing Number of Patents



Led and participated in the formulation or revision of **70+** national and international standards

*Data : CATL's 2021 annual report

Competitiveness in Four Dimensions

Comprehensive safety and reliability

Material safety, electrical safety, and system safety are taken as the basis for product development and manufacturing to ensure safety and reliability of the product throughout the life cycle.

Material safety

Electrical safety

System safety

Long service life of the whole system

CATL's original leading technologies: To achieve "0" loss in the first year of operation, and a long service life of 25 years

1 Auto-sleep coating passivation

Reduce activity during storage

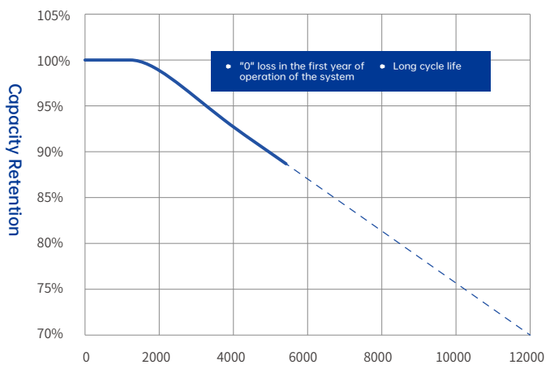
2 Low lithium consumption

Significantly enhance surface stability and bulk phase stability of anode material

3 Bionic electrolyte

Improve cell cycle and storage performance

Cycle Performance of LFP Cells at 25 ℃



Cathode material

Particles with enhanced chemical strength: enhance cycle stability and improve product service life under high temperature environment
Uniform surface: make improvement in gassing problem of the HV system battery at high temperature, and improve the safety performance of the product

Anode material

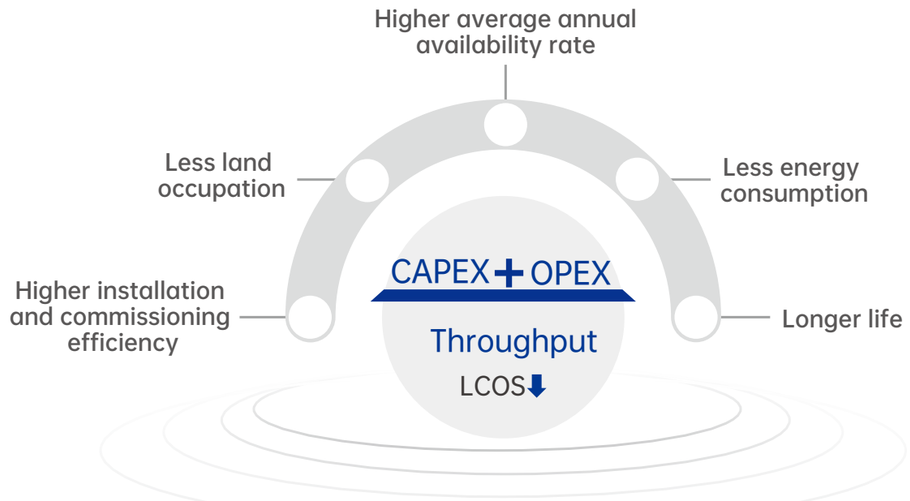
High-grade graphite anode: simultaneously improve the dynamic properties and life performance
Long-life silicon anode: SiOx material coated with the artificial SEI, with good surface stability and intact silicon particles after cycling

Electrolyte

Low gassing and long-life electrolyte: Improve the gassing of the battery at high temperature and extend the product life
Electrolyte with substantial safety: Greatly improve the thermal stability of the cell

Full-life-cycle high returns

The combination of high reliability, long life, and high energy efficiency of the battery system makes the "renewable energy + energy storage" mode superior in terms of system returns throughout the life cycle.



Flexible applications in various scenarios

The innovative solutions are adaptive to various application scenarios, covering all scenarios throughout the entire system of power generation, transmission, distribution and consumption.

Quality Assurance

Extreme manufacturing

Defect rate of a single cell reduced to 1/1,000,000,000

Extremely strict processes	Extremely fast production speed	Extremely high quality requirements
·Strict shape and performance control ·Strong coupling of multiple fields ·Size control from nanometer level to kilometer level	·Produce a cell in **1.7 s** on average ·Produce a module in **20 s**	·3,600+ quality control points ·More than **10,000 items** of traceability data for a battery on average ·**100+ tests** on each cell before delivery to warehouse

Targets: a defect rate of **one part per billion**, long-term reliability covering **2 million km**, and full-cycle life of **16 years**

Comprehensive testing and verification

100 items
of material testing and analysis capabilities

Comprehensive system of standards,
covering R&D, production and manufacturing fields, with CATL's leading and involvement in developing a number of national, industrial and company-level standards

World-leading characterization technology
·Characterization and analysis of single-particle microelectrodes
·High-precision in-situ expansion analysis
·UHPC analysis
·Electrochemical simulation and material simulation analysis

Laboratory testing capabilities
Material atoms, molecules, battery cells and devices, including crystal structure, element composition, chromatography, mass spectrometry, micro-area surface structure, thermal analysis, electrochemical analysis and many other fields

400+ product tests

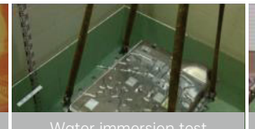
Multi-level: materials, cells, modules, BMS, packs
Multi-dimensional: mechanism, electrical performance, safety and reliability, etc.
Standards: GB/T, ISO, IEC, UN, ECE, etc., with complete company-level standards developed

High-pressure water spray test

Impact test

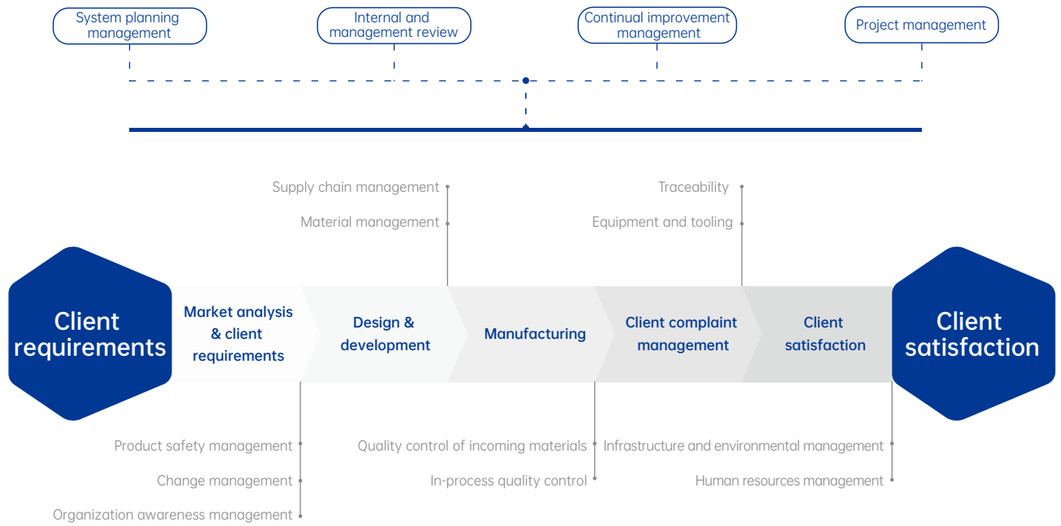
Crush test

Fire test


Water immersion test

Vibration test

Quality management system



Quality policy

Providing clients with the perfect quality beyond expectations is our unremitting pursuit.

IATF16949 ISO9001

Energy Storage Station of the Luneng Haixi Complementary Multi-energy Demonstration Project (50MW/100MWh)

Energy Storage Solutions

Since energy storage is a key part of energy transition and power transformation, CATL has always been committed to providing first-class energy storage solutions to the world. CATL has developed a safe, efficient, and economical electrochemical energy storage system that is widely adaptive to the fields of power generation, power transmission and distribution, and power consumption, helping to optimize the energy structure, enhance the safety of the power system, and reduce the cost of energy use.

CATL Cell Solutions

Cell

280Ah

Basic Parameters		
Capacity [Ah]	280	
Charge/discharge rate [P]	0.5	1
Cycle life [25℃, @60%SOH]	8,000	8,000
Dimensions [L*W*H] [mm]	173.9*71.7*207.2	

Testing and certification

IEC 62619 · UL 1973 · UL 9540A · UN 38.3

Cell

100Ah

Basic Parameters	
Capacity [Ah]	100
Charge/discharge rate [P]	1
Cycle life [25℃, 0.5C/0.5C @70%SOH]	6,000
Dimensions [L*W*H] [mm]	160.0*49.9*116.0

Testing and certification

IEC 62619 · IEC 62133 · UL1642 · UN 38.3

Cell

26Ah

Basic Parameters	
Capacity [Ah]	26
Charge/discharge rate [P]	0.5
Cycle life [25℃@65%SOH]	8,000
Dimensions [D*H] [mm]	46.7*152

Certification

IEC 62619 · UN 38.3 · UL 1973 · UL 9540A

Cell

20Ah

Basic Parameters	
Capacity [Ah]	20
Charge/discharge rate [P]	1
Cycle life [25℃@65%SOH]	10,000
Dimensions [D*H] [mm]	46.7*152

Certification

IEC 62619 · UN 38.3 · UL 1973 · UL 9540A

Liquid Cooling Solution

EnerC

High level of safety

- LFP batteries with high thermal stability
- Protection level of IP55 to meet the requirements of outdoor applications
- Resistance up to C5 corrosion level, with 20-year reliability
- Prevention-oriented fire protection strategy, with a separate fire protection system

Long service life

- Available for integration with CATL's advanced technologies (e.g. optional cell with super-long cycling up to 12,000 cycles)
- Integrated high-efficiency liquid-cooling system, with the temperature difference in the container limited to 5℃

High integration

- Modular design for the 1,500V system
- Separate arrangement of electrical room and battery room for convenient maintenance
- Non-walk-in/modular design with high integration, saving the floor space by 35%
- Prefabricated installation, reducing on-site installation costs and commissioning time

Basic Parameters	
Configuration	10P416S
Cell capacity [Ah]	280
Rated voltage [V]	1331.2
Rated energy [MWh]	3.72
IP Level	IP55
Product weight [T]	35
Dimensions [L*W*H] [mm]	6058*2462*2896

Testing and certification

IEC 62619 | UL 1973 | UL 9540A | IEC 62477-1

EnerOne

High level of safety

- LFP batteries with high thermal stability
- Protection level of IP66 to meet the requirements of outdoor applications
- Resistance up to C5 corrosion level, with 20-year reliability
- Separate fire protection system

Long service life

- Available for integration with CATL's advanced technologies (e.g. optional cell with super-long cycling up to 12,000 cycles)
- Integrated frequency conversion liquid-cooling system, with cell temperature difference limited to 3℃, and a 33% increase of life expectancy

High integration

- Modular design, compatible with 600 - 1,500V system
- Separate water cooling system for worry-free cooling
- Modular design with a high energy density, saving the floor space by 50%
- Transportation after assembly, reducing on-site installation costs and commissioning time

Basic Parameters	
Configuration	1P416S
Cell capacity [Ah]	280
Rated voltage [V]	1331.2
Rated energy [kWh]	372.7
IP Level	IP66
Product weight [kg]	3500
Dimensions [L*W*H] [mm]	1300*1300*2280

Testing and certification

IEC 62619 | UL 1973 | UL 9540A | IEC 62477-1

UPS Solution

UPS lithium-ion battery rack

High level of safety

Cell safety
·LFP batteries with high thermal stability
System Safety
·Dual redundancy for BMS control and protection: shunt trip by contactor control and moulded case circuit breakers
·Dual redundancy for short circuit protection: magnetic trip by fuse protection and moulded case circuit breakers

High reliability

Self-powered DC/DC auxiliary power supply
·Dual redundancy of auxiliary power to reduce the risk in case of AC power interruption
·Black start in case of power outrage in the grid
Individual rack exit
·Exit of the faulty cabinet only to improve system availability
Low temperature rise
·A temperature rise of about 20℃ at the highest discharging rate, with only natural cooling needed to meet the use requirements
·Simple and reliable system

Super flexibility

Flexible wiring system
·Available for three-wire and two-wire UPS systems
Flexible configuration
·Available for a wide voltage range configuration of 320 - 691V,compatible with UPS of high and low voltage platforms
·Available for a wide energy range configuration of 32.768-49.152kWh for individual rack, reducing excessive configuration
Flexible transportation mode
·Available for whole rack transportation, reducing packaging materials, transportation costs, and on-site installation and commissioning costs and time
·Available for bulk transportation, with flexible shipment of the rack body and spare parts

Basic Parameters					
Item	Cell	Module	Rack (8/10/12 Modules)		
Configuration	/	4P16S	4P128S	4P160S	4P192S
Dimensions [mm]	46*145[D*L]	480*750*130[W*D*H]		600*900*2000[W*D*H]	
Weight [kg]	0.53	50	600	700	800
Rated voltage [V]	3.2	51.2	410	512	614
Voltage range [V]	2.5~3.6	40~57.6	320~461	400~576	480~691
Rated capacity [Ah]	20	80		80	
Rated energy [kWh]	0.064	4.096	32.768	40.960	49.152

Testing and certification

IEC 62619 | UN 38.3 | UL 1973

Base Station Solution

48100 Battery module for base station

Basic Parameters	
Cell material system	LFP
Capacity [Ah]	100
Rated voltage (V)	51.2
Dimensions [W*H*D][mm]	438*130*450

Household Energy Storage Solution

BluE

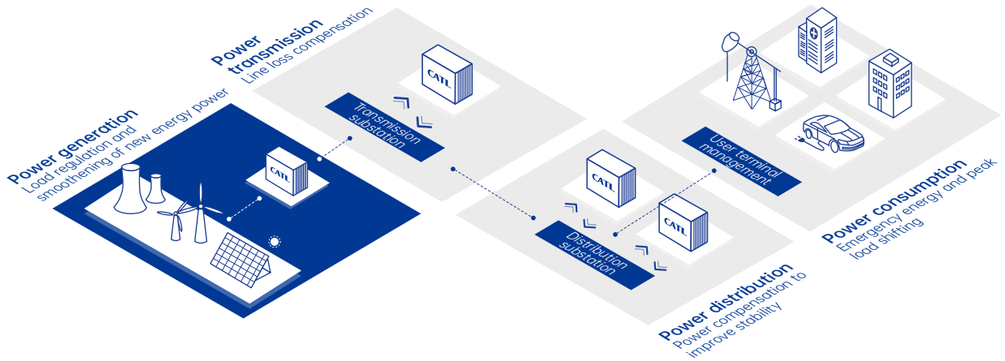
Basic Parameters	BluE-Pack 5.1	BluE-Pack 10.2
Rated Energy [kWh]	5.12	10.24
Rated voltage [V]	51.2	51.2
Operating voltage range [V]	44.8～57.6	44.8～57.6
Dimensions [L*W*H] [mm]	540*490*240	540*940*240
Protection level	IP65	IP65

Testing and certification

IEC 62619 | UL 1973 | UN 38.3

Energy Storage on Power Generation

The ES system can realize storage and output management on the power generation side. It is a system combining the electrochemical ES technology and the renewable energy power generation technology. With the good consistency of cells and the strong computing ability of the battery management system (BMS), CATL's solution helps, on the power generation side, restore the stability of the power grid, optimize the energy output curves of power generation and reduce waste of wind and photovoltaic energy, and provides functions such as system inertia, frequency and peak regulation, thus increasing the proportion of renewable energy power generation and optimizing the energy structure.



Benefits for clients

· Improve the utilization proportion of new energy power generation channels and improve access capacity for power generation
· Reduce waste of wind and photovoltaic energy, and effectively handle the energy utilization
· Improve the power quality of PV power stations
· Enhance output characteristics of PV power stations

Features

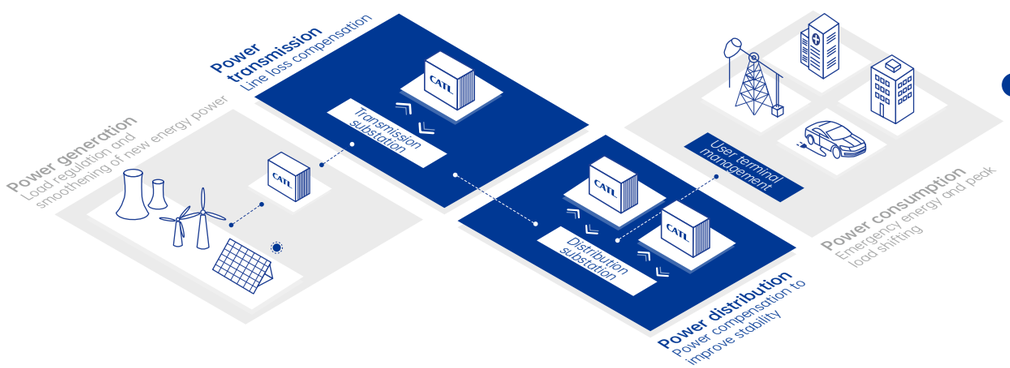
· High-power batteries in modular design, with safe and fast charge and discharge
· Cells with square aluminum shells, with excellent thermal performance, long life and high safety
· Operating automatically based on the state of the wind-solar plant EMS and according to the dispatching plans to improve grid-connection convenience.
· Quick response of the battery system to frequency regulation command

CATL's Advantages

· Industry-leading lithium iron phosphate manufacturing technology, with high safety
· Availability of high rate charge and discharge, with multiple large projects constructed under stable operation
· Long cycle life and long project period of benefits
· Fully automated production lines, with high safety and reliability

Energy Storage on Power Transmission and Distribution

The ES system enables intelligent load management on the power transmission and distribution side, and makes timely peak and frequency regulation based on grid loads. Featured in capacity expansion and backup power supply, CATL's electrochemical ES system can help utilize more renewable energy on the transmission and distribution side to ensure safe, stable, efficient and low-cost operation of the power grid.

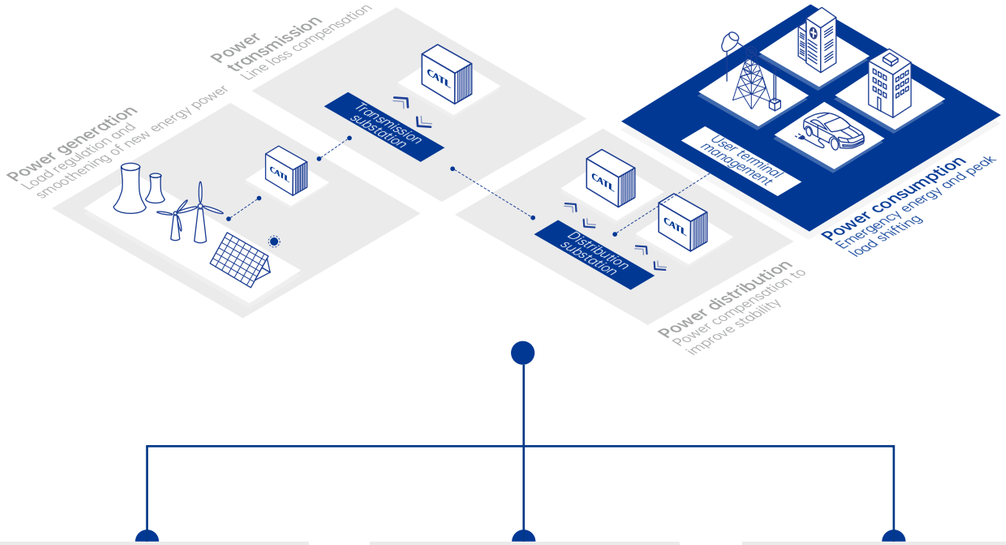


Benefits for clients

· Undertake the government's deep frequency regulation instructions for the power grid to obtain benefits
· Abide by regulatory requirements for electricity to avoid fines and receive rewards
· Extend the life of thermal power units, reduce the fault rate, and reduce the labor intensity of workers
· Assist in the stable operation of the power grid and reduce line losses

Energy Storage on Power Consumption

The ES system enables power users to carry out peak shifting & valley filling and stable power quality management. CATL's electrochemical ES products have been successfully applied in large-scale industrial and commercial projects and residential fields, with the applications extended to emerging fields such as backup power supply for communication base stations, UPS, micro grids for islands, and intelligent BESS station, thus achieving goals of power coverage, reduced costs of electricity in the society, improved guarantee of electricity on the user side, and maximized utilization of energy to achieve social and economic benefits.



Benefits for clients

· Provide sufficient backup power for peak shifting and valley filling, ensure power supply, reduce costs and increase efficiency
· Explore the peak-to-valley price arbitrage model
· Address issues of power grid capacity expansion and new energy vehicle charging

Features

· Peak shifting and valley filling to reduce electricity expenses
· UPS to guarantee power supply
· Real-time dispatching for intelligent life
· Diversified ES applications, covering all aspects of power consumption

CATL's Advantages

· Self-developed high-performance lithium iron phosphate batteries that are safe, reliable, and long-life
· Unattended operation, with the operation of the ES and charging station automatically controlled by the EMS in the power station
· Fast charging technology & leading BMS technology

Applications of Electrochemical Energy Storage Solutions

CATL Energy Storage Application Cases

Power Generation Side

Luneng Haixi Multi-Energy Complement Energy Storage Power Station Demonstration Project

Scale: 50MW/100MWh
Functions: virtual synchronization-based control, tracking of power generation plan, and support of second frequency regulation

Power Generation Side

National wind and solar energy storage and transmission demonstration project

Scale: 4MW/16MWh
Functions: smoothening of wind and solar power generation, tracking of planned power generation, peak load shifting, frequency regulation in the grid system

Power Generation Side

New energy storage power station in Southern California, the U.S.

Scale: 70MW/70MWh
Functions: energy integration, frequency regulation in the system, peak-to-valley price arbitrage

Power Generation Side

Minety Battery Storage Project in the U.K.

Scale: 99.8MW/99.8MWh
Functions: peak and frequency regulation in the power grid, black start, and capacity market

CATL Energy Storage Application Cases

Power Transmission & Distribution Side

Jinjiang 100MWh Energy Storage Power Station

Scale: 30MW/108MWh
Functions: new energy utilization, peak loading shifting, and frequency regulation

Power Transmission & Distribution Side

Guantang Energy Storage Project, Huai'an

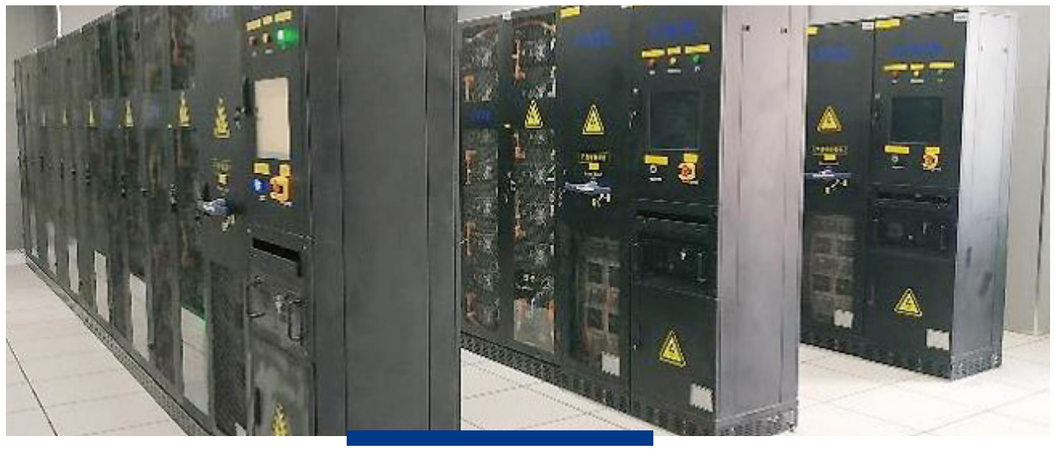
Scale: 15MW/26MWh
Functions: peak load regulation and frequency regulation of 110KV transformer substations on the power distribution side

Power Transmission & Distribution Side

Zhenjiang Xinba Power Station, Jiangsu

Scale: 10MW/20MWh
Functions: peak load regulation of 110KV transformer substations on the power distribution side

CATL Energy Storage Application Cases



Industrial & Commercial Energy Storage

ADN Comprehensive Demonstration Project of Smart Grid Application Demonstration Area in Suzhou Industrial Park

Scale: 1.5MW/3MWh
Function: peak load shifting, and backup power supply

Industrial & Commercial Energy Storage

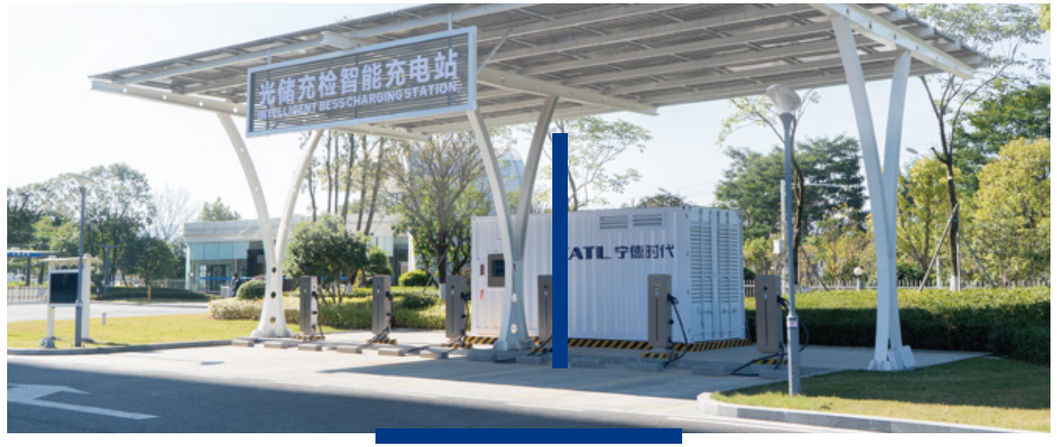
Energy Storage Power Station in Zhangjiagang Cement Plant

Scale: 8MW/32MWh
Function: peak-to-valley price arbitrage

Energy Storage for Emergency Power Supply

Mobile energy storage vehicle

Scale: 250kW/500kWh
Function: emergency power supply and uninterrupted power supply for critical loads; Flexible applications for multiple scenarios, with access available anytime and anywhere



Smart Micro-Grid Energy Storage

Intelligent BESS Charging Station

Scale: 250kW/500kWh
Functions: fast charge of new energy vehicles; online battery inspection; energy storage, cost reduction and efficiency increase; V2G, income increase; and integration of renewable energy

Market Performance

CATL ranked first in the world in global market share of BESS battery production in 2021

Covering major ES markets such as the United States, China, the United Kingdom, Germany, Australia, rendering local ES services such as clean energy utilization, auxiliary services for grids, peak-load shifting and valley filling

Since its establishment, CATL has delivered 100+ large-scale ES projects worldwide. CATL hopes to provide safe and innovative ES solutions to improve the stability and reliability of renewable energy generation, increase the proportion of renewable energy utilization, optimize the energy structure, and help achieve the goal of carbon neutrality.

*Data source: ICC Sino

After-sales Service for Energy Storage

- **Seven-star after-sales service to guarantee various energy storage applications worldwide**

Specialized | Comprehensive

China

200+
Cities with service outlets

350+
Service outlets

*Data as of September 2021

Overseas

Key outlets

Europe (Iceland, United Kingdom, France, Netherlands, Bulgaria and Germany), Americas (United States, Mexico, Colombia, Chile, Uruguay and Brazil), Asia (Singapore, Kazakhstan, Indonesia, Israel, Pakistan and Nepal), Oceania (Australia and New Zealand)

System improvement

Service outlets + logistics network + central warehouses for spare parts (China, Europe and North America) + recycling of used parts

System services

On-site maintenance + empowered self-maintenance + client training + remote diagnosis consultation + spare parts/tool support + free regular inspection during the warranty period