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About CATL

CATL is a global leader of new energy innovative technologies, committed to providing premier solutions and services for new energy applications worldwide.

Main Business

Provide EV battery systems and services for green transportation

Provide solutions and services for clean energy storage

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 realize integrated innovation of market applications

Innovation in Four Dimensions

Innovation in Material and Electrochemistry System

Structure System Innovation

Business Model Innovation

Extreme Manufacturing Innovation

About CATL

World Economic Forum The Member of Global Lighthouse Network

TIME TIME100 Most Influential Companies of 2022

NAAT Batt Dr. Zeng was awarded the Lifetime Achievement Award

Automotive INNOVATIONS Awards The Most Innovative Automotive Supplier (2021)

Financial Times Propering in the pandemic 2020’s top 100 companies

Forbes Future 50 (2019 - 2021)

MIT Technology Review 50 Smartest Companies in China (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).

2003
Establishment of CATL, a new endeavor started by the founding team.

2004
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.

2011
Establishment of CATL in Germany, the company’s wholly-owned subsidiary.

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 Lijiang 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 1 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.

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

5 R&D Centers
- China: Ningde, Fujian / Liyang, Jiangsu / Shanghai
- Germany: Munich

10 Production Bases
- China: Ningde, Fujian / Xining, Qinghai / Liyang, Jiangsu / Yibin, Sichuan / Zhaoqing, Guangdong
- Germany: Erfurt

- CATL Headquarters
- CATL R&D Centers
- CATL Production Bases
- CATL Subsidiaries

Supervised by the Ministry of Natural Resources of the PRC
R&D Strength

- **R&D Scope**

  - Raw Materials Regeneration
  - Materials Innovation
  - Equipment & Process
  - Recycling & Disassembling
  - Energy Density
  - Cost
  - Power Density
  - Cycle Life
  - Cell Technologies
  - Materials Innovation
  - Cycle Life
  - System Technologies
  - Module Technologies
  - Cascade Utilization
  - BMS Technologies

- **R&D Investment and Talents**

  - Annual R&D investment (M USD)
    - 2018: 294.2
    - 2019: 442.1
    - 2020: 551.9
    - 2021: 1,206.1

  - R&D Talents
    - 10,079
    - 170 Doctors
    - 2,086 Masters

- **Rapidly Increasing Number of Patents**

  - Issued Patents
    - 2018: 2,110
    - 2019: 2,913
    - 2020: 3,317
    - 2021: 4,445

  - Pending Patents
    - 2018: 1,656
    - 2019: 2,484
    - 2020: 3,454
    - 2021: 5,777

- 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.

- 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

- 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

<table>
<thead>
<tr>
<th>Extremely strict processes</th>
<th>Extremely fast production speed</th>
<th>Extremely high quality requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Strict shape and performance control</td>
<td>- Produce a cell in 1.7 s on average</td>
<td>- 5,000+ quality control points</td>
</tr>
<tr>
<td>- Size control from nanometer level to kilometer level</td>
<td>- Produce a module in 20 s</td>
<td>- More than 10,000 items of traceability data for a battery on average</td>
</tr>
<tr>
<td>- 100+ tests on each cell before delivery to warehouse</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.

400+ product tests

World-leading characterization technology

- Characterization and analysis of single-particle materials
- High precision in situ expansion analysis
- SEM 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

- Fire test
- Water immersion test
- Vibration test

Quality management system

System planning management
- Project management
- Supply chain management
- Tractability

Internal and management review
- Material management
- Equipment and testing

Continual improvement management
- In-process quality control
- Human resources management

Client requirements
- Market analysis & client requirements
- Design & development
- Manufacturing
- Client complaint management
- Client satisfaction

Client requirements
- Product safety management
- Change management
- Organization awareness management

Quality policy

IATF16949
- ISO 9001

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

Quality Assurance

Quality Assurance
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.
## Liquid Cooling Solution

- **High level of safety**: LFP batteries with high thermal stability, protection level of IP55 to meet the requirements of outdoor applications, 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 50%, prefabricated installation, reducing on-site installation costs and commissioning time.

### EnerC

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<td>Rated voltage [V]</td>
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### Testing and certification

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

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**Testing and certification**

- IEC 62619
- UL 1973
- UL 9540A
- IEC 62477-1
### UPS Solution

**High level of 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

- Cell safety:
  - LFP batteries with high thermal stability

#### 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 outage in the grid
- Individual rack exit
- Exit of the faulty cabinet only to improve system availability
- Simple and reliable system

#### Flexible wiring system
- Available for three-wire and two-wire UPS systems
- Flexible configuration:
  - Available for a wide voltage range configuration of 320 - 491V, compatible with UPS of high and low voltage platforms
  - Available for a wide energy range configuration of 52.748 - 105.200kWh 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 Station Solution

**48100 Battery module for base station**

**Basic Parameters**

<table>
<thead>
<tr>
<th>Item</th>
<th>BluE-Pack 5.1</th>
<th>BluE-Pack 10.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Energy [kWh]</td>
<td>5.12</td>
<td>10.24</td>
</tr>
<tr>
<td>Rated voltage [V]</td>
<td>51.2</td>
<td>51.2</td>
</tr>
<tr>
<td>Operating voltage range [V]</td>
<td>44.8 - 57.6</td>
<td>44.8 - 57.6</td>
</tr>
<tr>
<td>Dimensions [L<em>W</em>H] [mm]</td>
<td>540<em>490</em>240</td>
<td>540<em>940</em>240</td>
</tr>
<tr>
<td>Protection level</td>
<td>IP65</td>
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### Household Energy Storage Solution

**Testing and certification**

- IEC 62619
- UN 38.3
- UL 1973
- UN38.3
● **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.

[Diagram of Energy Storage on Power Generation]

● **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.

[Diagram of Energy Storage on Power Transmission and Distribution]
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.
CATL Energy Storage Application Cases

**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

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

**Luneng Haixi Multi-Energy Complement Energy Storage Power Station Demonstration Project**
- Power Generation Side
- Scale: 50MW/100MWh
- Functions: virtual synchronization-based control, tracking of power generation plan, and support of second frequency regulation

**National wind and solar energy storage and transmission demonstration project**
- Power Generation Side
- 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

**Minety Battery Storage Project In the U.K.**
- Power Generation Side
- Scale: 9.9MW/99.8MWh
- Functions: peak and frequency regulation in the power grid, black start, and capacity market

**National wind and solar energy storage and transmission demonstration project**
- Power Generation Side
- Scale: 70MW/70MWh
- Functions: energy integration, frequency regulation in the system, peak-to-valley price arbitrage
CATL Energy Storage Application Cases

**Jinjiang 100MWh Energy Storage Power Station**
- **Scale:** 10MW/20MWh
- **Functions:** new energy utilization, peak loading shifting, and frequency regulation

**Zhenjiang Xinba Power Station, Jiangsu**
- **Scale:** 30MW/108MWh
- **Functions:** new energy utilization, peak loading shifting, and frequency regulation

**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**

**Scale:** 10MW/20MWh
- Functions: peak load regulation of 110KV transformer substations on the power distribution side
**CATL Energy Storage Application Cases**

- **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
- **Mobile energy storage vehicle**
- **Energy Storage Power Station in Zhangjiagang Cement Plant**
  - Scale: 8MW/32MWh
  - Function: peak-to-valley price arbitrage
- **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

**Industrial & Commercial Energy Storage**

- **Energy Storage for Emergency Power Supply**
  - 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**
Market Performance

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.

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

China

- 200+ Cities with service outlets
- 350+ Service outlets

Overseas

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)

Key outlets

- Service outlets + logistics network + central warehouses for spare parts (China, Europe and North America) + recycling of used parts
- On-site maintenance + empowered self-maintenance + client training + remote diagnosis consultation + spare parts/tool support + free regular inspection during the warranty period