Commercial Application Solutions
Earn more with each mile
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

Company Philosophy

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 Material and Electrochemistry System

Structure System Innovation

Extreme Manufacturing Innovation

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

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.

Established strategic partnership with BMW.

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

Established Xining production base.

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

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

Established CATL in France, USA, Canada, and Japan.

Established joint ventures with SAIC Motor.

Established the CATL Academician and Specialist Workstation.

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

Established joint ventures with Dongfeng Motor and GAC Group respectively.

Listed on the Shenzhen Stock Exchange.

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

Established 21C Lab.

Established joint ventures with Dongfeng Motor and GAC Group respectively.

Put Liyang production base into operation.

Put Yibin production base into operation.

Listed on the Shenzhen Stock Exchange.

Put Yibin and Lingang production bases into operation.

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

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.

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Released its first-generation sodium-ion battery with the world’s leading energy density of its kind.

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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.

Launched CTP 3.0 battery “Qilin.”

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

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R&D Strength

R&D Scope

- Raw Materials Regeneration
- Materials Innovation
- Equipment & Process

- Cost
- Energy Density
- Power Density

- Recycling & Disassembling
- Cycle Life
- Cell Technologies

- Cascade Utilization
- System Technologies
- Module Technologies

- 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
  - 2022 H1: 864.2

- R&D Talent: 12,132
- Doctors: 193
- Masters: 2,233

Rapidly Increasing Number of Patents

- Pending Patents
- Issued Patents

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

*Data: CATL’s 2022 semi-annual report*
Material Characterization Analysis & Product Test and Validation

Capable of performing 100 analyses of material characterization.

CATL has led and contributed to setting numerous national, industrial and corporate standards.

Leading technologies
- Single particle micro-electrode analysis
- In-situ swelling analysis
- Ultra-high precision charger analysis
- Electrochemical & material simulation platforms

Test & analysis capabilities
Large-scale and multifunctional characterization capability from atomic/molecular level to device/battery level, including element, chromatography, mass spectrometry, thermal, surface structure and electrochemical analysis. CATL has created a comprehensive standard testing manual for material, process and battery design.

Multi-level: material, cell, module, BMS, pack.
Multi-dimension: mechanism, safety & reliability, electrical performance, etc.
Standards: cover GB/T, ISO, IEC, UN, ECE, which also enable the establishment of a complete corporate standard in the company.

400+ Product testing & validation items

- Mechanical Shock Test
- Crush Test
- External Fire Test
- Immersion Test
- Vibration Test
- IP Test
The first battery plant recognized as a member of the Global Lighthouse Network by the World Economic Forum

**Self-adaptive Production Lines**
We integrate cloud computing and artificial intelligence into the manufacturing processes, thus making the production lines self-adaptive.

**Higher Quality**
Our AI defect detection system has a higher consistency than humans.

**Greener Manufacturing Process**
The smart energy management system optimizes the energy consumption of our equipment through real-time monitoring of various energy data.

**Full Lifecycle Data Tracing**
Digital factory with high efficiency and high level of safety. Precise product optimization through tracking from the raw material to recycling.

The World’s First Certified Zero-Carbon Battery Factory

**Overview**
In March 2022, SGS awarded Sichuan Contemporary Amperex Technology Limited (CATL-SC), a wholly-owned subsidiary of Contemporary Amperex Technology Co., Limited (CATL), the PAS 2060 certification on carbon neutrality, making the plant the world’s first zero-carbon battery factory.

With a total investment of over RMB 50 billion (about USD 7.58 billion), CATL-SC was established in October 2019. It has been planned that the project will be executed in 10 phases and cover a total area of over 6,000 mu (400 hectares). After the whole project is completed, its annual production capacity will exceed 200 GWh and it will become a world-leading lithium-ion battery production base.
SNE Research: CATL ranked No.1 globally in EV battery consumption volume for five consecutive years.

CATL’s Global EV Battery Consumption Volume (GWh)

There are 501,000 commercial vehicles equipped with CATL batteries in China, with an accumulative mileage of 86.3 billion kilometers, which is about 2.15 million laps of the earth, reducing carbon emissions by 62.4 million tons.

*Data source: SNE Research, data as of June 30, 2022
Cities include prefecture-level city, municipality, region, autonomous prefecture and league.

*Data source: Vehicle Insurance

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Comprehensive Performance

An intelligent way to the green future

Standing the test of time
Through a futuristic tech combination in software and hardware, and the material mechanism of self and external maintenance, CATL batteries achieve more cycles, longer service life, better performance and greater economic benefits.

Confidence comes with reliability
Safety guarantees in design, testing, materials, production and processing procedures make every battery safe, reliable and durable.

Easy drive in cold and heat
Whether in high temperatures, low temperatures or on rainy days, CATL can provide you with comprehensive protection.

Services beyond expectations
With rapid response standards and a global after-sales network, CATL provides customers with high-quality after-sales services.

Smart, instant feedback
The intelligent battery management system makes the battery safer, the system more efficient and your travel experience more comfortable.
Cell Solutions

<table>
<thead>
<tr>
<th>Product Type</th>
<th>High Energy Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (Ah)</td>
<td>228</td>
</tr>
<tr>
<td>Chemistry</td>
<td>LFP</td>
</tr>
<tr>
<td>Dimensions (L<em>W</em>H, mm)</td>
<td>53.7×173.9×204.6</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>4.12</td>
</tr>
<tr>
<td>Energy Density (Wh/kg)</td>
<td>178</td>
</tr>
<tr>
<td>Cycle Life (25℃, 100%DOD)</td>
<td>4000</td>
</tr>
<tr>
<td>Operating Temperature (℃)</td>
<td>-35～65</td>
</tr>
<tr>
<td>Certification</td>
<td>UN 38.3, IEC 62619, IEC 62660</td>
</tr>
</tbody>
</table>

- Compacted LFP chemistry and lightweight structure significantly improve energy density and achieve better cost performance.

- Low lithium consumption anode, passivated cathode and bionic self-repairing electrolyte enable the cell to reduce the consumption of active lithium and improve its cycling and storage performance, achieving zero fading over 1,000 cycles.

- Isotropic graphite technology enables 6C fast charging;
- With microstructural design in electrode sheets, the “ion and electron high-speed channel” is constructed to enable 10C recharging;
- The standard-size PHEV2 allows flexible configuration for different vehicles.

119Ah Cell

<table>
<thead>
<tr>
<th>Product Type</th>
<th>High Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (Ah)</td>
<td>119</td>
</tr>
<tr>
<td>Chemistry</td>
<td>LFP</td>
</tr>
<tr>
<td>Dimensions (L<em>W</em>H, mm)</td>
<td>53.2×200.3×169.6</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>2.37</td>
</tr>
<tr>
<td>Energy Density (Wh/kg)</td>
<td>161</td>
</tr>
<tr>
<td>Cycle Life (25℃, 100%DOD)</td>
<td>6,000</td>
</tr>
<tr>
<td>Operating Temperature (℃)</td>
<td>-35～65</td>
</tr>
<tr>
<td>Application Scenarios</td>
<td>BEV, PHEV</td>
</tr>
</tbody>
</table>

- Super electronic network and fast Ion ring design allow a 80% charge in 15 minutes at room temperature and 2C discharge at -10 ℃;
- Superconducting electrolytes boost the battery’s charging speed, generating 10% less heat than similar products.
Module & Pack Solutions

More than 2 million battery systems have been shipped to 55 countries and regions worldwide.

**Lightweight**
- Substantially safe LFP cells and high-strength pack structure enable the pack to meet international safety standards;
- With highly integrated structure design, the groundbreaking CTP (cell to pack) technology significantly boosts the integration efficiency, which can reach 91%, and the system energy density can reach 160Wh/kg.

**Long Service Life**
- Meet 8 years or 800,000 kilometers warranty requirements (80% SOH or above).

**Flexible Configuration**
- Modular design allows flexible configuration of packs for a variety of voltages and energy scenarios.

**Lightweight**
- Equipped with the latest generation of high energy LFP cells, MTV technology increases the vehicle utilization space by 40% and is compatible with various types of buses, facilitating vehicle weight reduction.

**Authentic Safety**
- Battery modules can be integrated into the vehicle roof, preventing the battery from flood damage and thermal runaway caused by vehicle collision.

**High Reliability**
- Centralized installation improves module consistency and lowers the subordinate fault rate of the buses.
- Modular assembly enhances operation efficiency.

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<table>
<thead>
<tr>
<th>Basic Parameters</th>
<th>MTV (Module to Vehicle)</th>
<th>High Energy Density Pack</th>
</tr>
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<tbody>
<tr>
<td>Cell Capacity (Ah)</td>
<td>228Ah</td>
<td>268Ah</td>
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<tr>
<td>Chemistry</td>
<td>LFP</td>
<td>LFP</td>
</tr>
<tr>
<td>Dimensions (L<em>W</em>H, mm)</td>
<td>1060<em>560</em>240</td>
<td>1055<em>424</em>240</td>
</tr>
<tr>
<td>Energy (kWh)</td>
<td>35.83</td>
<td>32.79</td>
</tr>
<tr>
<td>Pack Energy Density (Wh/kg)</td>
<td>160</td>
<td>175(10%↑)</td>
</tr>
<tr>
<td>Nominal Voltage (1/3C, 25℃, V)</td>
<td>154.56</td>
<td>122.56</td>
</tr>
<tr>
<td>Operating Voltage Range (V)</td>
<td>120~175.2</td>
<td>95~138.7</td>
</tr>
<tr>
<td>Charge Rate@25℃ (C)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>IP ratings</td>
<td>IP68, IP6K</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature (℃)</td>
<td>-35~65</td>
<td>-35~65</td>
</tr>
<tr>
<td>Certification</td>
<td>ISO26262, ECE R100/R10</td>
<td></td>
</tr>
<tr>
<td>Application Scenarios</td>
<td>Bus, truck, construction machinery, etc.</td>
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<th>Pack Energy Density (Wh/kg)</th>
<th>Nominal Voltage (1/3C, 25℃, V)</th>
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<th>Charge Rate@25℃ (C)</th>
<th>IP ratings</th>
<th>Operating Temperature (℃)</th>
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<th>Application Scenarios</th>
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<td>268Ah</td>
<td>LFP</td>
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<td>32.79</td>
<td>175(10%↑)</td>
<td>122.56</td>
<td>95~138.7</td>
<td>1.0</td>
<td>IP68, IP6K</td>
<td>-35~65</td>
<td>ISO26262, ECE R100/R10</td>
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</tbody>
</table>
## Module & Pack Solutions

### Basic Parameters

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</tr>
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<td>Cell Capacity (Ah)</td>
<td>228Ah</td>
</tr>
<tr>
<td>Chemistry</td>
<td>LFP</td>
</tr>
<tr>
<td>Dimensions (L<em>W</em>H, mm)</td>
<td>2160<em>644</em>245</td>
</tr>
<tr>
<td>Energy (kWh)</td>
<td>70.5</td>
</tr>
<tr>
<td>Pack Energy Density (Wh/kg)</td>
<td>150</td>
</tr>
<tr>
<td>Operating Voltage Range (V)</td>
<td>240~350.4</td>
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<tr>
<td>Charge Rate@25℃ (C)</td>
<td>1.0</td>
</tr>
<tr>
<td>IP ratings</td>
<td>IP68, IP6K9K</td>
</tr>
<tr>
<td>Operating Temperature (℃)</td>
<td>-35~65</td>
</tr>
<tr>
<td>Application Scenarios</td>
<td>Applications with long life requirements such as buses, heavy-duty trucks</td>
</tr>
</tbody>
</table>

### Application Scenarios
- Forklift
- Golf cart
- Lift machine
- Aircraft towing tractor
- Tricycle
- Towing tractor

### Long Service Life Pack

- **High level of Safety & High Reliability**
  - Supported by cells with substantially safe LFP chemistry and ultra high-strength box structure design, the pack is able to operate in harsh working conditions including mining areas.

- **Long Service Life**
  - 10 years or 8,000 cycles warranty for heavy-duty and cascade utilization application scenarios.

- **Automatic Temperature Control**
  - Vertically arranged thermal management structure design leads to a threefold increase of the heat exchange area, greatly improving the heating and insulation performance.

- **Multiple Configurations**
  - Energy capacities ranging from 130~160kWh are available to meet the diverse needs of vehicles.

### Low-Voltage Platform Module

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>228Ah-IP45</td>
</tr>
<tr>
<td>Chemistry</td>
<td>LFP</td>
</tr>
<tr>
<td>Dimensions (L<em>W</em>H, mm)</td>
<td>267<em>178</em>237</td>
</tr>
<tr>
<td>Energy (kWh)</td>
<td>2.94</td>
</tr>
<tr>
<td>Module Energy Density (Wh/kg)</td>
<td>154</td>
</tr>
<tr>
<td>Nominal Voltage (1/3C, 25℃, V)</td>
<td>12.88</td>
</tr>
<tr>
<td>Operating Voltage Range (V)</td>
<td>10~14.6</td>
</tr>
<tr>
<td>Charge/Discharge Rate@25℃ (C)</td>
<td>1.0/1.0</td>
</tr>
<tr>
<td>Operating Temperature (℃)</td>
<td>-35~65</td>
</tr>
<tr>
<td>Certification</td>
<td>UN38.3, UL2580</td>
</tr>
</tbody>
</table>

### Authentic Safety

- Cells with substantially safe LFP chemistry to meet international safety standards.

### High Temperature Adaptability

- Heating films in the modules ensure a wide operating window ranging from -35℃ to 65℃.

### Flexible Adaptation

- A wide operating voltage range, adaptable to a variety of industrial vehicles and application scenarios.
Application in Hot Areas

Hainan, the southernmost province of China, features tropical climate which could hit 40°C in the summer. The vast majority of electric buses in Hainan are equipped with CATL EV batteries, which enjoy wide recognition by partners and have been successfully applied in hot places such as Qatar and Dubai.

Application in Cold Areas

Located in northeast China, Harbin is dubbed as China’s “Ice City,” where the lowest temperature can reach -35°C. Since 2014, CATL started to facilitate the city’s bus electrification. Its solutions successfully withstood the test of extremely cold weather, and have been gradually promoted in Iceland, Norway and other Arctic countries.

Application in Metropolis

Big cities have high population density, which need stronger transportation networks and vehicle stability. Buses equipped with CATL EV batteries have functioned well in Shanghai, Beijing and other big cities, ensuring safe urban travel.

Application in High-altitude Areas

The Everest Base Camp has an elevation between 4,657 m and 5,168 m. Buses equipped with CATL EV batteries were officially put into operation at the Everest base camp starting July 24, 2017, providing passengers with a more comfortable and safer travel experience.

Customer Benefits

Safe and Reliable
- Battery design has passed more than 400 rigorous tests, which is above the international safety standards
- Outstanding battery performance ensures low failure rate and stable operation throughout its full life cycle

Smart Control
- Supported by advanced BMS control, vehicles are able to adapt to a wide range of temperatures and monitor battery health in real time, ensuring vehicles’ great performance during operation

Cost-effective
- Lightweight and long service life battery design enable low capacity attenuation and long driving range, thus reducing total cost of ownership (TCO)
A large amount of road spectrum and working condition data are collected and incorporated into CATL’s unique heavy-duty truck pack design standard, thus ensuring the stable operation of vehicles in complex working conditions and supporting continuous high-power discharge with strong power.

The built-in heating film and water cooling system can effectively adapt to harsh mining environments and ensure worry-free operation. The IP68 protection of the batteries effectively keeps off dust and water of its working conditions, making the vehicle run smoothly.

Long driving range and multiple charging modes, which include both standard 1C charging and high-power 2.5C fast charging, ensure efficient driving throughout the day.

CATL provides strong and clean power to heavy-duty vehicles for the working conditions of mining areas, ports and construction sites, greatly improving operation efficiency and offering practical solutions for the reduction of mobile source pollution.

Heavy-Duty Transport Solutions

Customer Benefits

Reliable Power
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- Support continuous high-power discharge with strong power.

Excellent Adaptability
- The built-in heating film and water cooling system can effectively adapt to harsh mining environments and ensure worry-free operation.
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Flexible and Efficient
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Applications

Smart Unmanned Mining Solution: EnerMagic
CATL and Yuexin Intelligent released the "EnerMagic" electric smart unmanned mining solution, which has been successfully applied in mining areas, creating a new era of "electric, intelligent, unmanned, and networked" mining.

Battery Swapping Solution for Heavy-duty Trucks
CATL provides an efficient battery swapping solution for heavy-duty trucks of the “Road-Rail Combined Transportation” scenario. China’s first battery swapping commercial application scenario for heavy-duty trucks has been put into operation, promoting the electrification of road transportation industry.

Green Port
CATL has reached strategic cooperation with Xiamen Port and Tianjin Port, helping ports to achieve comprehensive electrification. Electric vehicles such as unmanned container trucks and AGVs have also been put into operation.

Factory Transportation
CATL provides reliable power for the short-haul trucking in large steel plants in the Beijing-Tianjin-Hebei region.
Urban Delivery Solutions

CATL’s EV batteries are widely used in light trucks, mini buses, and minivans for express delivery, supermarket delivery, fresh food delivery and other scenarios. CATL provides customers with safe, reliable and comprehensive battery solutions, and accelerates the electrification of urban logistics to reduce costs and increase efficiency.

Customer Benefits

Safe and Reliable
- CATL batteries meet international safety standards to ensure the safe operation of vehicles.
- Excellent battery charging and discharging performance over a wide range of temperatures ensures the stable operation of a vehicle throughout the year.

Flexible Adaptation
- Customized battery design can be adapted to various kinds of vehicles to meet the requirements of various application scenarios.

Cost-effective
- A lightweight battery system reduces the weight of the whole vehicle and enables it to carry heavier loads, saving operating costs.
- Battery products degrade slowly throughout the life cycle, with a low failure rate and low maintenance costs.

Application

CATL has joined hands with Electric Vehicle Rental (Shenzhen) Co., Ltd. (DST), China’s large electric logistics vehicle operator, to provide reliable transportation power for express companies and e-commerce platforms, creating new logistics ecosystem.
Sanitation Vehicle

CATL provides customized product solutions for special vehicles which can be easily adapted to specific working conditions, thereby improving economic benefits, reducing pollution and creating a comfortable and safe working environment. The products are widely used in logistics parks, airports, ports, and other scenarios.

Applications

Airport Ground Service Equipment

In September 2019, Beijing Daxing International Airport was officially opened for operations. Meanwhile, airport vehicles equipped with CATL batteries have been put into large-scale use, helping the construction of a “green and smart airport.”

Sanitation Vehicle

CATL provides reliable battery products for the industry’s mainstream sanitation vehicle enterprises, which have been put into use in more than 70 cities across the country, helping to create a clean and beautiful city image.

Forklift

CATL and Hangcha Group have reached a strategic cooperation agreement. The cooperative products have been put on the market in 2018, helping the rapid development of the warehousing and logistics industries.

Construction Machinery

CATL is an active player in the field of new energy construction machinery, providing battery products that can be adapted to various vehicles including reach stackers and port heavy duty forklifts, which have been put into use in large ports.

Special Vehicle Solutions

Innovative Application Solutions

Breaking industry boundaries, together for the energy freedom

CATL provides reliable power for rail transit with lithium-ion batteries, which can increase energy efficiency by 30% and reduce the burden on the grid.

On May 30, 2020, a refrigerated container equipped with CATL lithium-ion batteries was put into operation in Shanghai. It is the first refrigerated container in China that uses large-capacity lithium-ion batteries as a power system, which can meet the requirements of various transportations such as railway, road, and waterway.

Rail Transit

It is crucial to develop electric vessels with low energy consumption, zero carbon emissions, low noise, and zero pollution for the sustainable development of the industry. CATL is leading the electrification of vessels.

CATL provides reliable power for the maritime command ship “Deep Sea 01,” which is China’s first governmental maritime vessel to use lithium-ion batteries as hybrid propulsion power.

Vessel
Battery Recycling

Explore urban mining

Supported by its subsidiary Brunp, CATL is working with customers to create a closed loop of battery production – application – cascade utilization – battery recycling.

CATL has reached a strategic cooperation agreement with BASF to focus on cathode active materials and battery recycling, to promote CATL’s localization in Europe, which contributes to achieving both companies' global carbon neutrality goals.

- **Overall Network of 7 Bases**
- **279 Standards**
- **1,407 Innovative Patents**
- **Large-scale Recycling**

- Covers the Yangtze River Delta, Pearl River Delta and central China, and expands to Indonesia; Strategic cooperation with top automotive enterprises, battery and material enterprises, and scientific research.
- Participated in setting and revising standards related to waste battery recycling and battery material regeneration. Among those, 162 standards have been issued.
- Brunp takes the lead to address the issues of waste recycling through the original "reverse product positioning design" and "directional recycling" technologies.
- **120,000 Tons** Waste battery disposal ability
  - Nickel, cobalt, manganese: 99.3%
  - Lithium: 90%+
  - Metal recovery rate
- **50%** Comprehensive recycling rate of used batteries in China

Aftersales Service

CATL is committed to building a global after-sales network of workshops and spare parts warehouses so as to provide customers with convenient and efficient seven-star after-sales service.

**Service Network**

- **200+** Regional Supervision
- **20+** Parts Stores
- **20+** Technical Experts
- **526** Service Stations

**Global Resources**

<table>
<thead>
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<th>200+</th>
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<tr>
<td>Regional Supervision</td>
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<td>Parts Stores</td>
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<td>Technical Experts</td>
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**Service Commitment**

**China**

- **Response Time**: 3.5-8H Commercial Vehicle
- **Maintenance Time**: 8H Common Problem, 72H Complex Problem

**Overseas**

- **Service Model**: Joint Operation & Maintenance, Self Operation & Maintenance
- **Timeliness**: 24H Response, 24H Arrival
- **Maintenance Timeliness**: Response time depends on our partners and supported by CATL experts, 3-5D Commercial Vehicle

*The data above are as of June 30, 2022.*
Together for the Energy Freedom

- Electric Smart Unmanned Mine
- Electric Bus
- Electric Two-wheeled Vehicle
- Industrial Energy Storage
- Private Electric Vehicle
- Electric Heavy-duty Truck
- Port Electrification
- Renewable Energy Generation + Energy Storage
- EVOGO Fast Battery Swap
- Microgrid

Together for the Energy Freedom