China Electrification Industry Guide

Electrification Solutions

May 2023

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China Electrification Industry Guide

Executive Summary

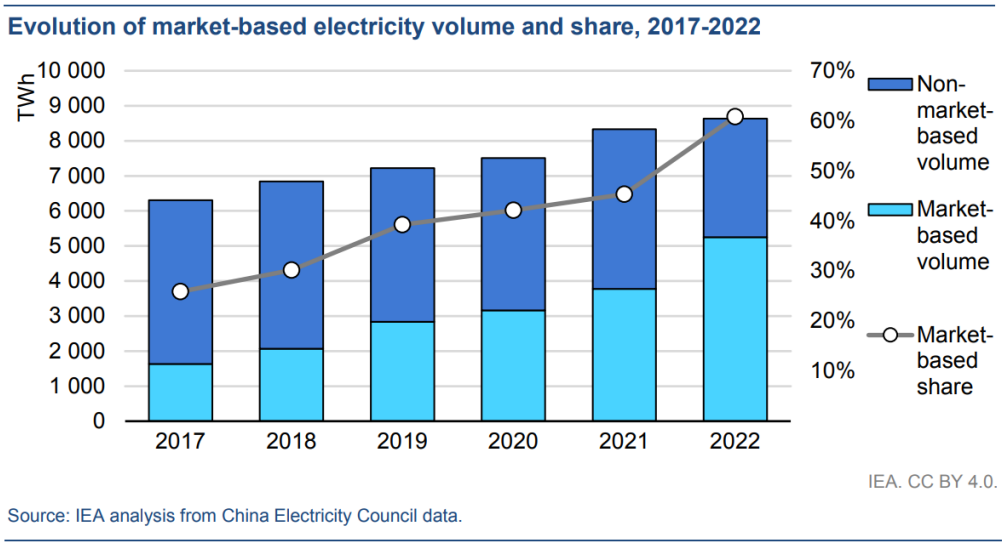
With significant potential to mitigate emissions and decarbonizes energy supply chains, electrification is an important strategy to reach net zero goals. As more energy end uses become electrified, the share of electricity in total final energy consumption increases in the Net Zero Emissions by 2050 Scenario from 20% in 2021 to 27% in 2030.

The world's energy diet is changing. The strong demand for EV, ESS & portable applications with the vision of green world drives the strong demand for battery solutions, especially for lithium battery industry. That demand is responsible for more than 10% average yearly battery production capacity growth. China continues to dominate Bloomberg NEF's (BNEF) global Li-ion battery supply chain ranking, for the third time in a row, for both 2022 and its projection for 2027, thanks to continued support for the electric vehicle demand and raw materials investments. China currently hosts 75% of all battery cell manufacturing capacity and 90% of anode and electrolyte production.

I. Overview of Electrification Industry in China

1. The Evolution of China's Li-ion Battery Industry

Electrification is an important way to support the construction of a new energy system, build a new power system and help achieve the goal of carbon peaking and carbon neutralization.



So far, the development of Li-ion battery industry can be divided into four stages.

Stage 1: In the 1990s

In 1995, China's first Li-ion battery was born in the Institute of Physics of the Chinese Academy of Sciences. In 1996, the 18th Research Institute of China Electronics Science and Technology Group Corporation successfully developed the 18650 battery which can be mass-produced, which marks a breakthrough in this industry.

Stage 2: From 2000 to 2008

The rapid development of BYD, BAK, LISHEN and other Li-ion battery enterprises had greatly promoted the progress of China's Li-ion battery technology, and thus China's Li-ion battery industry had entered a stage of rapid growth. The acceleration of the industrialization of new energy vehicles had also accelerated the research and development and application of Li-ion batteries, which officially indicated that new energy had become one of China's

strategic industries.

Stage 3: From 2008 to 2016

Thanks to the rapid growth of mobile devices, the demand for Li-ion batteries was also soaring. However, as the 3C battery sector was difficult to expand, the increase was leveling off. Under the trend of global promotion of electric vehicles, China's electric vehicle market had also shown explosive growth, making the EV batteries become the largest downstream market in Li-ion battery export.

In 2014, China surpassed Japan and South Korea in Li-ion battery production, and then ranked first in the world.

Stage 4: From 2016 to present

The rapid development of electric vehicles has brought a broad market space for Li-ion batteries. 3C battery is still occupying a larger share. Benefiting from the extensive application of 5G, energy storage batteries will also be cast a light on.

The technological breakthroughs have also greatly expanded the Li-ion batteries' scope of application. And in the future, it will be gradually applied to the military industry with the improvement of safety performance and energy density.

Relying on the benefits of its abundant raw materials, large market and favorable policies, China has become the head of the global Li-ion battery industry and has the most complete and mature industrial system and supply chain in the world, which has also made it become the world's largest producer and exporter of Li-ion battery by monopolizing the production capacity.

2. General Policy Issued by The Chinese Government

In recent years, the government has issued ***the Decision of the State Council on Accelerating the Cultivation and Development of Strategic Emerging Industries***, ***the Catalogue of Key Products and Services for Strategic Emerging Industries***, ***the Technology Roadmap for Energy Saving and New Energy Vehicles***, ***the Development Plan for New Energy Vehicles Industry from 2021 to 2035***, which makes it clear that energy-saving and new energy vehicles, electric tools, electric bicycles, and new energy storage have become key areas of national investment and development. Li-ion EV battery is the core of new energy development, and battery materials are the key to EV battery safety, performance, life and cost.

Goals set for national markets in Document No. 118

Items	2025 goals	2030 goals
Implementation of unified national electricity market	Establish preliminary structure of the market	Fundamentally establish a unified national electricity market
Role of provincial and regional markets	Co-ordinated operation with national market	Integrated operation with national market
Connection among MLT/spot/ancillary services markets	Design an integrated system and pursue linked operation	--
Interprovincial and regional trade/green power trade	Significantly expand trade volume	--
Renewable energy	Establish a preliminary foundation for market and price mechanisms that enables the development of renewables and energy storage	Full integration of renewables into the market

The Guidelines on Accelerating the Development of New Types of Energy Storage pointed out:

- By 2025, new types of energy storage should be transformed from the initial commercialization to large-scale development, with the installed capacity reaching more than 30 million kW.

- By 2030, new types of energy storage will be fully marketized. It has become a critical support for carbon peaking and carbon neutrality in the energy sector.

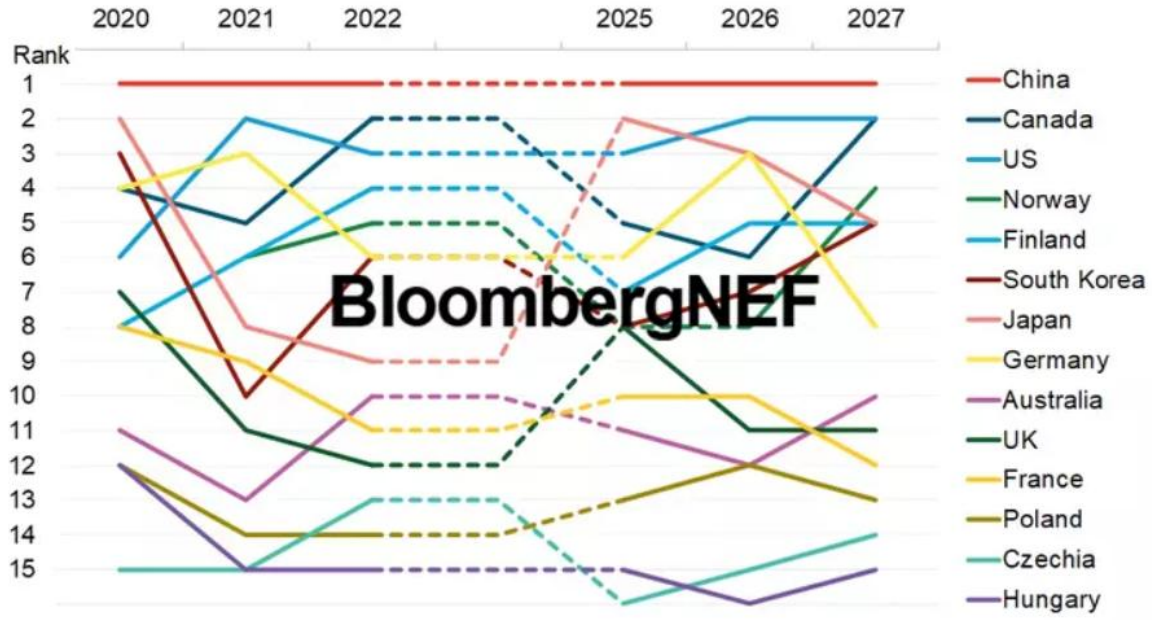
II. Current Situation of Electrification Industry in China

1. China's Market Scale Ranks First in the World

Benefiting from the early domestic investment in technology research and development, the Li-ion battery industry chain is completely mature, and the product performance is excellent. China's Li-ion battery industry is leading in the international market.

According to the data of Global Trade Analysis System (GTAS), in the past 10 years, China has remained the world's largest Li-ion battery exporter, accounting for about 40% of the total global Li-ion battery export value.

From January to July 2022, China's Li-ion battery exports accounted for 49.5% of the world's total, much higher than the second South Korea (7.8%).



2020-2027 Top 15 Countries of Li-ion battery Supply

2. The Development of Local Enterprises is Vigorous

In the early stage of industrial development, China's Li-ion battery exports were dominated by foreign-invested enterprises. Subsequently, local enterprises burst into a burst of superior vitality, and their development speed far outpaced foreign-invested enterprises and state-owned enterprises. In 2016, they ranked first among the types of China's Li-ion battery export enterprises.

Data from SNE Research showed that from January to November 2022, CATL continued to maintain the first place in the world in terms of power battery loading. The second BYD is also a Chinese private enterprise. CALB, Gotion, Sunwoda and EVE also joined the top 10 list.

3. The Li-ion Battery Exports to the European Union, the United States, South Korea and ASEAN Accounted for 3/4 of the Total.

According to the statistics from China Customs, in 2022, the total export value of Li-ion battery reached up to USD 50.4 billion with 86.7% year-on-year growth. From January to November 2022,

- ✓ China's export to the EU reached USD 1.7 billion, increased by 131.2%, accounting for 38.6% of the total export value of lithium batteries in the same period.
- ✓ China's exports to the United States, South Korea and ASEAN were USD 850 million, USD 450 million and USD 385 million respectively, increased by 110.8%, 83.2% and 27% respectively, accounting for 38.1% of the total value of China's Li-ion battery exports in the same period.

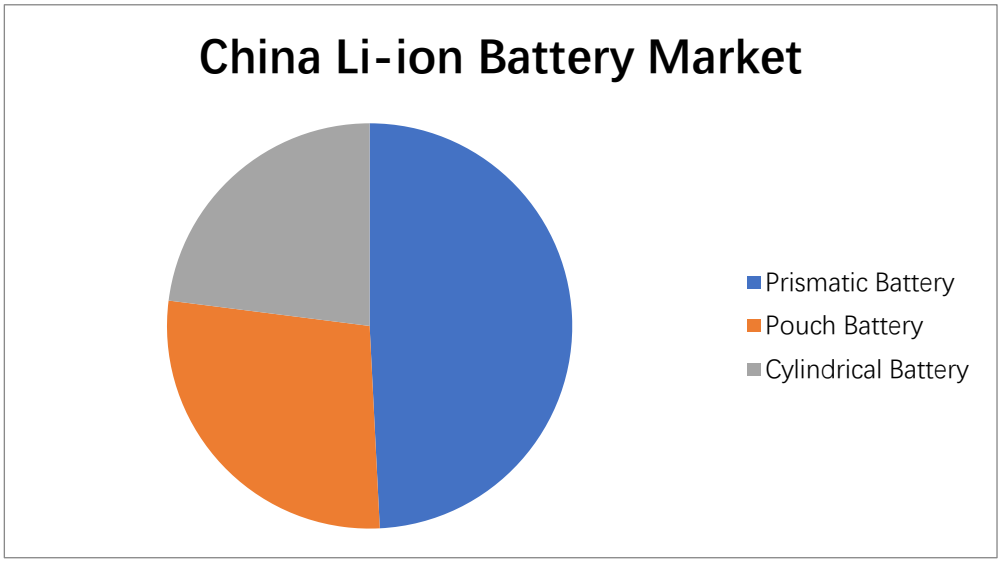
4. Export Enterprises of Li-ion Battery Are Mainly Located in the Southeast Coastal Areas, and the Southwest Provinces Have Great Development Potentials

Southwest China has the richest lithium and phosphorus resources in China. Yunnan, Guizhou and Sichuan account for more than 40 percent of the country's phosphate ore reserves. The resource advantages of the southwest region are continuously highlighted, and

the southwest provinces such as Sichuan and Guizhou are significantly more attractive to industrial Li-ion battery investment, which greatly accelerates the industrial development.

5. Prismatic Cell Gradually Occupies A Dominant Position in China's Market

Prismatic cell has the highest cost performance and has occupied the mainstream of China market. Prismatic cell accounts for 49.2% while pouch battery for 27.8% and cylindrical battery for 23%.



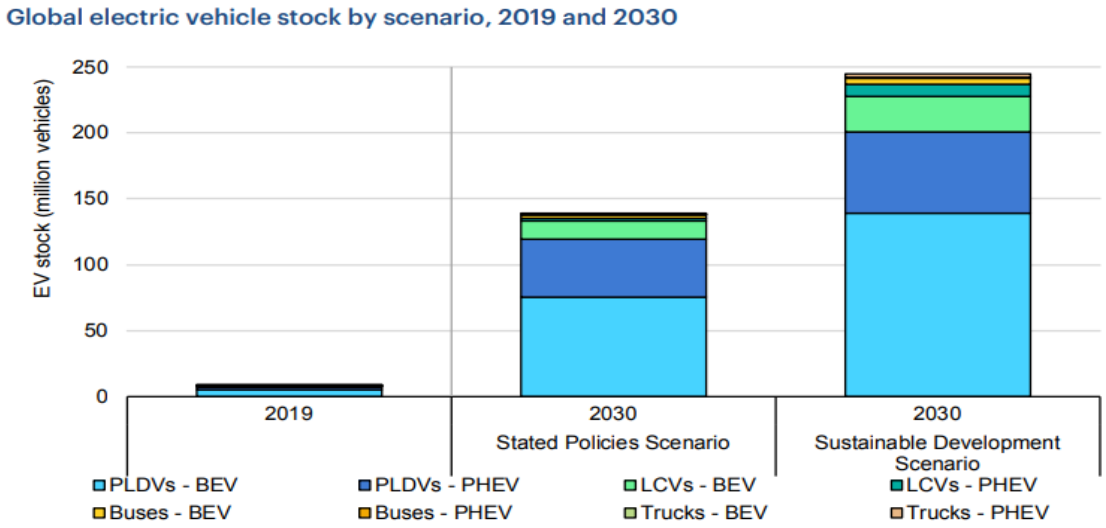
6. Solid-state Lithium Batteries Will Become the Future Trend

The scientific community predicts that in 2030, Li-ion batteries will no longer be the mainstream of electric vehicle batteries, but they still have a place in some fields of electronic components. According to the calculation of SNE Research, the market space of solid-state batteries in China is expected to reach USD 441.18 million in 2025 and USD 2.94 billion in 2030.

III. Application Market of Electrification in China

1. Installed EV Battery

Electric vehicles play a critical role in meeting the environmental goals of the Sustainable Development Scenario to reduce local air pollution and to address climate change. In this scenario, the global electric vehicle stock grows by 36% annually, reaching 245 million vehicles in 2030 – more than 30 times above today's level. Other than two/three-wheelers, growth is strongest for the light-duty vehicle segment where electric power train technologies are most readily available. In the Stated Policies Scenario, under the assumptions taken, the global electric vehicle stock reaches nearly 140 million vehicles and accounts for 7% of the global vehicle fleet.

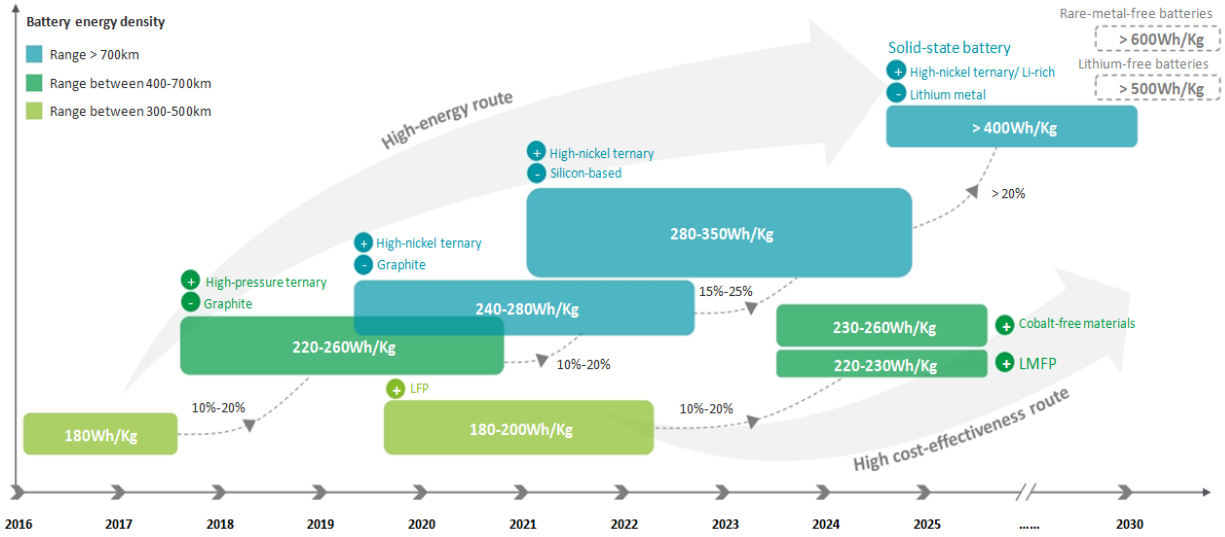


Notes: PLDVs = passenger light-duty vehicles; LCVs = light commercial vehicles; BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle.

Source: IEA analysis developed with the IEA Mobility Model.

Technical Route of EV Battery

High-energy and high cost-effectiveness are the two main routes in the development of EV battery technologies, with the key being the upgrade of the underlying battery chemical systems.



Source：Expert interview, public information, Deloitte analysis

Packaging Routes for EV Battery

EV batteries are most commonly seen in prismatic, cylindrical and pouch packaging. Prior to 2017, the packaging share and trends within and outside of China were relatively consistent. Due to the expansion and mass-production of top players on each route, different trends were seen in recent year.

Comparison of Different Packaging Routes

	Prismatic Battery	Cylindrical Battery	Pouch Battery
Technical Advantages	• High level of safety • High systematic energy efficiency, relatively high energy density • Relatively simple structure, good stability, convenient for capacity expansion	• High flexibility in grouping • Matured production techniques, highly standardized production lines • Relatively low costs	• High flexibility in size variations, relatively low weight • High energy density • Low internal resistance, high level of safety
Technical Disadvantages	• Production techniques are highly variable, resulting in significant individual heterogeneity • In mass-application, system life is often much shorter than individual cell life	• Post-grouping heat dissipation remains a challenge for design • Low unit capacity, relatively low energy density	• Weak mechanical strength, complicated sealing technology • Complicated grouping structure, complex requirements for design • Relatively high costs

Top Players in China

According to SNE Research, the amount of energy held by batteries for electric vehicles (EV, PHEV, HEV) registered worldwide in 2022 was 517.9GWh, a 71.8% year-to-year increase, and 6 out of TOP 10 global installed EV battery suppliers are from China. The Chinese manufacturers including CATL and BYD have boasted an explosive growth.

CATL is running far ahead of others with 191.6GWh and a 92.5% year-to-year growth in 2022, increasing its market share from 33% in 2021 to 37% in 2022. LG Energy Solution and BYD are in fierce competition for the 2nd place in the ranking, both with 70.4GWh in 2022. BYD's market share reached 13.6% in 2022, with a 167.1% year-to-year growth.

2022 Global Installed EV Battery (GWh)					
Rank	Supplier	Year 2022	Year 2021	YOY Increase	Market Share
1	CATL	191.6	99.5	92.5%	37.00%
2	LG	70.4	59.4	18.5%	13.60%
3	BYD	70.4	26.4	167.10%	13.60%
4	Panasonic	38	36.3	4.60%	7.30%
5	SK On	27.8	17.3	61.10%	5.40%
6	Samsung SDI	24.3	14.5	68.50%	4.70%
7	CALB	20	8	151.60%	3.90%
8	Gotion	14.1	6.7	112.20%	2.70%
9	Sunwoda	9.2	2.6	253.20%	1.80%
10	Farasis Energy	7.4	2.4	215.10%	1.40%
Others		44.5	28.5	55.9%	8.60%
Total		517.9	301.5	71.8%	100%

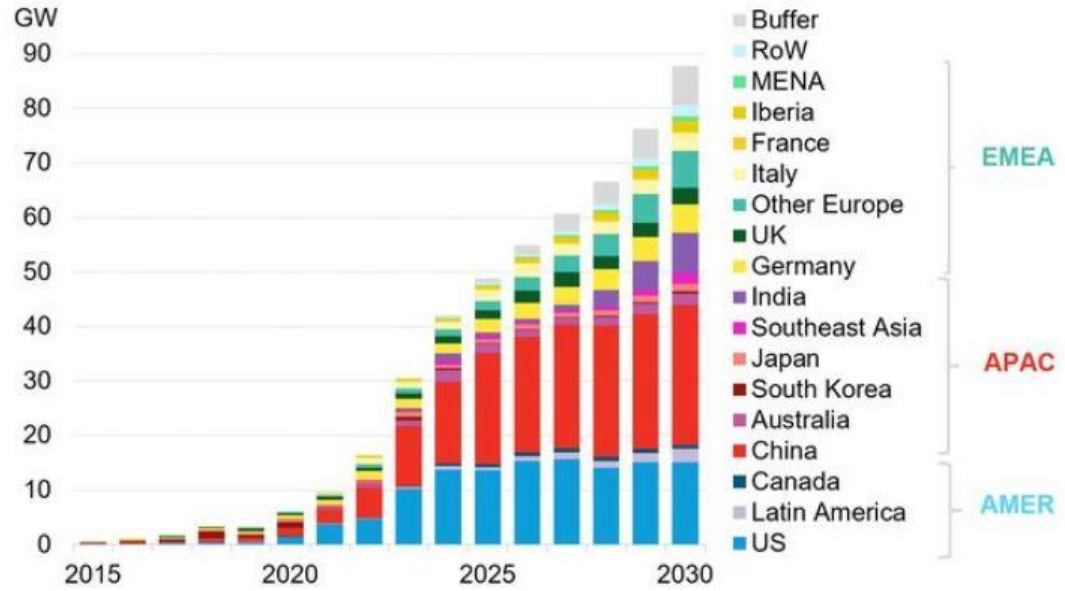
2. Energy Storage Battery

The global energy storage hit another record year in 2022, adding 16 gigawatts/35 gigawatt-hours of capacity, up 68% from 2021. The ambitious energy storage target is announced totaling more than 130GW by 2030.

By the Numbers

66%	Increase in 2030 China forecast due to new provincial targets
1GW/2GWh	2022 residential storage deployments in Italy
508GW/ 1,432GWh	Global cumulative capacity by the end of 2030

Global gross energy storage capacity additions by key market



Source: BloombergNEF

Note: MENA = Middle East and North Africa. EMEA = Europe, Middle East and Africa. APAC = Asia Pacific. AMER = Americas. Countries ordered by regional group. Buffer = headroom not explicitly allocated to an application. RoW = rest of the world.

China overtakes the US as the largest energy storage market in megawatt terms by 2030. This is due to China's new provincial energy storage targets, power market reforms and industry expectations supporting significant new capacity. In contrast, project delays continue to slow US deployments, with 7.2GW/18.4GWh of utility-scale storage projects delayed in 2022.

Top Players in China

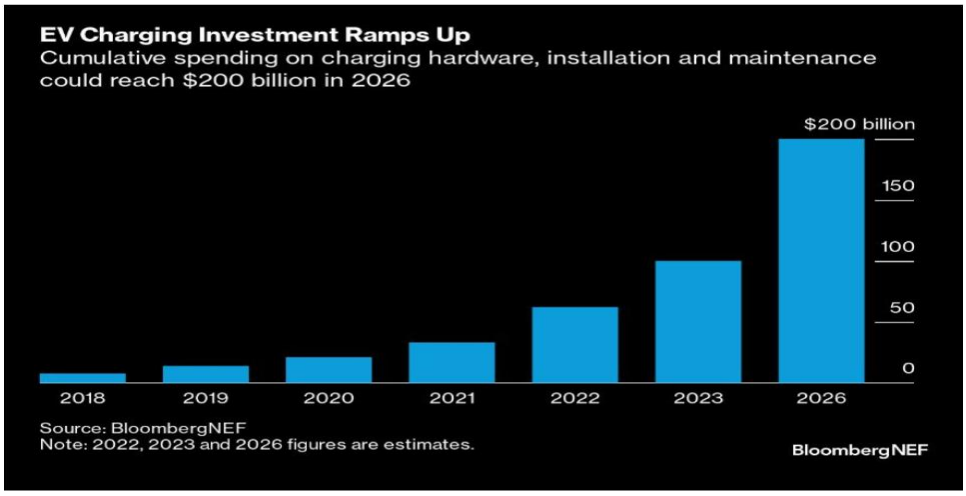
In 2022, China's CATL, BYD and EVE ranked TOP 3 in the global energy storage battery market.

Global Sales of Energy Storage Battery (MWh)						
Rank	Supplier	Year 2021	Year 2022	Increased	2021 Market Share	2022 Market Share
1	CATL	17,000	53,000	212%	38.3%	43.4%
2	BYD	4,500	14,000	211%	10.1%	11.5%
3	EVE	1,000	9,500	850%	2.3%	7.8%
4	LG	7,900	9,200	16%	17.8%	7.5%
5	Samsung SDI	8,200	8,900	9%	18.5%	7.3%
6	Rept Battero	1,400	7,500	436%	3.2%	6.1%
7	Great Power	500	5,800	1060%	1.1%	4.7%
8	Gotion	500	5,500	1000%	1.1%	4.5%
Others		3,400	8,800	159%	7.7%	7.2%
Total		44,400	122,200	179%	100%	100%

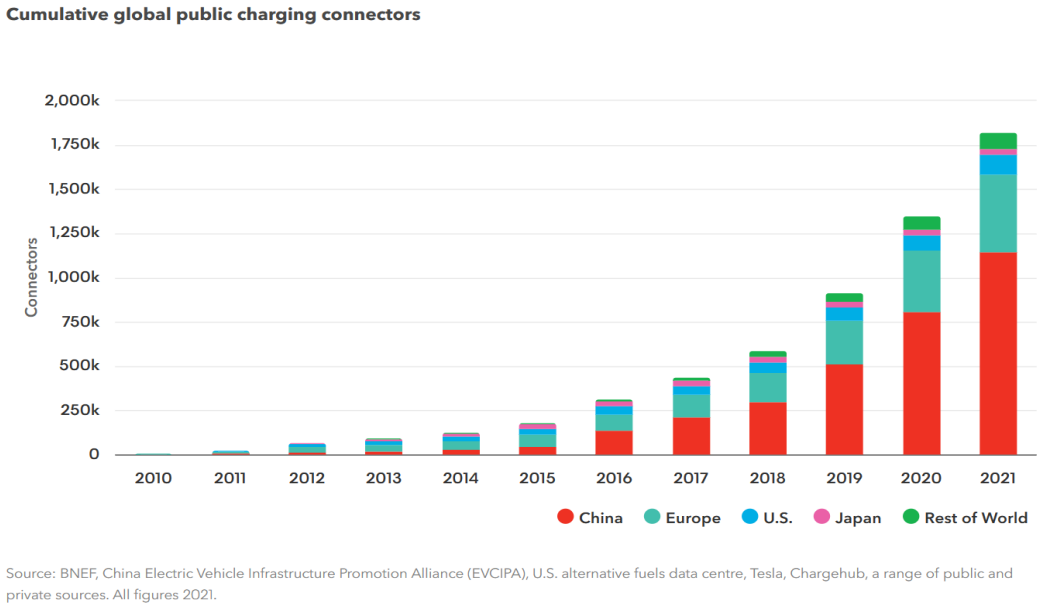
Data resource: SNE Research

3. Charging Stations

There are currently more than 12 million active EV plug points globally, with the number of home chargers exceeding public chargers. That will likely flip as the adoption of EVs increases. Nowadays with the investment on EV charging ramping up, more and more charging stations are being built, and each country is likely to have its own optimal mix of home, workplace and public chargers. Also, it is predicted that the investment on the charging infrastructure will reach USD 200 billion in 2026.



It is undeniable that China has accounted for a big part of the production of global public charging connectors and has kept ranking first in market share, and China may have the potential to maintain this trend.

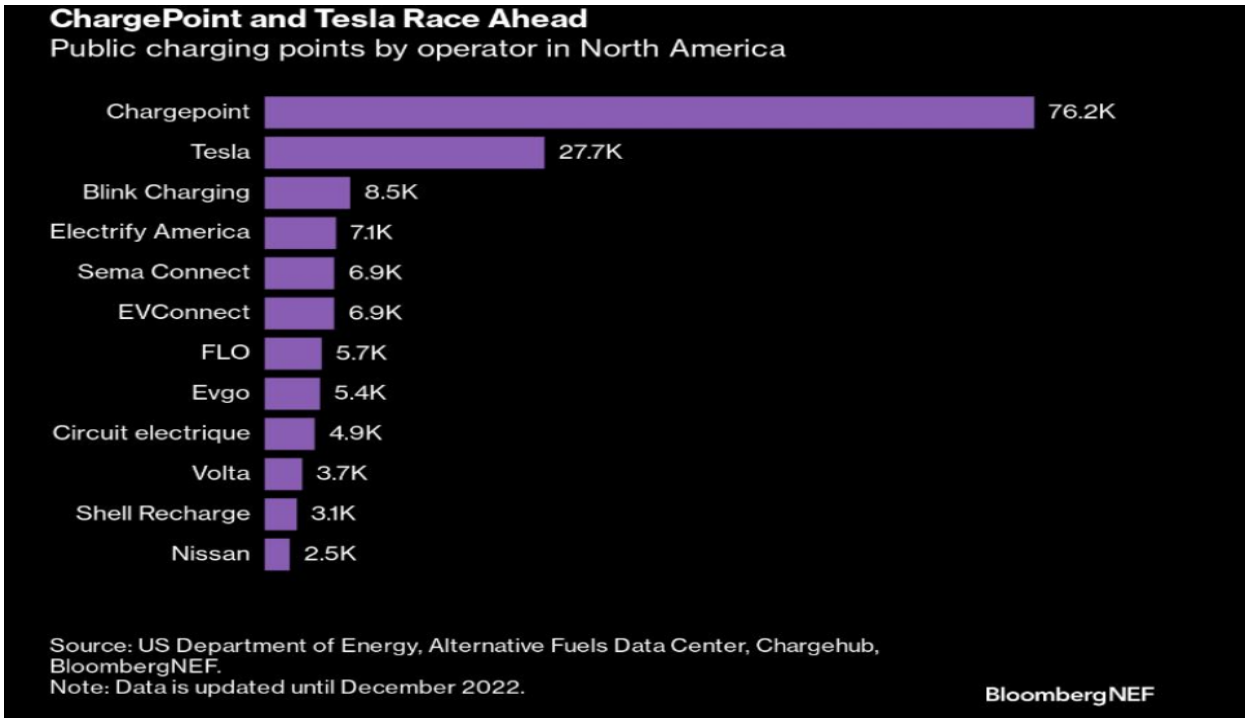


Source: BNEF, China Electric Vehicle Infrastructure Promotion Alliance (EVCIPA), U.S. alternative fuels data centre, Tesla, Chargehub, a range of public and private sources. All figures 2021.

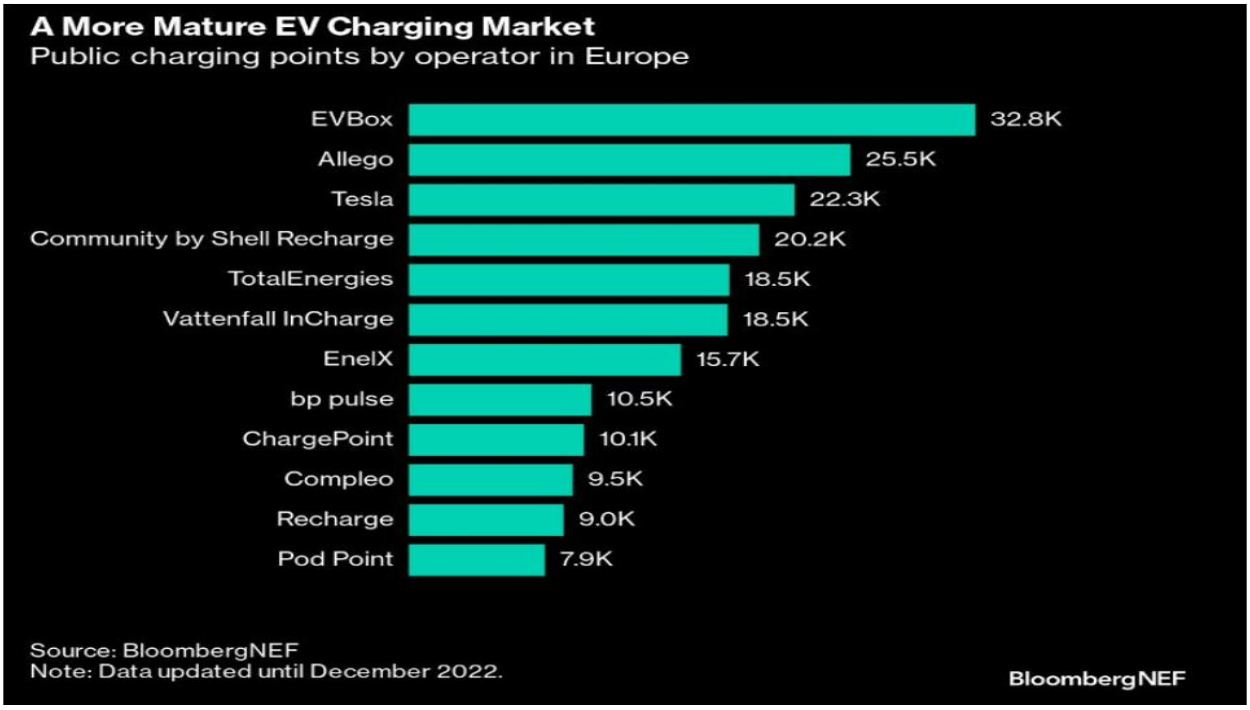
China and Europe are taking the lead. The US is gaining traction, however, with government funds having been set aside specifically for charging infrastructure under the bipartisan infrastructure law.

Top Players in Different Places

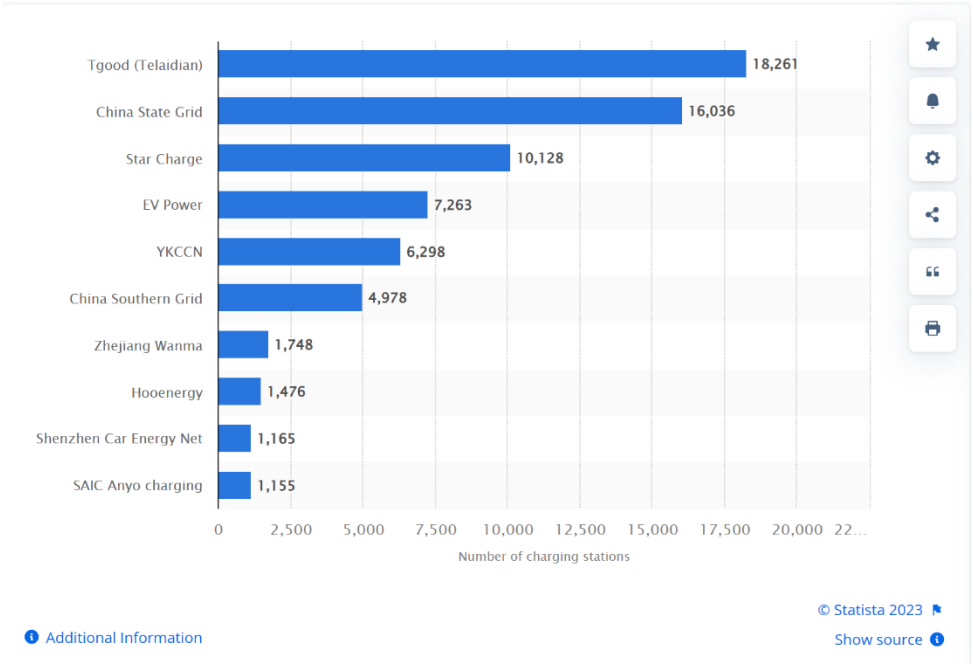
--North America



--Europe



--China



Top ten leading public electric vehicle (EV) charging companies in China as of February 2022

4. 3C Battery

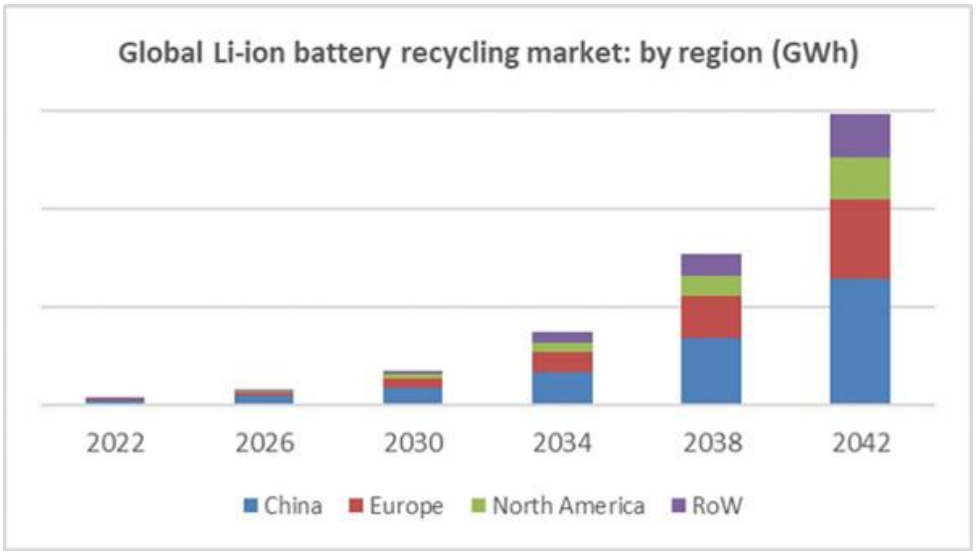
3C batteries are everywhere in our daily life which covers all kinds of electronic devices like mobile phone, computer, laptop, tablet computer, digital camera, Walkman, electronic dictionary, audio and video player hardware or digital audio player, etc.

Although $LiCoO_2$/LCO batteries have disadvantages in expensive cobalt price, low cycling and safety performance, the market demand is still increasing. With high tap density and working voltage, $LiCoO_2$/LCO batteries play leading role in the field of ultra-thin electronic products.

China 3C battery head manufactures include ATL, BYD, Zhuoneng New Energy, Lishen, Great Power, Shanshan and etc.

5. Recycle Battery

Lithium battery recycling is a major issue. It is expected that 11 million tons of used lithium batteries will likely accumulate before the year 2030.



Source: IDTechEX

Lithium battery recycling advantages:

- Protect the environment
- Recover critical materials
- Generate incomes
- Reduce energy consumption and CO2 emissions
- Contribute to the circular economy

6. Home Appliance Battery

Home appliance battery can be seen in vacuum cleaner, sweeping robot, mopping machine and etc.

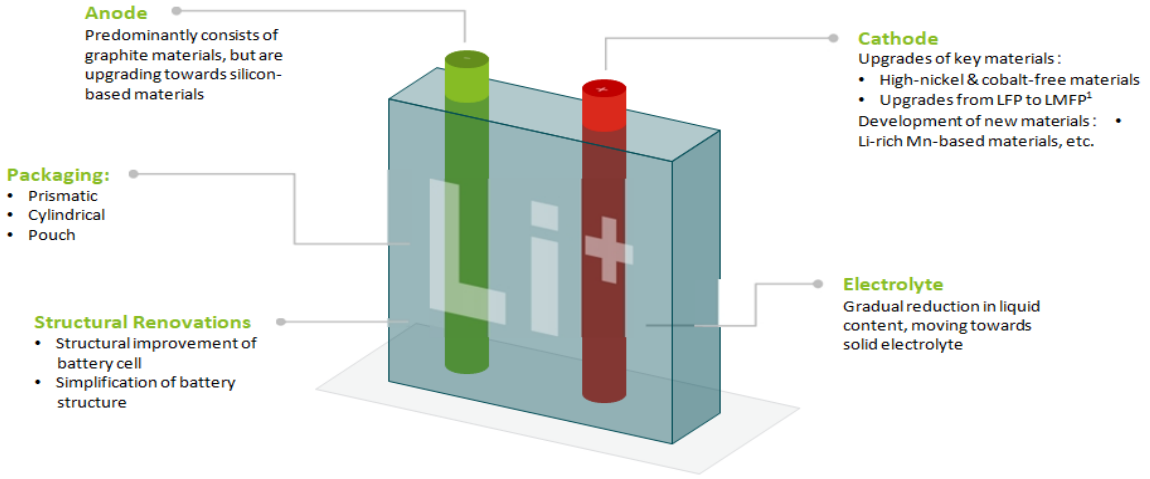
7. Power Tool Battery

Power tool, heavy duty power pool, lawn and garden tool, etc.

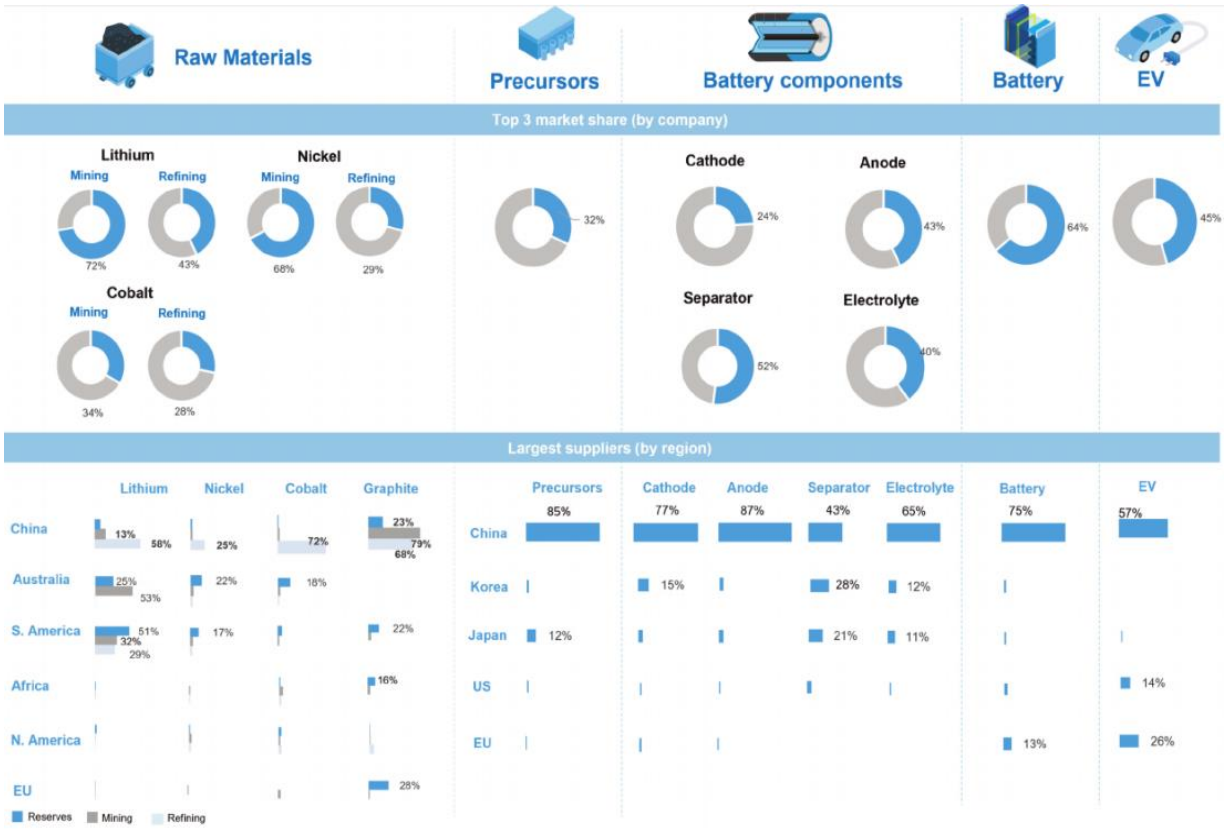
The global lithium battery power tool market is expected to grow from USD 12.36 billion in 2022 to USD 21.56 billion in 2029. The key factor driving market growth is the increasing use of cordless power tools in the market, the growing demand for fastening tools in industrial environments and growth in the construction industry in emerging economies.

IV. Raw Materials of Electrification

Currently, lithium batteries are mainly comprised of the key components of cathode, anode and electrolyte. Enterprises are actively seeking technological innovation and breakthroughs in various parts.



China dominates the supply of intermediate battery materials and components, despite having a modest share of resources and raw materials (data of 2021)



1. Cathode Material

From the perspective of competition pattern, the market concentration of lithium cobaltate has been increasing in recent years, and the trend of head concentration has gradually emerged. The high concentration of lithium cobaltate is closely related to the significant stratification of high and low-end products, the increase of high-end product barriers, and the maturity of the overall market. In the future, high-voltage lithium cobaltate and other products may promote the further increase of product barriers.

2. Anode Material

Because the consistency and cycle performance of artificial graphite is better than that of natural graphite, which is more suitable for the demand of power and energy storage batteries, the shipment proportion of artificial graphite continues to increase, while the market share of natural graphite declines. The market concentration of negative anode materials in China is high and the competition pattern is relatively good.

3. Electrolyte

Current concentration of lithium battery electrolyte industry is high. At the same time, Chinese Li-ion battery electrolyte leading enterprises have been continuing to invest in plant expansion, thus the industry competition pattern is stable and the concentration is further improved.

4. Separator

The methods of manufacturing diaphragm are divided into dry method and wet one. From the perspective of diaphragm product structure, the market is still dominated by the diaphragm made by the wet method.

5. Copper Foil

Benefiting from the rapid development of China's new energy vehicles and lithium battery industry, the development of China's lithium copper foil is in a leading position in the world, with products covering thin copper foil, ultra-thin copper foil and ultra-thin copper foil. At

present, the market for 6-nanometer lithium battery copper foil is broad, while that for the traditional 7-8 nanometer copper foil is competitive.

Now China has become the world's largest producer of lithium copper foil.

6. Aluminum Plastic Film

Generally, the market size of China's Aluminum plastic film industry is expanding.

7. Equipment

The production process of lithium battery is mainly divided into front section, middle section and rear section. The value of the equipment employed in front section is the highest, while the production of the front section equipment is mainly controlled by Japanese and Korean enterprises. China has a technological advantage in the manufacturing the equipment employed in the middle and rear section and has reached the international advanced level. Hence, the price advantage is obvious.

8. Battery Pack

Battery pack is a combination of single or multiple battery cells with protective plates or other battery accessories. Lithium battery pack can be customized designed according to the market demand.

9. Battery Management System

The battery management system (BMS) is responsible for safe operation, performance, and battery life under diverse charge-discharge and environmental conditions. When designing a BMS, engineers develop feedback and supervisory control that:

- ✓ Monitors cell voltage and temperature
- ✓ Estimates state-of-charge and state-of-health
- ✓ Limits power input and output for thermal and overcharge protection
- ✓ Controls the charging profile
- ✓ Balances the state-of-charge of individual cells
- ✓ Isolates the battery pack from the load when necessary

V. One-stop Electrification Solution Services We Provide

With strong network to those different Chinese key players and suppliers in different battery aspects, we make this work available to client- partners through our consulting services on a cost-effective solution.

1. **Sourcing Management**

✓ **Raw materials sourcing,** such as anode and cathode materials, electrolytes, separators, etc. for customers who want to produce battery cells.

✓ **Power batteries and energy storage batteries sourcing**, such as battery cells, battery packs, battery modules, spare parts, ESS, BMS

✓ **Lab, testing and production equipment sourcing**.

✓ **PCBs, sensors and other related electronics.**

✓ **Engineering plastics, thermoforming covers, CNC sheet box and lid sourcing.**

✓ **Other related accessories sourcing.**

✓ **Price negotiation and contract confirmation**, represent the clients to negotiate product price with the potential suppliers and coordinate with the final contract signature.

✓ **After service assistance**, communicate between the clients and Chinese suppliers for any after service issues.

✓ **Supplier on-site auditing：** Supervise and control quality for foreign companies to ensure that products meet customer's standard requirements.

✓ **Provide logistics services** from China to overseas for foreign companies, including transportation, customs clearance, and warehousing. Help foreign companies optimize supply chain management, coordinate suppliers and logistics, and reduce supply chain risks and costs.

✓ **Third party recommendation: such as testing agency, certification institution, etc.**

2. Partners Development

- ✓ **Find business and technical partners**
- ✓ **Find JV partners**
- ✓ **Find finance/investment**

3. Other Consulting Services

- ✓ **Rep office program**

The clients can hire employees in China via NTC. NTC will provide office space, water, electricity, stationery, printer, landline and etc to the hired employees. NTC can be a supervisor on the employees as requested by the clients.

- ✓ **China expo/conference representing**

This could involve exhibiting products or services, attending meetings or seminars, or networking with potential partners or customers. Promote the company and establish new business relationships.

- ✓ **Product development and customization**

Assist foreign companies in developing and customizing battery packs and related supporting products that meet their product and market needs.

- ✓ **Technical support and consulting**

Provide the latest information on the development of the Chinese market and local industries, as well as technical support and consulting services for foreign companies.

VI. Our Competitiveness

1. Strong Database of Chinese Electrification Industry Companies

With 25+ years' experience in supply chain management consultancy and 13 years' in electrification solution business, NTC has established a comprehensive database which includes the latest information of Chinese companies involved in the electrification industry.

2. Close to the Supplier Market

With headquarters both in China and Canada, NTC maintains good relationship with the major Chinese suppliers in each electrification industry, especially for Li-ion battery suppliers.

3. Professional Team

NTC team has 10+ years' consulting experience in the electrification industry. We use both Chinese and English as our working language which leads to a smooth communication between our clients and the Chinese suppliers.

4. Cost Effective

Due to the strong networking in Chinese electrification industry, NTC is capable of securing competitive quotation while providing quality products from Chinese suppliers which significantly saving cost for our clients.

5. High Efficiency

NTC has Chinese professional team with abundant experience in the electrification industry which allows us to communicate with Chinese suppliers in time and without any barriers and promptly feedback to our clients.

6. Various Exhibitions & Trade Shows

With the lifting of COVID-19 restrictions, Chinese economy is recovering in 2023. Various exhibitions and trade shows will be held in China in the coming months. NTC can attend the exhibitions & trade shows on behalf of the clients.

VII. Our Partners & Clients

远东电池
FAR EAST BATTERY
当升科技
EASPRING
ARASIS
孚能科技
CHAM
创明电池
LEAD先导
均胜电子
JOYSON ELECTRONICS
EBAK
新威
NEWARE
高特电子
GOLD ELECTRONIC
海博思创
HYPER STRONG
CEEC 中国能建
ENERGY CHINA
HUASU 华塑
iPotisEdge
精控能源
Kgooer科工
科列
ZTT
中天科技
里德
锂动科技
LITHIUM TECHNOLOGY
MSENERGY
美克生能源
派能科技
PYLONTECH
BMSer 协能科技
高泰昊能
UDAN优旦
TLES 炫途储能
华能清洁能源研究院
Goldwind
Carbon Neutral
天邦达
TIAN POWER
PACEEK 沛城科技
科曜能源
KOYOE
VREMT
LIGOO 力高技术

VIII. Electrification Products List

- **Customer Battery:**

(1) Cylindrical Cell

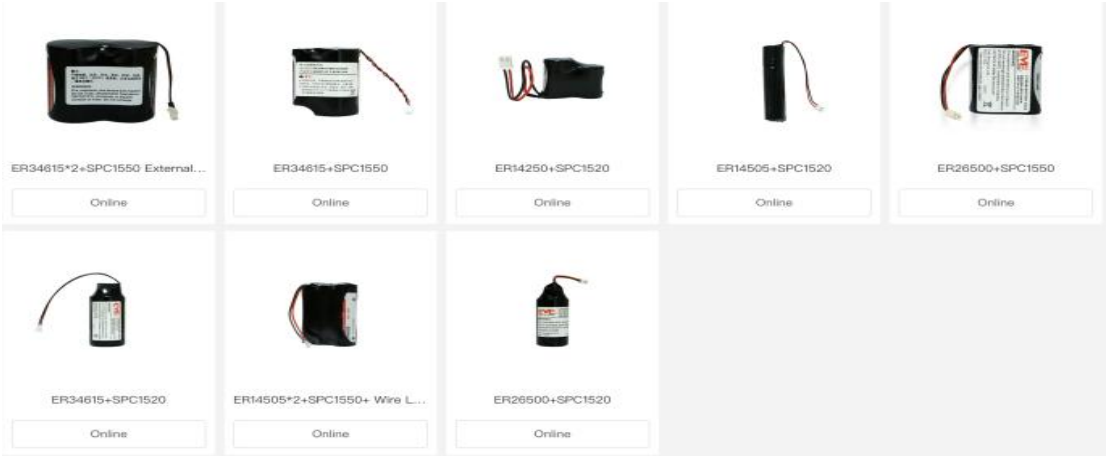
Type	Item	Model	Capacity (mAh)	Voltage (V)	Impedance (mΩ)	Max. Continuous Dis. Current	Cut Off Voltage (V)	Cycle Life (Charge/Discharge Current)				Discharge Operating Temperature (℃)
14500	Medium-rate	14500F2	850	3.6	≤70	1.7 A (2 C)	2.75	≥300	80%	2.75V-4.2V	1 C / 1 C	-20 ~ 60
18650 2.0Ah -2.2Ah	high-rate	18650F2P	2000	3.7	≤20	20 A (10 C)	2.75	≥300	70%	2.5V-4.2V	4 A / 20 A	-20 ~ 80
	Medium-rate	18650F2T	2000	3.65	≤40	6 A (3 C)	2.0	≥400	60%	2.0V-4.2V	1 C / 1.5 C	-40 ~ 90
	high-rate	18650F5P	2200	3.6	≤20	11 A (5 C)	2.75	≥500	80%	2.75V-4.2V	1 C / 1 C	-20 ~ 75
	Capacity	18650F56	2200	3.7	≤60	2.2 A (1 C)	3.0	≥300	80%	3.0V-4.2V	0.5 C / 0.5 C	-20 ~ 60
18650 2.5Ah -2.6Ah	high-rate	18650F8P	2500	3.6	≤18	30 A (12 C)	2.5	≥250	60%	2.5V-4.2V	4 A / 20 A	-20 ~ 80
	Medium-rate	18650F8L	2600	3.6	≤30	7.5 A (3 C)	2.9	≥1000	70%	2.9V-4.1V	0.5 C / 1 C	-20 ~ 60
	Medium-rate	18650F8M7	2600	3.6	≤30	7.5 A (3 C)	2.75	≥1000	70%	2.75V-4.1V	0.5 C / 1 C	-20 ~ 60
	Capacity	18650F8R	2600	3.7	≤60	2.6 A (1 C)	3.0	≥300	80%	3.0V-4.2V	0.5 C / 0.5 C	-20 ~ 60
18650 2.9Ah -3.5Ah	Medium-rate	18650F9P(L)	2900	3.6	≤40	8.7 A (3 C)	2.5	≥1000	70%	2.5V-4.2V	0.5 C / 1 C	-20 ~ 60
	High Capacity	18650F30	3000	3.7	≤60	4.5 A (1.5 C)	3.0	≥300	80%	3.0V-4.2V	0.3 C / 0.5 C	-20 ~ 50
	High-rate	18650F30P	3000	3.6	≤18	30 A (10 C)	2.5	≥300	60%	2.5V-4.2V	4 A / 20 A	-20 ~ 75
	Medium-rate	18650F9M	3200	3.6	≤40	9.3 A (3 C)	3.0	≥1000	80%	3.0V-4.1V	0.3 C / 0.5 C	-20 ~ 50
	High Capacity	18650F9L	3350	3.6	≤60	4.8 A (1.5 C)	2.75	≥300	80%	2.75V-4.2V	0.3 C / 0.5 C	-20 ~ 50
	Medium-rate	18650F9E	3500	3.6	≤40	10 A (3 C)	2.75	≥1000	70%	3.0V-4.1V	0.2 C / 1 C	-20 ~ 50
21700	Medium-rate	21700F2E	5000	3.62	≤25	15 A (3 C)	2.5	≥1000	70%	2.5V-4.2V	0.3 C / 1 C	-20 ~ 60
	High Capacity	21700F2V	5200	3.65	≤40	7.8 A (1.5C)	2.75	≥1000	70%	2.75V-4.2V	0.5 C / 1 C	-20 ~ 50

(2) Consumer Li-ion battery

(3) Li-SOCI2 battery

(4) Li-MnO2 battery

(5) Battery capacitor SPC



(6) ER+SPC Solution

- **Power Battery:**

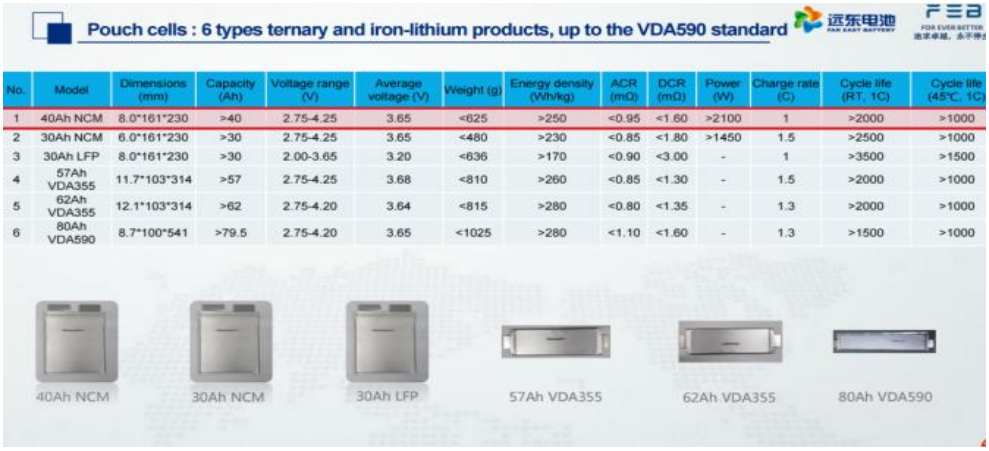
(1) Prismatic LFP cell

(2) Cylindrical LFP cell

(3) Prismatic NCM cell

(4) Energy storage & Reefer container power supply system & Energy Storage System（ESS)

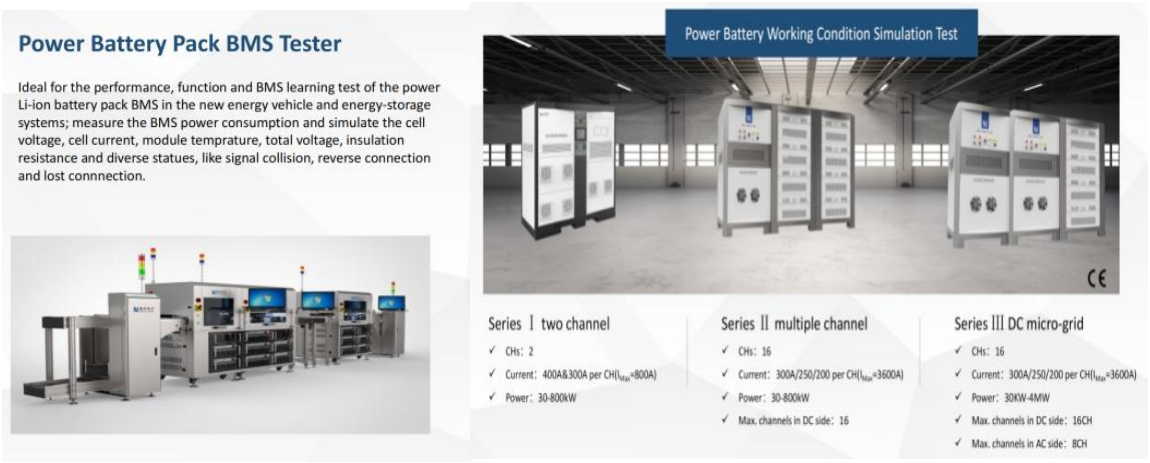
(5) Pouch NCM cell



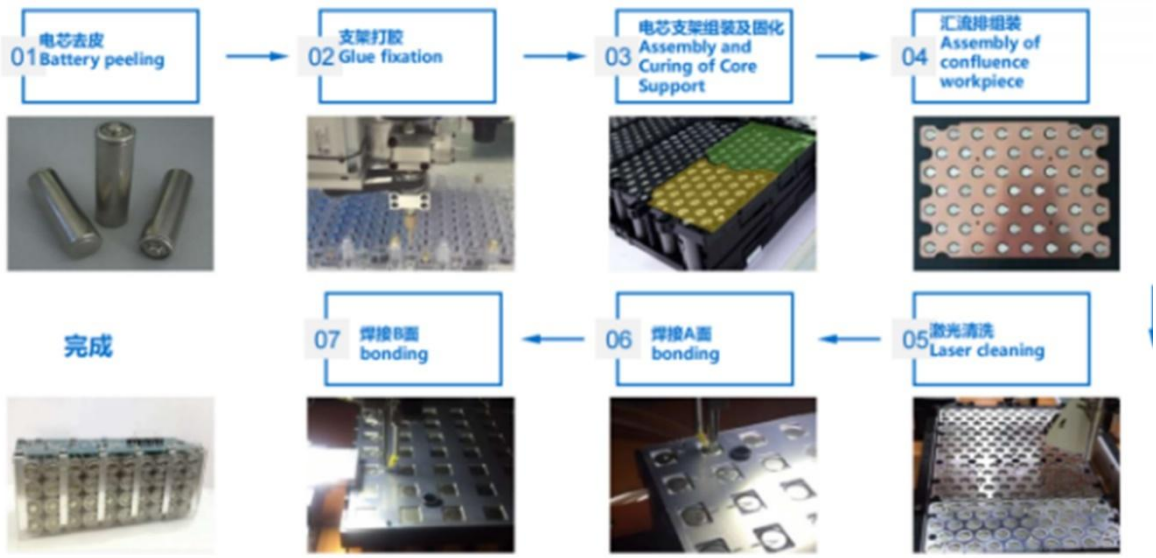
- **Custom Solutions**

(1) Battery module & pack（customized）：Robotic cleaner battery; mop cleaner battery; Lead-acid batteries

- **Battery test equipment for EV**



- **Module production line, Pack production line, Pack disassembly and Assembly line, Wire welding machine**



- **Positive and negative electrode material, Electrolyte, Separators**

Mainly oxides, such as lithium cobalt oxide, ternary materials (such as lithium nickel cobalt manganese oxide), quaternary materials (such as lithium iron phosphate); graphite and silicon materials

- **Energy storage**

Large scale energy storage, micro grid, distributed energy, home storage system, communication base station energy storage, industrial energy storage technology, home energy storage, electric car storage charge (change) power plants, BMS battery management system, PCS storage energy inverter and variety of chemical energy storage and physical energy storage products.

- **Charging equipment**

Charging station and related facilities, parking lot charging facilities and intelligent monitoring equipment, charging station power supply solution, charging stations, smart grid solutions, etc.

Appendix.

China Exhibitions to be Held in 2023:

(1) May 16-18, 2023, *14th China International Battery Fair (CIBF)*

(2) Jun. 7-9, 2023, *2th China International Battery Technology Exhibition (CBTE)*

(3) Jun. 14-16, 2023, *Shanghai International New Energy Storage Industry and Lithium Battery Technology Exhibition (ESS)*

(4) Jul. 6-8, 2023, *2023 China Power Technology Equipment & Photo Voltaic Industry and Energy Storage Exhibition (PETE)*

(5) Jul. 26-28, 2023, *2023 China International Energy Storage and Lithium Battery Technology Exhibition (CBTC)*

(6) Aug. 8-10, 2023, *8th World Battery Industry Expo (WBE)*

(7) Aug. 29-31, 2023, *Shanghai International Battery Fair (CNIBF)*

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