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OVERVIEW OF THE GLOBAL ENERGY STORAGE INDUSTRY

In recent years, in order to promote global sustainable development, various countries have actively responded to carbon emission reduction target. Energy, as the lifeblood of national economic development and an important cornerstone of national security, plays a crucial role. To ensure energy security and sustainability, countries around the world have proposed and implemented development strategies for energy structure transformation and building a green and low-carbon economy.

Electricity is one of the major forms of global end-use energy consumption. Driven by the rapid development of global transportation, industrial manufacturing, artificial intelligence and other industries, global electricity demand continues to rise. Global electricity consumption is expected to increase from 26,000TWh in 2024 to 70,000TWh in 2050, and the electrification rate will increase from 21.5% to 40.0%.

The robust growth of electricity demand has driven the continuous expansion of power supply, further promoting the upgrades and transformation of the supply structure. By virtue of its advantages of being clean, renewable, widely distributed and easily accessible, the proportion of renewable energy, dominated by wind and solar power, in the global electricity mix has continued to increase. The proportion of global wind and solar power generation is expected to increase from 16.5% in 2024 to 30.0% in 2030, and is expected to reach 60.0% in 2050. However, due to the large-scale grid integration, the intermittency and volatility of renewable energy has brought challenges to the safe operation of power systems. Therefore, energy storage, which can store excess electricity and release when needed, has become a key method to solve the problem of insufficient power grid's dispatchability for renewable energy. Currently, renewable energy equipped with ESS in certain regions have shown obvious economic viability. With the technological advancements and scaled application, the cost-effectiveness of energy storage will continue to improve, driving the industry into a period of rapid growth.

Overview of the Energy Storage Market

Energy storage enables the storage, conversion and release of electricity through mediums. In terms of utility scenarios, energy storage can cope with the intermittency, volatility, and spatial mismatch challenges associated with wind and solar power generation. In other scenarios, energy storage can meet the demands for energy management and emergency backup.

In recent years, the energy storage industry, driven by both policy guidance and market demand, has ushered in tremendous development opportunities. On one hand, through formulating carbon-neutral strategies and renewable energy quota policies, governments around the world have enhanced the role of energy storage in energy transition and power systems, providing guidance and support for the development of the energy storage industry. On the other hand, the establishment and improvement of multi-level market systems including the electricity spot market, medium- and long-term market, auxiliary service market and capacity market, have further enriched the revenue models for energy storage.

In the future, as the proportion of wind and solar power generation continues to increase, the duration demand for energy storage in power systems will gradually increase, and the long-duration energy storage (LDES) technologies will exhibit great potential and value in various scenarios. Additionally, the rapid development of artificial intelligence has facilitated a surge demand of electricity in data centers, making the combination of renewable energy and energy storage an effective solution to meet the fast-growing electricity demand in data centers.

Overview of Energy Storage Technologies

Energy storage mainly can be categorized into physical energy storage and electrochemical energy storage by technology routes, of which, electrochemical energy storage can be further categorized into lithium-ion battery energy storage, sodium-ion battery energy storage, flow battery energy storage, lead-acid battery energy storage, etc., while physical energy storage can be further categorized into pumped hydro storage, compressed air energy storage, etc.

Comparative Analysis of Different Technology Routes of Energy Storage, 2024

Category	Physical Energy Storage				Electrochemical Energy Storage				
Storage Type	Pumped Hydro Storage	Compressed Air Energy Storage	Gravity Energy Storage	Flywheel Energy Storage	Lithium-ion Battery	Sodium-ion Battery	Flow Battery	Lead-acid Battery	Solid-state battery
Efficiency	70%-75%	50%-70%	> 85%	> 90%	85%-98%	> 80%	75%-85%	70%-90%	80%-90%
Cycle Life	40-60 years	40-50 years	30-35 years	20 years	12,000 times	25,000 times	10,000 times	4,000 times	20,000 times
Power Density (Wh/kg)	0.5-1.5	30-60	5-20	50-150	150-250	70-160	10-30	30-50	400
Construction Period	●	◕	◕	◕	◔	◔	◑	◔	◔
Commercialization Process	●	◑	◔	◔	●	◑	◑	●	◔

Source: CIC

Note:

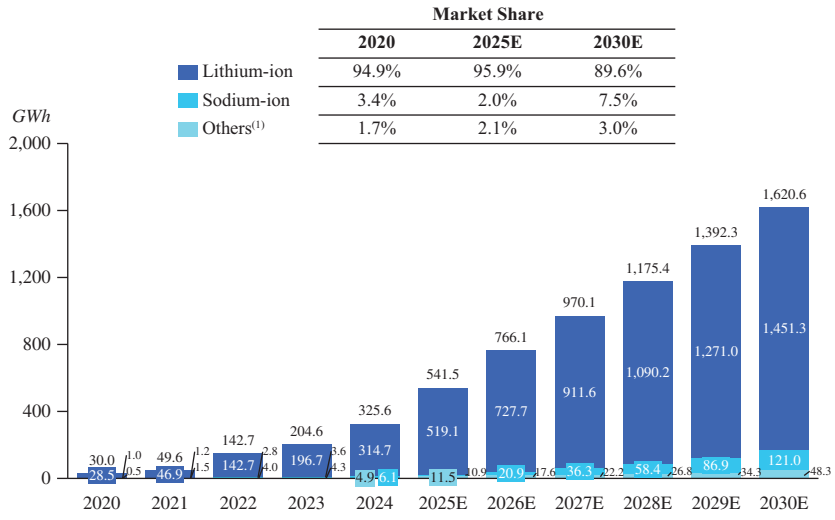
(1) ◔ → ● indicates the relevant indicators from low to high.

The commercial process of physical energy storage, except for pumped hydro storage, still needs technology validation, while pumped hydro storage is limited by terrain restrictions and long construction period.

Lithium-ion energy storage is the most mainstream electrochemical technology at present, and lithium-ion batteries have established a mature industrial chain and significant cost advantages and rapidly achieved industrialization in the field of energy storage. By virtue of its rapid response capability, flexible deployment and other characteristics, lithium-ion energy storage has became one of the essential dispatchable resources of the power grid. It is expected that by 2030, the global shipment volume of lithium-ion ESS batteries will reach 1,451.3GWh, accounting for approximately 90.0% of the shipment of electrochemical ESS batteries.

Sodium-ion batteries, with their performance advantages such as wide range of temperature durability, high safety and high charge/discharge rate, also show broad application prospects in the field of energy storage. It is expected that by 2030, the global shipment of sodium-ion ESS batteries will reach 121.0GWh, accounting for 7.5% of the shipment of electrochemical ESS batteries, serving as a complementary role with lithium-ion energy storage.

Market Size of Global ESS Battery Shipments, by Technology Routes, 2020-2030E



Source: Infolink, BNEF, CIC

Note:

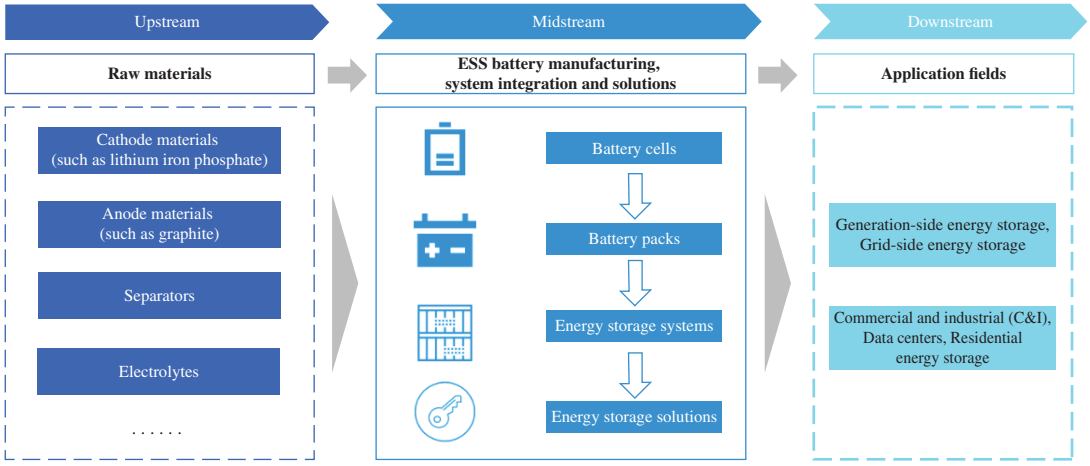
(1) Others include flow battery, lead-acid battery, etc.

OVERVIEW OF THE GLOBAL LITHIUM-ION ENERGY STORAGE INDUSTRY

Analysis of Lithium-ion Energy Storage Value Chain

The lithium-ion energy storage industry chain is divided into three major parts: upstream raw materials, midstream manufacturing and downstream applications. The upstream focuses on core raw materials such as cathodes (mainly lithium iron phosphate), anodes (graphite), separators, electrolytes, etc., and improves battery performance through material modification and electrode design. The midstream covers battery manufacturing and system integration, extending to energy storage solutions. The downstream covers utility energy storage, data center energy storage, and other energy storage scenarios. The diversified energy storage scenarios are driving ESS batteries and systems to iterate toward longer duration, higher safety and greater energy efficiency. With the stabilization of upstream material costs and innovations in downstream business models, midstream enterprises continue to expand their profitability by virtue of continuous product and technology innovation and business models that extend to full life cycle energy storage solutions.

Lithium-ion Energy Storage Industry Chain



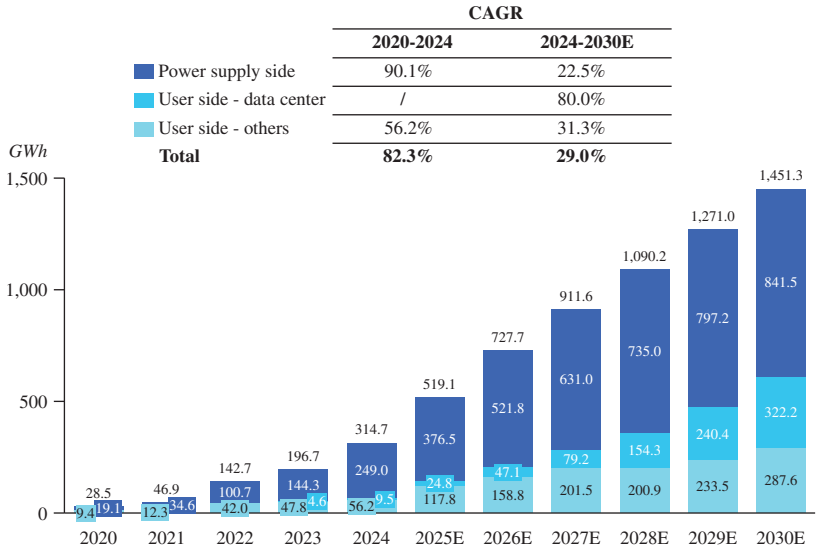
Source: CIC

Overview of the Global Lithium-ion Energy Storage Market

Market Size of Global Lithium-ion Energy Storage Industry

The global shipment volume of lithium-ion ESS batteries increased from 28.5GWh in 2020 to 314.7GWh in 2024. It is expected that the shipment volume of lithium-ion ESS batteries will further increase to 1,451.3GWh by 2030, with a CAGR of 29.0% from 2024 to 2030. The utility energy storage is the largest application scenario in the market. Meanwhile, artificial intelligence is driving the rapid development of data centers. The demand of lithium-ion ESS batteries used in the data centers will increase from 9.5GWh in 2024 to 322.2GWh in 2030, with a CAGR expected to reach 80.0% during the period.

Global Lithium-ion ESS Battery Shipments, by Application Scenarios, 2020-2030E



Source: InfoLink, CIC

Among different regions, China is an important part of the lithium-ion energy storage market, having established a comprehensive industrial chain and mastered the vast majority of the global lithium-ion ESS battery production capacity. The U.S. and Europe, the second and third largest energy storage market, are estimated to play an increasingly important role driven by policy incentives and market demand. On the one hand, Chinese lithium-ion ESS battery enterprises will continue to advance product upgrades toward larger capacities and longer lifetimes in the future, to meet the demand for high-quality ESS products in the market; on the other hand, by establishing globalized R&D and production capacities in the United States, Europe and emerging markets, the localized demand across regions, arisen by the differences in product demand and diverse policy environments, can be addressed.

Demand for LDES is Driving the Development of the Lithium-ion Energy Storage Market

Compared with the long approval and construction cycle of traditional fossil fuel power stations, comprehensive projects of wind and solar power paired with ESS will gradually replace fossil fuel to become the main power generation units deployed in the future by virtue of the advantages of low cost and short construction cycle. It is expected that the proportion of wind and solar power generation will reach 30.0% and 60.0% of total power supply by 2030 and 2050.

With the increasing proportion of renewable energy grid integration, the intermittency and volatility of power supply is further intensified, where its stability is also facing tough challenges. In result of that, the demand for long cycle and inter-day power grid dispatchable resources is increasing, and also driving the rapid development of LDES for 4 hours or longer. In utility energy storage scenario, lithium-ion LDES mitigates "curtailment of wind and solar

power generation" over a long-term cycle, while showing better cost-effectiveness. In 2024, the LCOE of PV+ESS coupling projects utilizing LDES in certain scenarios has been significantly lower than that of traditional fossil fuels. For those scenarios demanding for high reliability power like data centers, LDES could provide high quality and stable power supply. In addition, LDES also acts as a backup power source for data centers in case of extreme weather and emergencies.

By 2030 and 2050, the proportion of lithium-ion ESS batteries used for LDES is expected to reach 40.0% and 75.0%, respectively by then.

Drivers of the Global Lithium-ion Energy Storage Industry

- **Rapidly growing global demand for green power is driving the fast development of lithium-ion energy storage:** As the global energy structure is swiftly shifting towards green and low-carbon development, lithium-ion energy storage technology has become the core element to support the large-scale application of renewable energy by virtue of its millisecond-level response capability, multi-timescale dispatchability and the advantage of continuously declining cost. By mitigating the fluctuation of wind and solar power generation, enhancing the dispatchability of the power grid and empowering the distributed energy, the lithium-ion energy storage is able to effectively address the intermittency and volatility issue of renewable energy. In addition, the continuous breakthrough of lithium-ion energy storage technology in long lifetime and high safety, will provide a key path for realizing global clean power supply and deep decarbonization of energy.

- **Various countries have successively introduced supportive policies to promote the high-quality development of lithium-ion energy storage:** China has recently proposed the Action Plan for the High-Quality Development of the New Energy Storage Manufacturing Industry (《新型儲能製造業高質量發展行動方案》) and the U.S. Department of Energy has also proposed the draft Energy Storage Strategy and Roadmap (《儲能戰略路線圖》), both focusing on the development of electrochemical energy storage, characterized by lithium-ion energy storage, LDES and other technologies, and promoting the further development of energy storage towards higher efficiency, greater cost-effectiveness and enhanced safety. Meanwhile, industrial giants across Europe have jointly established the European Battery Alliance and released the Battery Innovation Roadmap 2030 (《2030電池創新路線圖》), highlighting the advantages of lithium-ion batteries in energy storage area and supporting localized industrial development as well.

- **Rapid development of green and low-carbon data centers increases the demand for lithium-ion energy storage:** By the end of 2030, the load capacity of global data centers will exceed 300GW, and the corresponding power demand will reach 2,600TWh. The power supply combining wind and solar power generation with lithium-ion ESS can satisfy the green and low-carbon, high-quality and stable power demand of data centers globally. In addition, energy storage also acts as a backup power supply for data centers to guarantee their uninterrupted power supply. It is expected that the additional demand for lithium-ion ESS battery in global data centers will exceed 300GWh in 2030.

- **The demand for LDES improves the cost-effectiveness of lithium-ion energy storage:** The demand of LDES continues to grow as the rising proportion of power generated by wind and solar. Driven by technology advancement in lithium-ion batteries, mass production and optimization of supply chain, the cost of lithium-ion LDES system continues to decline, further shortening the payback period. Concurrently, as the power market system gradually matures, the profit models for lithium-ion LDES projects become more diversified, improving the cost-effectiveness and further driving the growth of demand for lithium-ion energy storage.

Development Trends of Global Lithium-ion Energy Storage Industry

- **The continuous advancement of electricity market reform is broadening the profit scenarios for energy storage**: Countries are pushing forward with the electricity market reform. The European countries and the United States have already established relatively mature electricity market mechanisms, allowing energy storage to participate in various market transactions. In recent years, China has also been promoting the establishment of its electricity market, encouraging energy storage, alongside wind and solar power, to participate in frequency regulation, peak shaving, and other services to enhance the stability of the power system. In the future, the profit channels for energy storage will expand from traditional electricity price arbitrage to multiple scenarios including capacity markets, ancillary services, demand-side response, and virtual power plant operations.

- **Lithium-ion ESS are evolving towards longer duration:** The increase in the penetration rate of wind and solar power generation capacity has driven the growth in demand for LDES. The application scenarios have gradually shifted from intra-day to inter-day dispatchability. Lithium-ion energy storage suppliers need to follow the evolving pace of market demand, providing LDES products to meet the downstream demand for effectively mitigating "curtailment of wind and solar power generation" over a long-term cycle and enhancing the balancing capabilities of the grid, while satisfying the contingency power needs during extreme weather or unforeseen circumstances at the same time.

- **Energy storage equipment providers are expanding to full lifecycle energy storage solution providers:** Downstream clients increasingly prefer comprehensive turnkey solutions encompassing design, delivery, operation, and maintenance to maximize efficiency and reduce total cost of ownership. Concurrently, energy storage systems (ESS) have evolved into technologically complex ecosystems requiring seamless integration and optimization of multi-disciplinary technologies. Enterprises offering end-to-end energy storage lifecycle solutions possess deeper technical expertise in ESS product development, enabling superior service delivery and system performance. Furthermore, as market competition intensifies, enterprises with full lifecycle capabilities gain a strategic differentiator, fostering stronger client partnerships through value-added optimization and risk mitigation across project phases.

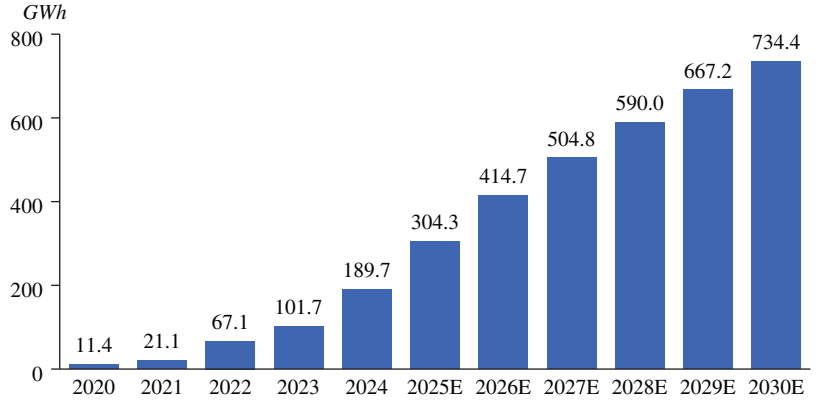
Analysis of Lithium-ion Energy Storage Markets Across Regions

Lithium-ion Energy Storage Market in China

In China, renewable energy, such as wind and solar have experienced rapid growth over the past few years. The traditional grid dispatching methods have struggled to meet the continuous and large-scale grid integration demands of renewable energy. Under such circumstances, lithium-ion energy storage, leveraging its well-established industrial chains, performance advantages and cost-effectiveness, has become a critical component of grid dispatchable resources in China. In April 2024, China National Energy Administration issued the Notice of Promoting the Grid Connection and the Dispatching and Use of New Types of Energy Storage (《關於促進新型儲能併網和調度運用的通知》), regulating the management and dispatch of new-type energy storage grid integration and optimizing the mechanism of ancillary service in power system. This provides adequate policy support for the development of energy storage market and further broadens the profit models. Meanwhile, new-type energy storage has been included in the Government Work Report for two consecutive years in 2024 and 2025, regarded as a strategic engine for China's energy transition.

In 2020, the lithium-ion energy storage market in China was at the early stage of development, and developed rapidly from 2020 to 2024, with the shipment volume of lithium-ion ESS battery increasing from 11.4GWh in 2020 to 189.7GWh in 2024. It is expected that the shipment volume of lithium-ion ESS batteries in China will further increase to 734.4GWh by 2030, with a CAGR of 25.3% from 2024 to 2030. China will remain the most significant market for global lithium-ion energy storage demand by 2030, with share of global ESS battery demand consistently remaining over 50% from 2024 to 2030.

Lithium-ion ESS Battery Shipments in China, 2020-2030E



Source: CNESA, InfoLink, CIC

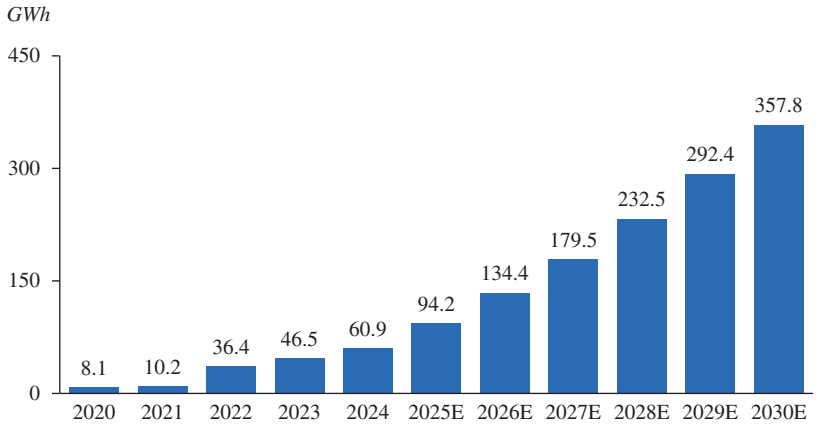
Lithium-ion Energy Storage Market in the U.S.

Due to the relatively early investment in power grid construction in the U.S., the aging problem of grid is increasingly prominent, where also faces challenges of insufficient capacity and flexibility during the process of energy transition. The electricity anomalies, such as energy shortage and winter blackouts, may easily occur under the circumstances of natural disasters and extreme weather conditions. Lithium-ion energy storage can help the power system operate stably at relatively low cost with flexible and efficient deployment. In addition, the electricity industry in the U.S. is highly marketized. The energy storage projects can achieve profitability through various channels, such as energy management, electricity spot trading and auxiliary services, forming a stronger economic driving force. Leveraging its ability to mitigate the fluctuations of renewable energy power generation and the cost-effectiveness of participating in the electricity market to obtain diversified revenues, LDES has gained application in the United States, being a pioneer in the world. California took the lead in deploying the world's first 8-hour lithium-ion ESS project (Tumbleweed), which is expected to be put into operation in 2026.

The introduction of relevant incentive policies also promotes the rapid development of the lithium-ion energy storage industry in the U.S. In 2020, the U.S. Department of Energy launched the first comprehensive energy storage strategy, the "Energy Storage Grand Challenge Roadmap," which calls for creating and sustaining the global leadership in energy storage application by 2030. Meanwhile, the strategy issued favorable policies including tax preference and fiscal subsidies to attract the local and international enterprises to establish lithium-ion energy storage production lines in the U.S.

In summary, the lithium-ion energy storage market in the U.S. is featured with robust demand, favorable cost-effectiveness, and strong policy support. The shipment volume of lithium-ion ESS batteries in the U.S. increased from 8.1GWh in 2020 to 60.9GWh in 2024, and is expected to further increase to 357.8GWh in 2030, with a CAGR of 34.3% from 2024 to 2030. In the future, as the policy landscape evolves and market competition intensifies, the core demands of customers will also shift. Enterprises with localized production capacity and services for lithium-ion energy storage in the United States will be best-positioned.

Lithium-ion ESS Batteries Shipments in U.S., 2020-2030E



Source: BNEF, InfoLink, CIC

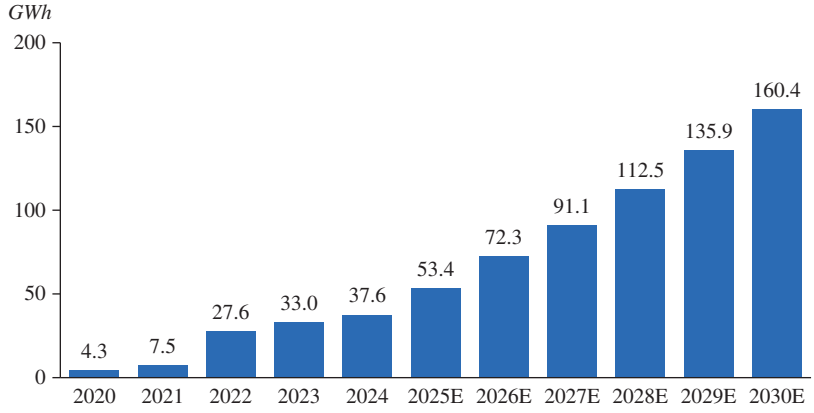
Lithium-ion Energy Storage Market in Europe

The European Union's "Fit for fifty-five" carbon emission reduction package is a key measure to achieve the goal of reducing at least 55% emissions by 2030 and accelerate energy transition. Meanwhile, energy security concerns have prompted European countries to reduce their dependence on traditional fossil fuels. Wind and solar power generation has surpassed nuclear power in the aspect of cost-effectiveness and safety, establishing themselves as the dominant sources of power generation in Europe in the future. However, deficiencies of overall European grid's transmission capacity and volatility of renewable energy power generation remains one of the bottlenecks of the transition. Characterized by its advantages of low cost and high flexibility, lithium-ion energy storage has become an important solution to address the need for grid dispatchability in various regions across Europe.

The Continental Europe, represented by Germany, has strong needs for economic and mature energy storage solutions. The lithium-ion energy storage, driven by the market, develops at a steady pace; the Northwest Europe, represented by the U.K., has a small-scale grid system. The lithium-ion energy storage can efficiently and economically meet the demand of the grid for dispatchable resources, becoming the first choice among various energy storage solutions. The Northwest Europe has begun to explore the energy storage solutions for longer duration; and the Eastern Europe, represented by Poland, which is in a proactive pace of energy transition, needs for the adjustment resources such as lithium-ion energy storage to be deeply involved in grid dispatching. Relevant policies such as long-term capacity contracts and subsidies also drive the rapid growth of lithium-ion energy storage; in Southern European market, represented by Italy, has an outstanding demand for LDES due to its abundant renewable resources and strong policy support. The MACSE bidding mechanism promotes the development of large-scale ESS projects.

From 2020 to 2024, the shipment volume of lithium-ion ESS batteries in Europe increased from 4.3GWh to 37.6GWh. With the in-depth reform of the capacity mechanism and the launch of related favourable policies in various regions of Europe, the shipment volume of lithium-ion ESS batteries in Europe is expected to reach 160.4GWh in 2030, with a CAGR of 27.3% from 2024 to 2030.

Lithium-ion ESS Battery Shipments in Europe, 2020-2030E



Source: BNEF, InfoLink, CIC

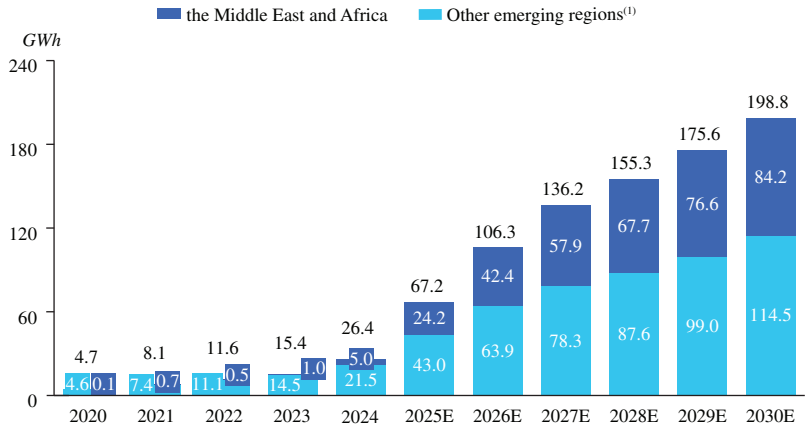
Lithium-ion Energy Storage Market in Emerging Regions

In addition to China, the United States and Europe, the lithium-ion energy storage in emerging regions is also in a stage of rapid development. The relatively sparse transmission lines and the underdevelopment of power grid infrastructure are common in most emerging regions, in urgent need for dispatchable resources to ensure the stable operation of the power grid. Leveraged by its cost-effectiveness, the demand of lithium-ion energy storage has experienced rapid growth. Moreover, driven by the global artificial intelligence wave, many technology companies are building data centers in emerging regions, which has rapidly promoted the development of the local lithium-ion energy storage market. The shipment volume of lithium-ion ESS batteries in emerging regions is expected to increase from 26.4GWh in 2024 to 198.8GWh in 2030, and the CAGR from 2024 to 2030 will reach 40.0%.

The market condition within emerging regions vary significantly. In order to reduce the economic reliance on a single petroleum industry, the Middle East and Africa, obtaining abundant resources, are vigorously developing renewable energy and gradually leading the reduction of oil subsidies. The shipment volume of lithium-ion ESS batteries in the Middle East and Africa is expected to reach 84.2GWh by 2030. Australia, with its rich lithium resources and active promotion of renewable energy, has become an important participant in the global energy storage market. It has achieved remarkable success in energy storage projects in both utility energy storage and other scenarios. The shipment volume of lithium-ion ESS batteries in Australia is expected to reach 8.2GWh by 2030. Chile, leveraging its advantages

in lithium resources and its emphasis on renewable energy, has demonstrated a unique development path in the application fields of utility energy storage scenario and the mining industry. The shipment volume of lithium-ion ESS batteries in Chile is expected to reach 5.8GWh by 2030.

Lithium-ion ESS Battery Shipments in Emerging Regions, by Region, 2020-2030E



Source: BNEF, InfoLink, CIC

Note:

(1) Other emerging regions include all other regions except China, the United States, Europe, the Middle East and Africa.

Cost and Price Analysis of the Lithium-ion Energy Storage Industry

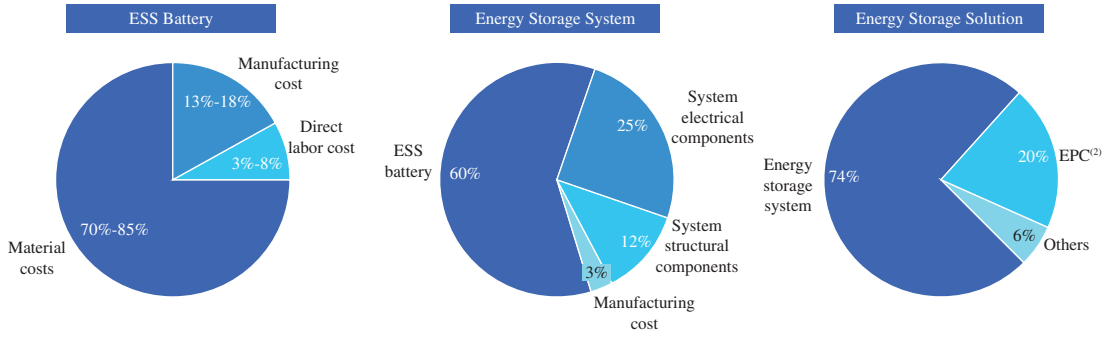
Cost of the Lithium-ion Energy Storage Industry

The lithium-ion ESS battery is primarily composed of a cathode, anode, electrolyte, and separator. Within the cost structure of the lithium-ion ESS battery, material costs account for approximately 70%-85% of the battery cost, with the cost of cathode materials representing the largest portion of the battery cost.

As a key component, ESS batteries account for approximately 60% of the total cost of the energy storage system. In addition, system electrical components and system structural components of the energy storage system account for approximately 25% and 12% of the cost, respectively.

The cost of the energy storage solutions consists mainly of energy storage systems and related services, of which the cost of the energy storage system represents the core component, accounting for approximately 74% of the cost, followed by the EPC at approximately 20%. The remaining costs mainly include operations and maintenance services, etc.

Cost Structure of Lithium-ion ESS Battery, Energy Storage System and Energy Storage Solution[(1)]



Source: CNESA, CIC

Notes:

(1) Taking 314Ah lithium-ion ESS battery and 5MWh lithium-ion energy storage system as examples, which are the two most common products on the market

(2) The approximate range is provided herein as the proportion of EPC varies across different regions and projects

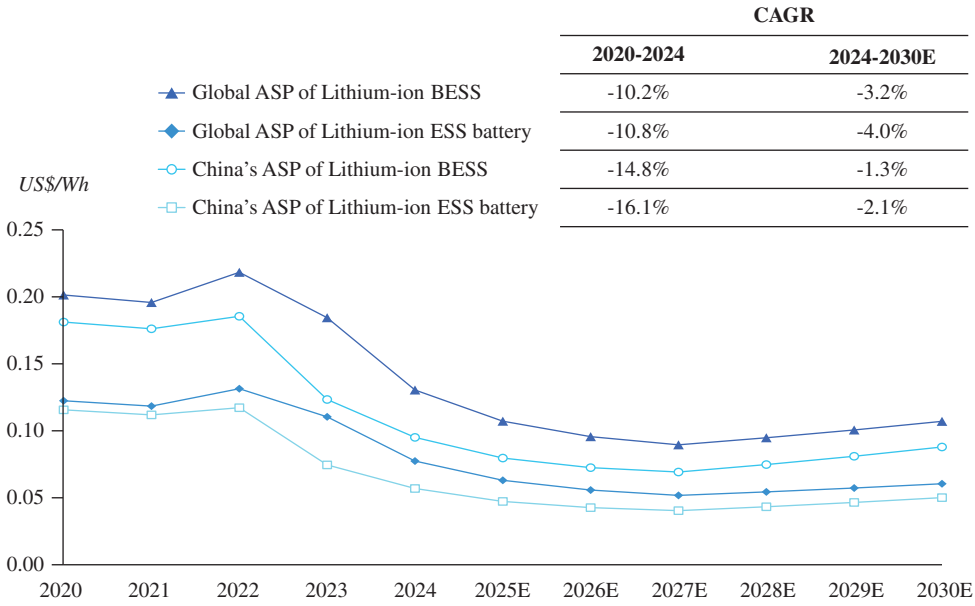
Prices for Lithium-ion Energy Storage System and its Raw Materials

Since 2023, the price of the major raw material, lithium carbonate, has significantly decreased, and the unit costs have been further reduced due to the expansion of lithium-ion ESS battery production scale, which has jointly driven a significant decrease in the prices of lithium-ion energy storage systems and lithium-ion ESS batteries.

The price of lithium-ion ESS batteries decreased from US$0.11/Wh in 2023 to US$0.08/Wh in 2024, and is expected to further decrease to US$0.06/Wh in 2030. With the decline in the price of lithium-ion ESS batteries and lithium-ion energy storage systems, their cost-effectiveness has improved significantly, which will further promote the growth of installed capacity. In the future, enterprises with solid technical advantages and continuous innovation will maintain a leading position in the competition to achieve long-term development.

The price of lithium-ion energy storage system decreased from US$0.19/Wh in 2023 to US$0.13/Wh in 2024, and will reach to the lowest in 2027. As the backward production capacity of lithium-ion energy storage is phased out then due to the continuous iterations of products and the shift of the downstream demand, the price of lithium-ion energy storage system is expected to rebound to US$0.11/Wh in 2023.

Price Trend of Global and China's Lithium-ion Energy Storage System and ESS Battery, 2020-2030E



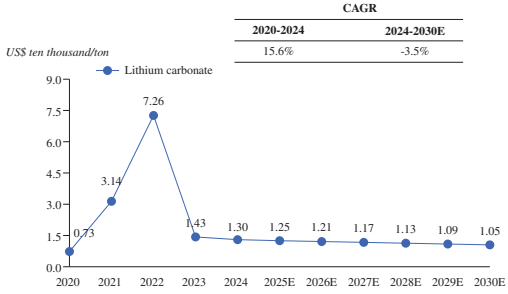
	CAGR	
	2020-2024	2024-2030E
Global ASP of Lithium-ion BESS	-10.2%	-3.2%
Global ASP of Lithium-ion ESS battery	-10.8%	-4.0%
China's ASP of Lithium-ion BESS	-14.8%	-1.3%
China's ASP of Lithium-ion ESS battery	-16.1%	-2.1%

Source: BNEF, CIC

The price of raw materials for lithium-ion ESS batteries, represented by lithium carbonate and graphite, experienced a sharp rise from 2020 to 2022, and then gradually returned to a reasonable level in 2023. The current price tends to be stable.

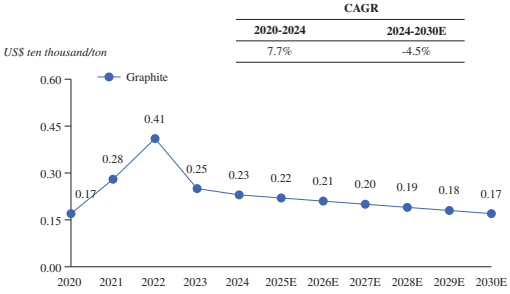
Between 2022 and 2024, the price of lithium carbonate declined from US$72,600/ton to US$13,000/ton, and the price of graphite decreased from US$4,100/ton to US$2,300/ton. It is expected that the price of lithium carbonate and graphite will reach US$10,500/ton and US$1,700/ton by 2030, respectively.

Global Lithium Carbonate Price Trend, 2020-2030E



Source: CIC

Global Graphite Price Trend, 2020-2030E



Source: CIC

OVERVIEW OF COMPETITION IN THE GLOBAL LITHIUM-ION ENERGY STORAGE INDUSTRY

Competition Landscape and Ranking Analysis of the Global Energy Storage Industry

Players in the global energy storage industry can be mainly divided into three categories: ESS battery manufacturers, energy storage system integrators and integrated energy management service providers. Among them, ESS battery manufacturers mainly provide energy storage batteries to the market; energy storage system integrators provide complete sets of energy storage systems; and integrated energy management service providers can provide a full range and full process of services from ESS batteries, energy storage systems to energy storage solutions.

The global energy storage industry has a high market concentration, and industry competition continues to intensify. In terms of lithium-ion ESS battery shipments, the market share of the top five ESS battery companies reached 74% in 2024.

As integrated energy management service provider, the Company provides comprehensive energy solutions centered around ESS batteries and systems. In terms of lithium-ion ESS battery shipments, the Company ranked third in the global energy storage market in 2024, with a market share of 11%. In 2024, the lithium-ion ESS battery shipment accounted for over 90% of the total ESS battery shipment. The Company ranked third in the global ESS battery companies as well, with a market share of 10.7% in terms of global ESS battery shipments.

Market Share of Global Top Five ESS Battery Companies by Lithium-ion ESS Battery Shipments in 2024

Rank	Company Name	Company Introduction	Market Share	280Ah Lithium-ion ESS battery	314Ah Lithium-ion ESS battery
1	CATL	• A listed company founded in 2011 and headquartered in Fujian Province, China. It mainly offers lithium-ion EV battery and ESS battery products.	35%	√	√
2	EVE	• A listed company founded in 2001 and headquartered in Guangdong Province, China. It mainly offers consumer batteries, EV batteries and ESS batteries.	13%	√	√
3	**The Company**	• Founded in 2019 and headquartered in Fujian Province, China. It is a globally leading new energy technology company driven by innovation, dedicated to providing comprehensive energy solutions centered around ESS batteries and systems.	**11%**	√	√
4	BYD Energy Storage	• A listed company founded in 1995 and headquartered in Guangdong Province, China. It is a new energy company, which also offers consumer batteries, EV batteries and ESS batteries.	9%	√	√
5	REPT BATTERO	• A listed company founded in 2017 and headquartered in Zhejiang Province, China. It mainly offers lithium-ion EV battery products and ESS battery products.	6%	√	√
Top five companies in total			74%		
Total			100%		

Source: SNE Research, Expert interviews, CIC

Note: 280Ah and 314Ah lithium-ion ESS battery are the representatives of first and second generation products in the industry.

Among ESS battery companies, the Company is a leading pure-layer, which can quickly respond to the shift of the market demand and launch forward-looking products.

Comparative Analysis of Pure-play Model and Non-pure-play Model, 2024

Category	Pure-play Model	Non-pure-play Model
Technology Expertise	◕	◑
Market Insights and Responsiveness	◕	◑
Solution Coverage in Energy Storage	◕	◑
Economies of Scale and Synergies	◑	◕

Source: CIC

Note:

(1) ◔→● indicates the relevant indicators from low to high.

Entry Barriers in the Global Energy Storage Industry

- **Technology barriers:** The essence of energy storage system is the ESS battery technology, the performance of which is highly dependent on the matching of electrochemical materials and precise design. In particular, since ESS batteries are evolving to larger capacity and systems are evolving to longer duration, higher requirements are imposed on aspects such as energy efficiency, cycle life and safety of batteries. For new entrants, breakthroughs in core technologies require substantial capital investment, robust R&D capabilities, and accumulation of large-scale manufacturing experience.

- **Scale and capital barriers:** The energy storage industry demonstrates significant economies of scale. A large amount of R&D investment and production lines capital expenditure are needed from R&D to mass production. Only enterprises with a large production scale and sufficient capital can spread the capital investment at the early stage and achieve the advantages of scale.

- **Customer relationship barriers:** Energy storage power stations require reliable performance and safety of ESS batteries over decades of operation, so customers prefer to choose ESS battery and energy storage system suppliers with strong technical capabilities, stable cooperative relationships and large-scale delivery capabilities. New entrants are less well-known and struggle to establish long-term and stable customer relationships in a short period of time.

- **Supply chain management barriers:** Raw material costs account for a large portion of the total cost of ESS batteries. Therefore, obtaining stable, cost-effective raw materials has become one of the core competitive advantages of energy storage companies.

Key Success Factors for the Global Energy Storage Industry

- **Continuous technological R&D and innovation capability:** Continuous technological R&D enables enterprises to stay aligned with the technological development trend of the global energy storage, leading to the launch of scenario-based energy storage solutions focused on ESS batteries and energy storage systems. As the iteration cycle of energy storage technologies and products continues to shorten, companies need to accelerate the pace of innovation to respond to rapidly changing market demand. At the same time, emerging application scenarios such as data centers continue to arise, requiring companies to continuously launch new products to meet the needs of diverse energy storage scenarios.

- **Localization capability around the world:** To capitalize the development opportunities in the global energy storage market, enterprises must establish marketing and business networks in each target market, expanding their global influence. Additionally, they should build a localized global professional and technical team to ensure that their technologies and services can meet local market demands. In addition, enterprises form an international procurement team and actively develop a localized supplier network, which will help optimize supply chain management and reduce costs.

- **Rapid response capability to customer demand:** Enterprises are required to have sharp market insights and agile product development capabilities. By understanding the regional market demands and launching high-performance and high-reliability ESS products, it can quickly respond to customer demand. It will help enterprises to establish a trusted brand image globally and ultimately transform it into a competitive market advantage.

- **Intelligent manufacturing and production control capabilities:** Intelligent manufacturing and production control run through all links of the product life cycle, which directly determine the performance, costs and market competitiveness of ESS products. In the entire product life cycle from material selection, production process, system design, manufacturing efficiency to recovery of residual value, companies can improve production efficiency and reduce manufacturing costs through intelligent manufacturing, optimization of production processes, refinement of production management, etc., thereby providing customers with more cost-effective and competitive energy storage solutions.

- **Brand influence:** Service providers with brand advantages often have significant advantages in the accumulation of project experience, enabling them to continuously and effectively empower and iterate their products. They can not only keep up with changes in market demand and make timely adjustments and optimization on strategies, but also launch products and services that better meet customer needs through data-driven innovation, winning the trust and support of customers.

Source of Information and Reliability

We have commissioned CIC to conduct an analysis and report on the global energy storage market. CIC is a market research and consulting firm established in Hong Kong, engaged in providing professional consulting services across various industries. We have agreed to pay CIC a fee of RMB0.5 million for the preparation of the CIC Report. We have extracted certain information from the CIC Report in this section, as well as from the sections of "Summary," "Risk Factors," "Business," "Financial Information" and elsewhere in this Document, so as to enable potential [**REDACTED**] to have a more comprehensive understanding of the industry in which we operate. Unless otherwise specified, all data and forecasts contained in this section are sourced from the CIC Report.

The information and data collected by CIC have been analyzed, evaluated and verified using CIC's internal analysis models and techniques. Primary research is conducted through interviews with key industry experts and leading industry participants. Secondary research involves analyzing data from various public data sources such as the National Bureau of Statistics of China and various industry associations.

The market forecasts in the CIC Report are made based on the following key assumptions: (1) in the forecast period, the overall social, economic and political environment globally and in China is expected to remain stable; (2) in the forecast period, relevant key industry drivers are likely to continue to drive the growth of the energy storage market, such as technological advancements, supportive policies, and the increasing downstream demand; and (3) in the forecast period, there will be no extreme force majeure events or unforeseeable industry regulations that could have a drastic or fundamental impact on the market.