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Current Situation and Trend of Electric Vehicle Battery Business - Take CATL as an example

Chang Liu, Chuanchen Bi

College of Graduate Study in Management, Khon Kaen University

chuabi@kku.ac.th

Abstract. New energy vehicles are one of the most important strategic emerging industries in China. Lithium battery is the universal choice of energy supply for new energy vehicles at present, which has the advantage of security and stability compared with other new energy sources. China has a complete lithium battery industry chain from lithium mining to battery manufacturing. The CATL is one of the large enterprises of this chain. However, with the rise of domestic competitors, foreign enterprises such as LG Chem have entered the Chinese market strongly. The intensification of market competition and the possible adjustment of national policies make the development of CATL facing many challenges. As early as before the COVID-19, the profits of CATL had declined, and the research on the strategic development of CATL has important practical significance. This paper analyzes the advantages and disadvantages, opportunities and threats faced by the power battery business of CATL through the SWOT analysis model. Based on the analysis of the development strategic direction corresponding to the combination of the four elements of the internal and external environment in the model, it is concluded that under the background of the emerging new energy vehicle industry and the gradual improvement of the market, CATL should seek diversified development strategic direction (ST strategy).

Keywords. Electric vehicles; Battery business; CATL

Brief Introduction

With the rapid development of China's economy, the vehicle industry has increased significantly, and the car ownership has continued to rise, which has brought enormous pressure on society in terms of energy and environment. Under the background of ‘carbon neutralization and carbon peaking’, the development of new energy vehicles is one of the most promising industrial directions at present. In the new energy vehicle industry, the power battery accounts for more than one third of the vehicle cost, and has a decisive impact on the safety, endurance and other aspects of new energy vehicles. Therefore, it is of great significance to study the power battery industry for the development of new energy vehicles.

Contemporary Amperex Technology Co., Limited. (hereinafter referred to as CATL), whose main business is the research, development and sales of new energy battery power systems, energy storage systems, etc., is the top power battery supplier in China and has a considerable market share advantage. With the increasing market demand and the support of national policies, CATL has gradually developed into the world's largest power battery

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company, with remarkable performance growth. However, with the industrial fluctuation caused by the outbreak of the epidemic in 2020, the technical threat from Japanese and Korean enterprises and the lifting of the ban on the white list of batteries in China, the supply of foreign enterprises, mainly LG Chemical, to domestic manufacturers, CATL is facing huge business problems. Although CATL still dominates the domestic market, the situation is not optimistic. This paper aims to analyze the advantages and bottlenecks of battery business development in CATL, so as to explore its future development direction.

Journals Reviewed

Qian Guilun (2008) proposed that the enterprise development strategy includes two parts: the development goal of the enterprise and the way to achieve this goal. It follows the four basic principles of long-term, overall, competitive and dynamic. It needs to be adjusted and improved as the external environment or internal conditions change.

Shi Wei (2005) introduced a variety of perspectives for studying the theory of enterprise strategy, including: industrial organization economics, which emphasizes the importance of market structure by studying the imperfect competitive market and taking "structure behavior performance" as the basic analysis framework; The corporate culture research method, which is based on values and analyzes strategies from the perspective of corporate culture; Using the game theory method of mathematical analysis; The research method of enterprise economics that explains the competitive advantages and benefits of enterprises by analyzing the internal environment and factors of enterprises; And the system theory method of simplifying the complexity and controlling the overall situation, and the empirical method of great practicality and purpose.

Xiang Baohua et al. (2000) summarized the development of enterprise strategy theory, and introduced three main schools of enterprise competitive strategy: industry structure school, enterprise core competence school and strategic resource school emphasizing the optimal allocation of resources. In addition, the author gives a research idea of ‘problem oriented’ to make up for the shortcomings of the traditional ‘theory oriented’ guidance.

Jiang Luan et al. (2002) pointed out that enterprise managers should not blindly pursue dynamic strategic thinking and ignore the influencing factors of the static environment. They should start from the overall situation, look at and distinguish the dynamic and static environment of the enterprise from a comprehensive strategic perspective, and implement the enterprise development strategy according to the different environment and market forms of the enterprise.

Chan and Renee (2005) believed that the ‘Red Sea Strategy’ of competing ruthlessly with competitors for customers in the industry, limited to the existing known industries, could not enable enterprises to win the future; Enterprises want to seek sustainable development, not by winning the battle with competitors, but by turning their eyes to buyers and providing them with value leap, so as to open a market with huge potential and huge demand, namely, ‘blue ocean strategy’.

Zhang Yinan et al. (2011) concluded by building a strategic utility function that enterprises should first become upstream enterprises in their own industries through specialization strategies before considering diversified development. The author also points out that the development strategy of an enterprise is a mechanism for an enterprise to adapt to the external environment, and the most fundamental way to measure the effectiveness of the strategy is to see whether the strategy contributes to the enterprise's adaptation to the environment.

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Su Jingqin et al. (2020) analyzed the advantages and disadvantages of diversified and specialized enterprise strategies. The diversified strategy has certain advantages in avoiding risks, while the specialized strategy can help enterprises better shaping their core competitive advantages. Choosing a development strategy that is more suitable for enterprises is of great significance to the survival and development of enterprises.

Bai Mei (2020) mentioned: First, the global new energy vehicles are still in the early stage of development, and do not have a high replacement rate, but have huge market potential and high-speed development trend. With the continuous expansion of the new energy industry, the competitiveness of the new energy industry has been rising compared with traditional vehicles, among which pure electric vehicles have stronger market competitiveness compared with plug-in hybrid electric vehicles. Second, China, the United States and Europe are in a leading position in the terminal market sales of the new energy automobile industry chain. China, Japan and the United States have competitive advantages in the production and manufacturing process. China, Japan and the South Korea have advantages in the industrial support of the new energy market. And China is superior to other countries in terms of public infrastructure. Third, the different roads that China and the United States have taken in the development of the new energy vehicle industry have led to different areas of advantage. The differences are mainly manifested in the following aspects: the advantages of the United States are shown in its technological innovation ability of the new energy industry, the degree of openness of the market to the outside world and the market share of a single vehicle model; China's advantages are shown in the scale of the industrial chain, supporting facilities, policy support and comprehensive effects.

Li Keqing et al. (2020) also pointed out that, combined with the research of scholars and the market performance of Chinese power battery enterprises, Chinese power battery enterprises have a high market share in the global market, but most of the internationally renowned automobile manufacturers prefer the products of Japanese and South Korean battery enterprises in the new energy industry. While Japanese and Korean battery manufacturers have gradually formed a trend of patent barriers, the main customers of China's power battery enterprises are more domestic car enterprises, which are in a disadvantage in terms of core competitiveness.

Liu Yanzi (2018) believed that new energy vehicles were the historical choice for the continuous development of the environment and the only way for the future development of the automobile industry. He summarized several operation modes, including ‘self charging sales and leasing mode’, ‘ex factory car sales, car electricity separation sales and leasing mode, and charging and changing mode’. Su Hao (2011) believes that under the background of the trend of global warming, the commitment of countries around the world to reduce emissions and the trend of global low-carbon life and economy, China's pure electric vehicle industry will choose to establish the operation mode of rapid ‘power change’ of the whole vehicle, which will be the best solution for the rapid development of pure electric vehicles.

Xu Chen et al. (2011) proposed a good solution and a new model to solve the problem of low investment recovery rate in the construction of pure electric vehicle charging and changing equipment, that is, to provide pure electric vehicle owners with a series of value-added services such as rapid vehicle power change service, power derivative value-added service and contract management of vehicle batteries to the grid, and adjusted the billing method to be based on vehicle charging time and service frequency pricing. Zhou Fengquan and other scholars (2010) studied the overall process of future operation and overall profit model of pure electric vehicles under the two modes of charging facilities and changing electricity. From the internal

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perspective of the enterprise, including the competitiveness of the enterprise, the profit point of the enterprise and the impact on the overall power grid operation, etc., the comparison is made. Finally, the suggestions are given, which mainly rely on the operation mode of power replacement, supplemented by charging. Wang Na and other scholars (2017), through research on major cities in China, combined with the characteristics of charging and changing facilities and analyzed the underlying factors of the main business models in the current market, obtained the most critical factors of the charging and changing facilities operation mode.

Xue Zhenyu and other scholars (2014) had a detailed understanding of the detailed rules on how to charge electric vehicles and how to connect power exchange facilities to the power grid, and provided important suggestions on how to ensure the safety, stable construction and operation of infrastructure equipment. Zhang Jianzhou et al. (2015) also introduced charging and power exchange technologies, elaborated on some problems encountered and provided relevant solutions. Lin Huiqing (2017), by interpreting the current development process of new energy vehicles and infrastructure, learned about the problems caused by charging and changing electricity in access to the distribution network, all the technologies needed for infrastructure access to the distribution network, and summarized a set of feasible business plans. Gao Ciwei et al. (2013) proposed that power exchange has many advantages, so it has now developed into the main supply mode of new energy vehicles. At the same time, according to the analysis of the operation mode of the power exchange network, they summarized the problems encountered in its development process and put forward their vision for the future development prospects. At the same time, Zhang Zhimin (2017) proposed that the academic community should advance the research agenda of the power replacement theory to meet the theoretical knowledge required for the development of the industry.

Cao Yue (2022) pointed out that CATL is China's largest supplier of power batteries and automotive energy storage solutions. Its main business includes the development, manufacturing and sales of lithium batteries for electric vehicles and energy storage management systems, new energy vehicle battery modules, battery management system related products, etc.

Jiang Xianda (2022) said: At present, the field of power battery is the core technology area of CATL, including battery materials, power battery manufacturing, power battery system, power battery recycling and reuse and other industrial modules; The R&D and sales of power battery system and energy storage system are the main business of the company.

Research Method

1. Non Participatory Observation

Learn the latest consultation and progress of battery business of CATL through multiple channels.

2. Secondary Data Collection Method

Through professional databases such as CNKI, CQVIP, WANFANG DATA and BAIDU Academic, we obtained relevant literature, extracted views that are consistent with this article and found arguments that can strongly support the views. We summarize the views of various scholars in the relevant literature to form the literature review of this article.

3. SWOT Analysis Model

Mainly through the analysis of the internal and external environment of the CATL, identify the four elements of enterprise strengths (S), weaknesses (W), opportunities (O) and threats (T), identify the key capabilities and constraints of the enterprise, so as to confirm the

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current strategy of the enterprise. The core point of SWOT analysis is that the company's strategy must match its internal capabilities (strengths and weaknesses) with the external environment (opportunities and threats). Based on the interdependence between the company and its environment, SWOT analysis can form four different strategic directions, namely, the SO strategy that relies on internal advantages to seize external opportunities; take advantage of external opportunities to improve the WO strategy of internal weaknesses; take advantage of the company's advantages to avoid or mitigate external threats; WT strategy to directly overcome internal weaknesses and avoid external threats.

Research Conclusion

SWOT Analysis of Battery Business in CATL

1. Advantage Analysis

(1) Technical Advantages

High specific energy: CTP technology, the industry's first efficient CTP grouping technology, can improve the volume utilization rate of battery pack by 20% to 30% and the production efficiency by 50% by simplifying the module structure. CTC (Cell to Chassis) technology, integrates the electric core with the body, chassis, electric drive, thermal management and various high and low voltage control modules, making the driving distance exceed 1000 km. The intelligent power domain controller optimizes power distribution and reduces energy consumption, reducing the power consumption of 100 km to below 12 degrees. High Nickel Technology, high nickel 811 leading system, combined with the industry's first nano rivet technology, carries out structural reinforcement and protection at the electric core level, greatly improves the energy density, and effectively takes into account the high standard of safety and reliability. High Voltage Technology, precise single crystal particle design and oxidation resistant electrolyte can significantly improve energy density and achieve optimal cost performance by continuously expanding the upper voltage limit and removing more active lithium.

Long life: Low Lithium Consumption Technology can significantly reduce active lithium consumption during the use of the cell and significantly improve the stability of the anode material surface and body structure, meet the performance requirements of ultra long life. Through FIC Coating Technology and fine design of electrode layer, capacity attenuation is reduced. In the field of passenger vehicles, the super long life battery will meet the driving needs of users for more than 8 years. In the face of commercial vehicles, the long-life battery products that can operate for 6 years and 600,000 kilometers ensure a worry free product life cycle.

Ultra Fast Charging Technology: The fully nano material surface greatly improves the lithium ion removal rate and the response speed of the cathode material to the charging signal. The surface of the anode material modified with porous coating provides rich active sites for lithium ion exchange, which greatly improves the charge exchange rate and embedding rate of lithium ions. The high-altitude gap diaphragm can effectively reduce the average data transmission distance of lithium ion and greatly reduce the lithium ion transmission resistance. The Multi-dimensional Space lug Technology can greatly improve the current bearing capacity of the pole piece and break through the technical bottleneck of high core temperature during 500A direct charging. The gradient distribution of porous structure is adjusted to achieve high porosity structure in the upper layer and high pressure real density structure in the lower layer, giving consideration to high energy density and super fast charging.

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Safety Technology: It conduct high-throughput screening of ‘material gene library’, lock specific metal elements for doping with variable valence elements such as ‘nickel’ and ‘cobalt’, which ensure energy density, increase the difficulty of oxygen release and greatly improve the thermal stability of ternary materials. The original advanced Nano Coating Technology forms a stable and dense solid electrolyte interface facial mask on the electrode surface that greatly reducing the reactivity of materials and electrolyte, and significantly improving the thermodynamic stability of the cell. Starting from the electrolyte, one of the four main raw materials of the battery, they have successfully developed a variety of functional additives. By improving the electrolyte gene, they have effectively reduced the reaction heat generation between the solid-liquid interface, significantly improved the battery's heat resistance temperature and thermal safety. The aviation grade thermal barrier material with ultra-low thermal conductivity and unique nano pore structure can inhibit air convection and radiation heat conduction, so as to prevent rapid heat transfer from causing sudden temperature rise of adjacent batteries and causing thermal runaway. The parameter fault and risk early warning model established based on big data ensures the timely response of the battery system in extreme cases, actively wakes up the whole vehicle and starts the cooling strategy, quickly ‘diagnose and treat’ and immediately takes effect, so that the battery can return to calm. Through analysis and mining, extract data depth features, summarize the internal relationship of feature variables and combine signal detection and transmission technology, build a real-time fault detection system to achieve battery early warning, so that no small abnormality can escape.

Automatic Temperature Control Technology: By controlling the motor controller, weak short circuit occurs between the battery and the motor to shorten the heating time. The Self Heating Technology can make the electric core generate heat evenly to the maximum extent and overcome the uneven heating of the electric core caused by the conventional heating film heating method. It is the first power compensation technology developed in the industry to provide a stable discharge voltage platform under the extreme conditions of low temperature and low SOC. By increasing the power, it can ensure the battery has a long life and strong power. In addition, cold resistant graphite, cold resistant cathode and cold resistant electrolyte guarantee the conduction efficiency of lithium ion under extreme conditions, with huge market potential.

Intelligent Management Technology: Through wireless communication in the battery pack, the sampling harness and the battery packaging is simplified, the cost is reduced, the reliability is improved, and 24-hour monitoring is realized. Through the cell health detection, real-time parameter optimization, single cell energy management, residual value evaluation and cloud edge collaboration, comprehensive battery diagnosis and humanized management are achieved.

(2) Market Share Advantage

On the domestic side, from January to October in 2021, CATL will have 54.48GWh of installed vehicles, accounting for 50.7% of the market share. Its position and advantages in the domestic lithium battery industry are obvious and still expanding rapidly. The advantages of the industrial chain is continuing to expand by increasing production capacity and investing in the distribution of raw materials.

Globally, SNE Research, a South Korean market research institution, released the latest report, describing the installed capacity of global power batteries from January to November 2021. With a market share of 31.8%, CATL firmly ranks first in the world, once again stabilizing its dominant position in the electric vehicle market.

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Detailed data show that the global market share of CATL is 31.8%, followed by LG New Energy, with a market share of 20.5%, a huge gap of 11.3% compared with the former. Panasonic, BYD and SKI ranked third, fourth and fifth with market share of 12.5%, 9% and 5.8% respectively. Later, there are Samsung SDI, CALB Co., Ltd, Guoxuan High Tech, Vision Power and Honeycomb Energy.

(3) R&D and patent advantages

On December 13, 2021, CATL said on the investor platform that the company has authorized and is applying for a total of 7229 domestic and foreign patents.

In the first half of 2021, the R&D expenditure of CATL will be 2.8 billion yuan, with a year-on-year growth of 115%, and its accumulated R&D investment will exceed 14 billion yuan. Compared with the main competitor LG Chem, since 2020, the R&D expenses of CATL have gradually widened.

Among them, in terms of solid state and semi-solid state battery business, CATL disclosed that the company has always maintained a high degree of attention and carried out technical layout for the next generation batteries and emerging technologies in the industry, such as cobalt free batteries, all solid state batteries and rare metal free batteries.

In terms of recycling of battery waste, CATL said that the company, relying on its subsidiary Guangdong Bangpu, worked with customers to create an ecological loop of 'battery production→use→cascade utilization→recycling and resource regeneration', and extracted nickel, cobalt, manganese, lithium and other metals from waste lithium ion batteries through processing, purification and other processes for the production of lithium ion battery materials such as ternary precursors, so as to achieve the recycling of nickel, cobalt, manganese and lithium resources.

CATL said that the company will continue to invest in research and development, maintain its industry-leading technological advantages. It will develop battery materials with high energy density and high performance on this basis, optimize product design and production process, improve production efficiency and product yield to achieve higher automation and lower costs.

(4) Advantages of industrial chain layout

In terms of lithium iron phosphate, CATL and Defang Nano, one of the main domestic suppliers, set up a joint venture Qujing Lintie to invest in the construction of 10000t/a lithium iron phosphate cathode project. In terms of ternary materials, CATL Holdings Guangdong Bangpu has arranged waste battery recycling business and produced ternary precursors and ternary materials. In terms of negative pole, the 430t/a silicon based negative pole project of Pingnan Times, a wholly-owned subsidiary of CATL, was put into production in 2019. In terms of electrolyte, CATL is building a 300t/a new lithium salt project through its subsidiary Longyan Sikang. In addition, the company continues to expand to mineral resources. The company has invested in lithium and nickel mining enterprises in Australia, Canada, Sichuan Yibin and Indonesia to ensure the supply of raw materials. Through direct or indirect shareholding, CATL has bound a number of upstream material factories, covering cathode materials, battery cells, battery PACK and other links, forming a closed loop of the industrial chain from raw materials to battery manufacturing to operation services to battery recycling, and deeply binding suppliers in all the upstream and downstream links of the industrial chain, which is conducive to process improvement and also ensures that the price and quantity of the company's raw materials are highly controllable.

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2. Disadvantage Analysis

(1) Operational Risk

According to the semi annual report for the first half of 2021, CATL achieved an operating revenue of 44.075 billion yuan in the first half of 2021, a year-on-year increase of 134.07%, and a net profit of 4.484 billion yuan, a year-on-year increase of 131.45%. The revenue and gross profit of CATL are mainly composed of power battery system, lithium battery materials and energy storage system. Among them, the sales of power battery was 30.45 billion yuan, accounting for 75.9% of its overall revenue, with a gross profit of 7 billion yuan and a gross profit margin of 23%. In addition, the revenue of lithium battery materials and energy storage system was 4.987 billion yuan and 4.7 billion yuan respectively. According to the semi annual report, the gross profit margin of power battery business in the first half of this year was 23%, down 3.5% compared with the same period last year, and it was the only one of its three major business sectors with a decline in gross profit margin. The gross profit margin of lithium battery materials and energy storage system business increased by 2.06% and 12% respectively year on year. It is worth noting that it is not the first time that the gross profit margin of power battery business in CATL has declined. The data shows that the gross margins of CATL power battery system from 2019 to 2020 are 28.46% and 26.56% respectively. Correspondingly, its operating cost increased. In the first half of this year, the operating cost of CATL power battery sector was 23.448 billion yuan, a year-on-year increase of 136.7% compared with 9906 million yuan in the same period last year. The sharp rise in raw material prices since this year is an important factor in the continued decline of gross profit margin in CATL. According to statistics, from the beginning of 2021 to the end of July, the prices of most battery materials have increased to varying degrees. Among them, lithium carbonate and lithium hydroxide, the most upstream, increased by 70% and 90% respectively in seven months. The midstream material LIPF had the largest increase, reaching 270%. As a result, the price of electrolyte also increased by about 120%. The cathode material, which accounts for the highest cost of power batteries, also rose by 30% - 40% in the first seven months of this year.

Obviously, with the increasingly fierce market competition and the retrogressive policy of government subsidies, the power battery market will also be in a more rigorous competitive environment when it grows in an outbreak. The proportion of power battery business in CATL is almost equal to 76.8% in 2019. The proportion of highly concentrated businesses has played a huge role in promoting the rapid development of power battery business, but market fluctuations will also have a greater impact on the operation of CATL. Taking 2020 as an example, affected by the epidemic, the market demand declined, leading to a sharp year-on-year decline in the sales of new energy vehicles and power batteries. In the first half of 2020, CATL achieved an operating income of 18.829 billion yuan, a year-on-year decline of 7.08%. At the same time, in addition to environmental factors, competitors will also have an impact on the too single business model. For example, at the end of 2021, Saturnose of India said that it would launch an aluminum ion battery next year. From various data, it may be the first commercial aluminum ion solid state battery in the world. If the authenticity is verified, the aluminum battery with abundant reserves and higher energy density than lithium battery will have a huge impact on the power battery industry, while the problem of the excessive proportion of power battery business in CATL will be magnified.

(2) Brain Drain

Work intensity is high. Subsidy attraction is low. Overtime is normalized. Compensation has little advantage in the industry compared with work intensity. And employees are under great pressure. Moreover, the geographical location is not attractive.There

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is a lack of entertainment projects. And medical facilities are not satisfactory. On social media and the Internet, the work style of CATL is not very good. For new employees, their work intensity, welfare (overtime pay, etc.) and living facilities are criticized. In the long run, the brain drain problem is worth paying attention to.

3. Opportunity Analysis

(1) Global Energy Transformation Trend

With the trend of energy crisis and environmental protection, the development of new energy industry has become the most potential emerging industry against the background of 'carbon neutral, carbon peak'. To this end, developed countries have announced the time nodes for banning the sale of fuel vehicles. *The Report Research on the Exit Schedule of China's Traditional Fuel Vehicle*s released by the China Petroleum Consumption Control and Policy Research Project also analyzes and forecasts the exit time of fuel vehicles and the time when various automotive markets will realize new energy, and 2050 may become a time node. In addition, at present, the future situation in Russia and Ukraine is not clear, with a low possibility of a solution in the short term. At the same time, many countries in Europe and the United States have joined the ranks of sanctions against Russia. Affected by this, international crude oil prices have soared, hitting a new high since 2008. The high commuting costs brought by high oil prices will at least tilt consumers who are swaying in the choice of fuel vehicles and electric vehicles to electric vehicles.

(2) National Policy and Planning

Previously, China issued a series of plans and policies to encourage the development of new energy industry. On November 2, 2020, the State Council officially released *the New Energy Vehicle Industry Development Plan (2021-2035)*, which defines the development of new energy vehicles as the only way for China to move from a big automobile country to a strong automobile country. Although *the Notice on the Financial Subsidies for the Promotion and Application of New Energy Vehicles in 2022* jointly issued by the Ministry of Finance and other four ministries and commissions has made it clear that the subsidy policy will be terminated on December 31, 2022, only the subsidy policy will decline, including other consumption tax reduction, license plate and other related policies that still show the government's support for the consumption of new energy vehicles.

(3) Huge Market Potential

In November 2020, the General Office of the State Council issued *the New Energy Vehicle Industry Development Plan (2021-2035)*, which pointed out the action program for the domestic new energy vehicle industry in the next 15 years. In its development vision, it proposed to strive to make pure electric vehicles the mainstream of new sales vehicles after 15 years of continuous efforts. By 2025, the sales of new energy vehicles will reach the target of about 20% of the total sales of new vehicles. According to the previous prediction of the market size of about 35 million in 2025 by various institutions, the sales volume of new energy accounts for 20%, and the market size is about 7 million vehicles a year. Compared with the current data of more than 1 million vehicles, nearly 6 million vehicles need to be increased. It can be seen that this goal is very ambitious and the potential of the industry is huge. At the same time, developed countries in Europe and the United States have successively released the time for banning the sale of fuel vehicles. Europe and the United States, which have a large number of mainstream automobile factories, are bound to create huge market conditions for new energy power batteries.

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Combined with the above analysis on the internal advantages, disadvantages, opportunities and threats of CATL, the SWOT analysis is carried out. The results are as follows:

	Internal Advantages (S)	Internal Weaknesses (W)
	1. Technical advantages (high specific energy, long life, fast charging, etc.). 2. Advantage of Market share (more than 50% in China and 31.8% in the world). 3. Advantages of R&D and patent. 4. Advantages of industrial chain layout.	1. Operational risk (the gross profit margin continues to decline, and the proportion of single business is too large). 2. Brain drain.
External Opportunities (O)	SO Expansion Strategy	WO Twist Strategy
1. The general trend of global energy transformation ensures the huge market potential of new energy industry. 2. National support for new energy industry in policy and planning. 3. The new energy vehicle industry is still in the early market, with relatively low penetration rate and huge potential market scale.	1. Improve the industrial chain. Cooperating with the upstream suppliers to control the stability and cost of raw material supply. Downstream cooperation with automobile manufacturing industry to expand market share. 2. Make full use of R&D investment to further achieve technological breakthroughs in power battery endurance and fast charging, and form greater technological advantages. 3. Make use of China's support attitude towards new energy industry to lay out battery recycling and energy storage industry, form a complete industrial closed loop and share the hidden trouble of excessive proportion of battery industry.	1. Transform the energy storage industry to avoid too single industrial structure. The power battery industry's fluctuations due to policy, market competition and other factors have too great impact on enterprise development. 2. The decentralized industrial structure ensures the income of the enterprise. Improves the staff performance evaluation structure and provides more benefits to stabilize the talents of the enterprise and ensure the cohesion of the enterprise.
External Threats (T)	ST Diversified Strategy	WT Defensive Strategy
1. The policy gradually retreated and subsidies entered the countdown. 2. The battery energy density is difficult to make a substantial breakthrough in the	1. Take advantages of its market share and cooperate with downstream automobile enterprises to make differentiated customization of its products to meet their different needs for various factors such as endurance, cost and low temperature. 2. Make use of its own	1. Reduce the R&D directions, focus on R&D advantage projects and reduce R&D costs. Some businesses with weak profitability should be properly abandoned to ensure the profitability of the enterprise.

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short term due to the technical bottleneck in the industry. 3. Technical advantages of competitors in the same industry (such as Japanese and Korean patents on all solid state batteries). 4. Maturity of other energy technologies. 5. Bargaining power of suppliers and consumers.	technical advantages, cooperate with upstream enterprises in charging pile related industries, layout the energy storage industry and rely on the huge battery market share to influence the product standards of energy storage and its supporting industries to a certain extent. 3. In addition to energy storage, it can also set foot in battery related industries, including power replacement technology, battery recycling, battery leasing, etc.	2. For projects and customers with poor profitability, appropriate streamlining and business contraction should be carried out to focus on the main business and profits.

The core point of SWOT analysis is that the company's strategy must adapt its internal capabilities (strengths and weaknesses) to the external environment (opportunities and threats). Based on the interdependence between the company and its environment, SWOT analysis can form four different strategies. The SO strategy relies on internal advantages to seize external opportunities. Take advantage of external opportunities to improve the WO strategy of internal weaknesses. Take advantage of the company's advantages to avoid or mitigate external threats. Take WT strategy to directly overcome internal weaknesses and avoid external threats. For the above strategic combination, CATL has technological advantages and market share advantages. Under the environment of increasingly mature new energy market and increasingly fierce competition in the industry, it should adopt the ST strategy in the matrix, which is the diversification strategy direction.

Summary and suggestions

Based on the relevant knowledge of strategic management, combined with the current development trends and trends of the new energy power battery and automobile industry, as well as the development and operation of CATL, this paper makes relevant strategies for the internal and external environment and operation of the company's development, and puts forward implementation suggestions. The conclusions are as follows:

SWOT analysis shows that CATL has strong technological research and development advantages and market share advantages, as well as closed-loop operation advantages brought by the complete industrial chain structure. Combined with the relevant energy background and the support policies of various countries for the industry, the new energy industry has huge potential and is in a rapid development stage. At the same time, in the face of increasingly fierce industry competition and policy recession and the cost strategy of foreign enterprises such as Panasonic and LG, CATL should adopt the ST strategy in the SWOT matrix, which is taking advantage of its own advantages and avoiding or mitigating the impact of external threats.

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