Study on the Profit Model of Power Battery Enterprises

Zhang Yan [1], Yang Yuetao [2,*]

[1] Suzhou Institute of Technology, Jiangsu University of Science and Technology, 215600, Zhangjiagang, China
[2] School of Business, Jiangsu University of Science and Technology, 215600, Zhangjiagang, China

Abstract. In recent years, global ecological environment deterioration, climate warming and other issues have become increasingly prominent. Governments of all countries are promoting the transformation of energy structure and vigorously supporting the new energy automobile industry. As the core part of new energy vehicles, power battery also ushered in a rapid development opportunity. As the most representative enterprise in China's power battery enterprises, CATL has become the leading enterprise in China's power battery enterprises by virtue of its first mover advantage, technological advantage and scale advantage in the power battery industry. Taking CATL as an example, this paper analyzes its profit model by using the five elements of profit model, and evaluates its financial performance from three aspects of profitability, cash earning ability and growth ability. It is concluded that the current CATL is a profit model dominated by power batteries, and the lithium battery industry chain is constantly improving its layout. The profit model of the enterprise is not unchanging but changing with the development of the enterprise. CATL has constantly explored and improved the profit model of the enterprise in its business process.

1 Introduction

2021 is the year when new energy vehicles will break out and the installed capacity of power batteries will grow rapidly. Under the influence of the COVID-19, the production and sales of new energy vehicles increased by 159.52% and 157.57% respectively, achieving a huge breakthrough. The rapid development of new energy vehicles has also driven the industry's demand for power batteries. In 2021, the cumulative load of power batteries in China will exceed 154.5GWh, with a year-on-year growth of 142.8%. Among them, the battery load of CATL will account for about 52.1%, accounting for half of the power batteries. On June 11, 2018, CATL was listed on the Shenzhen Stock Exchange, and its market value increased by more than 10 times in less than four years. The peak value of CATL rose to about 1 trillion yuan, surpassing the traditional energy giant PetroChina. CATL is not only the leader in China's power battery market, but also in the leading position in the global market. At present, China's power battery industry is in the forefront of the world. Analyzing the profit model of China's power battery enterprises has a great impact on the development of power battery enterprises.

2 Development status of power battery industry

2.1 Industry development overview

Power battery industry is one of the most promising industries in recent years[1]. The power battery is indispensable in the process of automobile power transformation. The power battery is the core part of new energy vehicles, and its cost accounts for 30% to 40% of the whole vehicle. Therefore, almost every automobile enterprise has considered the power battery. The shipment of power battery in China continues to increase. From 2017 to 2021, the shipment of power battery in China will grow at a compound annual growth rate of 37.6%. In 2021, the shipment of power battery in China will reach 220GWh, with a year-on-year growth of 175%. Under the influence of the epidemic, the shipment volume in 2021 has increased significantly compared with that in 2020, mainly because the power battery industry has deepened the supply side structural reform, and the supply capacity of advanced products has been continuously improved. With the growth of shipments, the installed capacity of power battery in China also continues to grow. From 2017 to 2021, the installed capacity of power battery in China will grow at a compound annual growth rate of 43.5%. In 2021, the installed capacity of power battery in China will reach 154.5Wh, with a year-on-year growth of 142.8%. With the rapid growth of the penetration rate of new energy vehicles, the healthy development of the industrial chain and the effective control of the epidemic situation, China's power battery market will continue to expand.

2.2 Industrial policies

The development of China's power battery industry has gone through the stages of technology accumulation at the initial stage[2], rapid expansion of industrial scale supported by policies, intensified competition and

* Corresponding author: 1360035761@qq.com

industrial integration to form leading advantages, until the current subsidy dependence is reduced and integration into the global market is intensified[3]. This series of changes are inseparable from the support of government policies. As early as 2004, the National Development and Reform Commission issued the Automobile Industry Development Policy to actively carry out research and industrialization of new power such as electric vehicles and vehicle power batteries; In 2009, the "lithium ion battery/supercapacitor" hybrid power system was included in the subsidy scope of new energy vehicles[4]. In March 2015, the Ministry of Industry and Information Technology issued the Standard Conditions for the Automotive Power Battery Industry, linking the standard list with enterprises, making it clear that only new energy vehicles with power batteries provided by enterprises on the list can receive financial subsidies, which has promoted the vigorous development of domestic power batteries[5]. In April 2020, the Notice on Improving the Financial Subsidy Policy for the Promotion and Application of New Energy Vehicles was issued, extending the implementation period of the financial subsidy policy for the promotion and application of new energy vehicles to the end of 2022. Since 2004, China has issued a series of power battery related policies, including scientific and technological innovation, industry management, recycling, fiscal and tax incentives, which provide strong policy support for the healthy and orderly development of China's power battery industry.

2.3 Industry development prospect

New energy vehicles are the trend of the times, and power batteries are in short supply. As the world pays more and more attention to climate change, many countries in the world have given a timetable for carbon neutrality[6]. At the end of September 2020, China proposed the goal of achieving carbon neutrality by 2060. Japan, South Korea, the European Union and other countries have announced that they will achieve carbon neutrality by 2050, which is in itself a major benefit to new energy vehicles and also drives the development of the power battery industry[7]. In addition, the policy support of various countries has strengthened such certainty. With the introduction of national policies to encourage and regulate the development of the power battery industry, the industry is gradually standardized, and the awareness of consumption of the whole society continues to improve[8]. Many institutions and social capital continue to enter the power battery field, which effectively promotes the rapid development of the industry market. The power battery industry has broad prospects for development[9].

3 Analysis of profit model elements in CATL

This paper selects five elements of profit model (profit point, profit object, profit lever, profit source, profit barrier) to analyze the enterprise profit model. In the daily production and operation activities of the enterprise, these five elements propose to the enterprise respectively: What goods or services does the enterprise provide to consumers? Who are the consumers of the enterprise? How does the enterprise provide goods or services? How do enterprises gain profits? How can an enterprise stand out from the competition in the same industry? The relationship between the five elements of the profit model is not fixed and can be arranged and combined at will. No matter how these elements are combined, their ultimate goals are the same, even if the enterprise gains long-term profits.

3.1 Profit points

In the power battery industry, changes in customer demand for products will have an impact on the profits of CATL. The main business of CATL is to produce and sell power lithium-ion batteries, and its scale has reached the first in China. At present, there are two types of mainstream power batteries in the market, the first type is lithium iron phosphate battery; The second type is ternary lithium battery; Among them, lithium iron phosphate has great advantages in the field of passenger car batteries based on safety, and lithium ternary has advantages in the field of passenger cars based on high energy density. Therefore, the difference in the strategic layout of power batteries such as lithium iron phosphate and lithium ternary will affect the subsequent development trend of power battery enterprises. The power battery system of CATL adopts the common development route of ternary lithium ion battery, lithium iron phosphate battery and other products, among which the ternary lithium battery of CATL has high energy density and long endurance. In December 2016, the state introduced a policy subsidy oriented to battery energy density. With the ternary lithium battery, CATL has become the first choice of many new energy automobile enterprises, with a high market share. In addition, the company is also conducting research on sodium ion battery, lithium manganese iron phosphate battery and AB battery, which is expected to further improve the application scenario of power battery[10].

In addition, CATL's products also include energy storage products and lithium battery materials[11]. The energy storage products of CATL are mainly electric cells, modules, electric boxes and battery cabinets. The energy storage system of the company mainly uses lithium iron phosphate as the cathode material, and the products are mainly square batteries, which are mainly used for energy storage at the power generation side, power grid side and power consumption side. CATL lithium battery materials mainly recycle valuable metals such as nickel, cobalt, manganese and lithium in waste lithium ion batteries through battery recycling, and produce ternary precursor and other lithium ion battery materials through processing, purification, synthesis and other processes, so that nickel, cobalt, manganese and lithium resources can be recycled. CATL acquired Guangdong Bangpu in 2015 and laid out the cathode material business in the form of light assets. Guangdong Bangpu, a subsidiary of Yituo, and CATL work together with customers to create an ecological closed-loop of "battery production → use → cascade

utilization→recycling and resource regeneration".

3.2 Profit Object

The customer group of the company determines the market positioning of the company, and the market positioning affects the production and operation strategy and decision-making of the enterprise, and then affects the profit of the enterprise. There is no long-term profit without a stable source of customers, so the profit object is one of the indispensable important factors in the profit model. The operating revenue of CATL mainly comes from the power battery system, and the main customers of the power battery system are mainly introduced below.

The customer base of CATL is mainly from the downstream vehicle industry, with a broad customer base. Its products are widely used in passenger cars, special vehicles and passenger cars, and have deep cooperation with global customers such as Tesla, Hyundai, Ford, Daimler, Great Wall Motors, Ideal, and Weilai. In 2021, the top five customers of CATL will be Tesla, Weilai Automobile, Xiaopeng Automobile, SAIC Motor and Geely Group, with total sales of about 40.826 billion yuan, accounting for 31.32% of the total sales. Tesla purchased 13.039 billion yuan of power batteries in 2021, accounting for 10% of the total revenue of CATL, becoming the largest customer of CATL.

Table 1. Data of Top 5 Customers of CATL Times in 2021.

N0.	Customer Name	Sales(10 thousand)	Proportion in total annual sales
1	First	1303903.76	10.00%
2	Second	894206.45	6.86%
3	Third	782602.27	6.00%
4	Fourth	654370.12	5.02%
5	Fifth	447550.35	3.43%
Total	--	4082632.94	31.32%

In 2021, CATL will be the sole supplier of Weilai Automobile, FAW Volkswagen, Ideals Automobile, SAIC Volkswagen, Brilliance BMW, Chichi Automobile and other auto enterprises, as well as Tesla, Xiaopeng, SAIC, Geely, Dongfeng, Yutong, BAIC, Zhongtong, Weima and other auto enterprises, with supporting facilities accounting for more than 50%.

3.3 Profit leverage

CATL mainly creates value for customers through technological innovation, layout capacity construction and layout of the upstream and downstream of the industrial chain.

If power battery enterprises want to develop in the long run, they must carry out R&D and innovation, so that technology can keep up with the market and meet customer needs. CATL adheres to the enterprise mission of "achieving customers through innovation" and constantly increases technology research and development. CATL has a clear product planning, and material and structure innovation go hand in hand. Considering the rapid development of new energy vehicles and passenger cars, the core materials have gradually formed a product structure dominated by ternary materials. At present, the company has adopted 4.5 micron ultra-thin foil in its 811 product system with high nickel and low cobalt, which can reduce the mass of inactive substances and the volume of battery pack, bringing about a 5% - 10% increase in the energy density of battery cells. The company has successfully achieved the energy density of battery cells exceeding 300Wh/kg, and the system energy density reaching 215Wh/kg, which is a world leading level. In terms of battery structure, the company has continuously introduced new technologies to improve the efficiency of the battery pack. The company pioneered CTP technology, integrating the battery cells into the battery pack, simplifying the battery module structure, and increasing the battery's guaranteed volume utilization rate by 15% - 20%. The average energy density of traditional battery packs is 180Wh/kg, while the CTP battery pack's energy density can reach more than 200Wh/kg, and the production efficiency has increased by 5%, reducing the system energy consumption and cost.

With the rapid development of new energy vehicles, the expansion of power battery production is imminent. By the end of 2021, CATL has planned 10 production bases, which are CATL in Fujian, Liyang in Jiangsu, Xining in Qinghai, Yibin in Sichuan, Zhaoqing in Guangdong, Lingang in Shanghai, Xiamen in Fujian, Yichun in Jiangxi, Gui'an in Guizhou and Germany. In addition, the company also established Time FAW, Time Geely, Time GAC, Dongfeng Times, and Time SAIC with FAW, Geely, GAC, Dongfeng Times, and Time SAIC to jointly produce power batteries. In addition, the capacity planning of the joint venture capacity company exceeded 760GWh, far ahead of other competitors.

The power battery is in the middle link of new energy vehicles, and bears the situation of "run" of upstream and downstream. CATL strengthens the competitive advantage of enterprises by arranging the upstream and downstream of the industrial chain. The upstream of the battery is the main raw materials, including positive pole, negative pole, electrolyte and diaphragm. The most expensive is the cathode material, and lithium is the most used. In the past year, lithium battery materials have been rising, especially lithium carbonate. CATL laid out key upstream resources by holding shares, establishing joint ventures, signing strategic agreements and other ways, which greatly eased the pressure on raw material costs. The downstream of the power battery is the car enterprise. CATL locked the order in advance by deeply binding the downstream high-quality car enterprises. Since 2021, CATL has successively locked a number of long orders, including the 57GWh order from Zhejiang Vision under Geely, the 4-year order from Tesla, the 10-year long-term strategic cooperation agreement signed with Great Wall Motors, and the increased supply of BMW, Volkswagen, Hyundai, Rolls Royce, etc.

3.4 Profit source

The main business of CATL is to produce and sell power lithium-ion batteries. In addition to selling power batteries, the company has also set foot in the battery material recycling business. At the same time, because of the need to deal with discarded lithium batteries, the company has also started energy storage business. It can be said that the main business of CATL is focused on lithium batteries. The power battery revenue accounts for about 80% of the operating revenue. In 2021, the power battery system revenue will be 91.491 billion yuan, a year-on-year increase of 132.06%, and the gross profit margin will be 22.00%, a year-on-year decrease of 4.56%. In 2021, the energy storage system of CATL will develop rapidly, with an operating revenue of 13.624 billion yuan, a year-on-year increase of 601.01%, and a gross profit margin of 28.52%, a year-on-year decrease of 7.51%. The gross profit margin of power battery system and energy storage system decreased, mainly due to the substantial increase of upstream raw materials. In 2021, the lithium battery material revenue of CATL will be 15.457 billion yuan, with a year-on-year increase of 350.74% and a gross profit margin of 25.12%, with a year-on-year increase of 4.66%. The increase in sales revenue and gross profit margin is mainly due to the strong customer demand, the sales growth brought about by the company's new lithium battery material production capacity and the increase in sales prices brought about by the rise in raw material prices.

In addition, government subsidies are also an important source of profits in the CATL. As a new energy enterprise, CATL received a large amount of government subsidies from 2016 to 2021. The amount of government subsidies has exceeded 4.5 billion yuan in six years, which is an important source of profits in CATL. In 2021, the proportion of government subsidies in the net profit will reach 9.36%. Under the influence of the COVID-19 and the sharp rise in the price of raw materials, CATL can still maintain a high profit without government subsidies. Part of the government subsidies obtained by CATL are used to develop the company's core technologies, including lithium battery technology, energy storage technology, etc., and the other part is used to build infrastructure, such as industrial bases, laboratories, etc.

Table 2. Government Subsidies in CATL from 2016 to 2021.

	2016	2017	2018	2019	2020
Net profit (100 million yuan)	29.18	41.94	37.36	50.13	61.04
Government subsidy (100 million yuan)	1.81	4.44	5.08	6.46	11.36
Annual growth rate	163.42%	145.42%	14.26%	27.29%	75.74%
Proportion in net profit	6.20%	10.60%	13.59%	12.89%	18.61%

3.5 Profit barrier

The profit barrier is the guarantee of the company's sustainable profitability, which can be summarized as the company's core competitiveness. CATL mainly constructs the core competitiveness of the enterprise through its technology research and development, advanced manufacturing system and high-quality management team. Innovation is the vitality of an enterprise, and achieving customers is the guarantee for the sustainable success of CATL. CATL attaches importance to the research and development of products and technology processes, and has established a sound research and development system covering product research and development, engineering design and process manufacturing. In 2020, the R&D investment was 7.691 billion yuan, accounting for 5.90% of the operating revenue, an increase of 19.28% over 2019. The company‘s accumulated R&D investment exceeded 18 billion yuan. As of December 31, 2021, the company has 10079 R&D technicians, accounting for 12.06% of the total. Among them, 170 have doctor's degrees and 2086 have master’s degrees. The overall R&D team size and strength are leading in the industry. The application of advanced manufacturing capacity and cutting-edge technology is another important profit barrier in CATL. CATL is committed to building a leading extreme manufacturing system. The company strives to improve its manufacturing capacity from the aspects of production efficiency, product quality, safety assurance, etc., and actively improves the existing manufacturing process and product quality by using artificial intelligence, advanced analysis, cloud computing and other technologies. The company's battery production yield, first pass rate and other indicators have been greatly improved. In addition, the company has a professional, diversified and international high-quality management team, and the core management members have accumulated profound professional knowledge and rich practical experience in the field of power battery. Under the leadership of a mature and stable management team, the company's differentiated competitive strategy and benign incentive mechanism jointly promote the company's sustainable and steady development, so that the company continues to maintain a leading position in the power battery market.

4 Summary of CATL profit model

The profit model of CATL implements a vertical integration layout, extending to the upstream and downstream of the power battery industry chain. In the vertical integration layout, CATL took power battery technology as the core, expanded capacity to maintain its scale advantage, and then laid out the upstream and downstream of the lithium-ion battery industry chain. Its industrial chain has formed a layout from mineral resources in the upstream of lithium-ion batteries to lithium battery materials. The downstream cooperates with new energy automobile enterprises for win-win results. The energy storage power station equipment uses power batteries step by step, and battery recycling realizes the recycling of lithium, nickel, cobalt and other metals. The power battery of CATL has formed a pattern of common development of various technical routes, mainly consisting of ternary lithium battery and lithium iron phosphate battery. Among them, the ternary lithium battery of CATL has a high proportion in the passenger car

market, becoming a major weapon for the company's development.

In order to meet the energy and transportation reform, the investment of CATL has involved power batteries, energy storage, lithium battery materials, lithium battery intelligent equipment manufacturing, charging and changing, automatic driving, new energy vehicles and other fields. The company has grown into a “super unicorn” in the field of power lithium batteries. The vertical integration layout of CATL has enhanced the way of creating value in CATL and helped the CATL become stronger and larger.

5 Conclusion

This paper takes CATL as an example to study the profit model of power battery enterprises. First, it understands the industry situation, industry policies and prospects of power battery, then analyzes the five elements of the profit model of CATL, and then analyzes and evaluates its performance from the financial perspective. Finally, it analyzes the shortcomings of the profit model of CATL and puts forward optimization suggestions. Through analysis, the following conclusions are drawn: CATL has gradually formed a profit model focusing on power batteries in the business process, with a perfect layout in the lithium battery industry chain, and has continued to expand production capacity to maintain its scale effect with technology research and development as the core, showing unique advantages in business activities. CATL has become a leading enterprise in the power battery industry. Its company has strong profitability and cash earning ability, which also proves from the side that the profit model of CATL has its own advantages and good profit model, but there are still some shortcomings, such as low degree of industrial chain integration, relatively low proportion of overseas markets, etc. The company should actively deal with and improve its profit model.

At present, the power battery industry is on a track of rising growth, and all enterprises are improving their profit models, striving to gain more share in the power battery industry. After years of development, CATL has grown into a leading enterprise in the industry, which is the guiding role of the national industrial policy and environmental development trend, and can not be separated from the existing profit model of the enterprise. The current profit model of CATL has pointed out the direction for the development of power battery enterprises in China, and has important reference significance for the development of power battery enterprises in China.

References

1. Gu Huaying, Liu Zhixue, Qing Qiankai. Optimal electric vehicle production strategy under subsidy and battery recycling[J]. Energy Policy, 2017, 109:579-589.
2. Harper G, Sommerville R, Kendrick E, et al. Recycling Lithium-ion batteries from electric vehicles[J]. Nature, 2019, 575(7781):75-86.
3. Ordonez J, Gago E J, Girard A. Processes and technologies for the recycling and recovery of spent lithium-ion batteries[J]. Renewable and Sustainable Energy Reviews, 2016, 60:195-205.
4. Pazoki M, Zaccour G. Extended producer responsibility: Regulation design and responsibility sharing policies for a supply chain[J]. Journal of Cleaner Production, 2019, 236.
5. Tasaki T, Tojo N, Lindhqvist T. Differences in perception of extended producer responsibility and product stewardship among stakeholders: An international questionnaire survey and statistical analysis[J]. Journal of Industrial Ecology, 2019, 23(2): 438-51.
6. Luo Hang, Zhang Yi, Meng Qingguo. Modeling and Simulation of Muliti-Cities’ Policy Coordination Based on Mas[J]. Chinese Journal of Management Science, 2015,23(1): 89-98.
7. Corwin S, Johnson T. The role of local governments in the development of China’s solar photovoltaic industry[J]. Energy Policy, 2019,130: 283-293.
8. Li Wenbo, Long Ruyin, Chen Hong. Consumers’ evaluation of national new energy vehicle policy in China: An analysis based on a four paradigm model[J]. Energy Policy,2016,99: 33-41.
9. Wang Ran, Cheng Jinhua, Zhu Yali, et al. Evaluation on the coupling coordination of resources and environment carrying capacity in Chinese mining economic zones[J]. Resources policy,2017,53(9):20-25.
10. Zhang Xiang, Bai Xue. Incentive policies from 2006 to 2016 and new energy vehicle adoption in 2010-2020 in China[J]. Social Science Electronic Publishing,2017,70: 24-43.
11. Yi Bowen, Xu Jinhua, Fan Ying. Coordination of policy goals between renewable portfolio standards and carbon caps: A quantitative assessment in China[J]. Applied Energy,2019,237:25-35.