

Longi green energy financial analysis

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Abstract. This article takes Longi Green energy Technology Co.,Ltd as the research object, conducting strategic analysis from macro environment (PEST) and industry background with its own strategy; Then the article conducts financial analysis from profitability, operating capacity, solvency and development ability and evaluates them comprehensively using Wall scoring method; Finally, corresponding suggestions are made through analysis.

Keywords: Financial analysis; Wall scoring method; Strategic analysis.

1. Introduction

With the rapid development of economy and society, the consumption of oil and other fossil energy in China is increasing. The high dependence of fossil energy has brought great hidden dangers to China's energy security and economic and social development. At the same time, the extensive use of fossil energy also brings severe challenges to the ecological and environmental protection.

In order to deal with the problems of energy security and environmental protection, the Chinese government strongly supports the development of new energy industry, among which the power generation industry, as the main source of energy consumption and greenhouse gas emissions, has become the key application field of new energy. With the strong support of national policies, the photovoltaic industry has achieved a blowout development, and the production and sales volume are also increasing year by year. Related photovoltaic enterprises have obtained unprecedented opportunities for development, not only in the scale of revenue, but also in the capital market. This paper takes Longi Green Energy, a leading enterprise in the photovoltaic industry, as an example to explore the industry's development.

1.1 Macroscopic background analysis---the PEST model

PEST model was used to analyze Longi green energy, and the macro environment of Longi green energy was analyzed from four dimensions: politics, economy, society and technology .

1.1.1 Political

Carbon peak reaching and carbon neutrality policy play an important role in China's ecological environment construction and global carbon emission control. Carbon peak means that the carbon emissions of the industry no longer rise after reaching the peak, but then enter a stage of continuous decline, while the economic development is still not affected, that is, high-quality economic development. Carbon neutrality refers to the fact that within a certain period of time, the carbon dioxide directly and indirectly emitted by human activities in a certain area will offset each other through afforestation, so as to achieve the "net zero emission" of carbon dioxide. China's carbon dioxide emissions will strive to reach a peak by 2030 and become carbon neutral by 2060.

Meanwhile, the US new energy policy is aimed at China. On August 12, 2021, the US Department of Commerce claimed that for national security reasons, four "emerging and basic technologies" were included in export control, including gallium oxide and diamond, fourth-generation semiconductor materials that can withstand high temperature and high voltage; EDA / ECAD software necessary for integrated circuits with GAAFET (surround gate field effect transistors) structure; pressure gain combustion technology that can be used for rockets and hypersonic systems. On the same day, the US Congress passed another Inflation Reduction Act, which will accelerate the development of clean energy, invest \$430 billion to build an independent and complete clean energy power generation industry chain and new energy vehicle industry chain, and reduce carbon emissions by 40% by 2030.

The bill includes a targeted statement that subsidized new energy vehicles must be assembled in North America, and that 40 percent of the battery materials and "key minerals" must come from the United States, or from countries that have free trade agreements with the United States. After 2023, new energy vehicles purchased with "batteries produced from other countries" will not be able to receive subsidies. This puts Chinese companies in a dilemma. Domestic new energy companies must go to the United States to build factories, otherwise they will be excluded from the American market, but this will lose the cost advantage of the domestic supply chain. Chinese enterprises can only choose to move the entire industrial chain or use the local supply chain in the United States, but this leads to high coordination difficulty and loss of cost advantage. In the short term, China's photovoltaic industry has a great advantage in the world. In 2021, among the four major links of polysilicon, silicon wafers, cells and photovoltaic modules, China all account for more than 75% of the world's output. However, in the long run, Chinese new energy enterprises must be prepared to compete with the United States. Only a steady stream of technological progress can ensure the cost advantage and product competitiveness.

Therefore, in order to achieve the dual-carbon target and deal with the conflict with the USA, the photovoltaic power generation industry focus on the layout of photovoltaic technology research and development, balancing the contradiction between technology and cost, and helping achieve the two-carbon goal.

1.1.2 Economic

With the increase of China's GDP and per capita income, the photovoltaic industry has experienced certain industry adjustment in some periods due to macroeconomic fluctuations, overheated industrial investment, international trade policies and other factors, but it still shows an upward trend on the whole. At present, China accounts for a large proportion of the world's new installed photovoltaic capacity and photovoltaic module production, reaching 204.7GW by 2019, accounting for 32.6% of the global photovoltaic installed capacity. With the support of the state and the development of industrial technology, China's photovoltaic industry has achieved rapid growth, and has become an industry that China can participate in international competition and occupy a leading position. In the future, the market size of photovoltaic modules and its power generation industry will continue to expand, and the development prospect of the industry is broad.

At the same time, the state has gradually established a green electricity market, increased carbon emissions tax, reduced carbon emission quota, forcing the transformation and upgrading of the power generation industry, and adjust the power generation structure. In 2021, due to the gradual economic recovery and factors such as rising coal prices, power supply is not enough to cover demand. According to the data of China Electricity Council, in 2021, the total electricity consumption of the whole society was 8,312.8 billion kilowatt-hours, up 10.3% year on year, and up 14.7% compared with the same period in 2019. Due to the gradual control of COVID-19 under control, the economic recovery and the growth of import and export volume, residential and industrial electricity consumption has rebounded substantially. In order to supply needed electricity and reduce carbon emissions, power enterprises are in urgent need of transformation and upgrading.

1.1.3 Social

With the development of economy and society, environmental pollution has seriously restricted the high-quality development of economy, while the traditional thermal power generation is very serious pollution to the environment, improving the power structure, increasing the proportion of new energy generation has become urgent.

As a labor-intensive and technology-intensive industry, the social objective environment will have an important impact on photovoltaic power generation. Western provinces with sufficient solar energy and low labor cost have become the first choice for many photovoltaic manufacturing enterprises to build factories. The site selection of photovoltaic enterprises promotes the economic development in western China and increases the employment rate in western China. In addition, after the construction of photovoltaic power stations in the western desert areas, the shielding of

photovoltaic modules reduces the surface evaporation, and improves the local desertification situation. The development of the photovoltaic industry in the western region not only brings industrial investment to the western region, but also promotes the local economic development and tax revenue, which plays an important role in reducing the gap between the east and the west and promoting the integration of the central and western regions.

At the same time, from the perspective of the whole life cycle, the water consumption of photovoltaic power generation is only 50% of the water consumption of coal power generation. Vigorously developing photovoltaic power generation can effectively save water resources. As people get distributed photovoltaic is popularized. The increasing number of installed household solar energy, fully reflects the public's requirements for energy conservation and environmental protection. At present, new energy power generation has become an inevitable choice under the economic and social development.

1.1.4 Technology

During the "13th Five-Year" period, with the continuous expansion of industrial scale, China's photovoltaic power generation technology has developed rapidly, and the industrialization mass production technology of photovoltaic cells, photovoltaic modules and other key components has reached the world's leading level; the production equipment and technology are continuously upgraded, and the complete technology of photovoltaic power generation system is continuously optimized and improved, and the intelligence level is significantly improved. By the end of the 13th Five-Year Plan, China's photovoltaic cell manufacturing has basically realized the upgrading from the traditional "polycrystalline aluminum back field" technology to "single crystal PERC" technology, and the average photoelectric conversion rate of mass production of crystalline silicon cells has increased from 18.5% at the beginning of the 13th Five-Year Plan to 22.8%, realizing leapfrog development.

However, China's photovoltaic industry is still facing the problem of overcapacity caused by the high operation of supply chain and the long expansion cycle of silicon. Although China's photovoltaic power generation technology is making continuous progress, the cost of photovoltaic products is also gradually declining. In 2021, the benchmark electricity price of photovoltaic remains between 0.2 and 0.3, which is basically the same as the cost of coal power generation, and in some areas, it is even lower than that of coal power generation. However, China's photovoltaic industry still belongs to the ranks of high investment and long payback period, mainly because China's photovoltaic industry is still in the growth stage and needs to develop urgently.

2. Longi green energy strategy analysis

2.1 Industry analysis

2.2.1 Industry development history

Since 2000, the global photovoltaic industry has entered a period of rapid development, with the cumulative installed capacity of photovoltaic growing rapidly, and the upstream and downstream related industries have also developed rapidly. In the second half of 2008, the impact of the global financial crisis, the growth of photovoltaic demand for a temporary decline. However, since the second half of 2009, the industry has developed again, and the market demand for photovoltaic has increased again. From 2009 to 2010, with the recovery of the global market and the promotion of the Chinese government's 4 trillion yuan plan, the photovoltaic industry once again ushered in the investment peak.

However, the global slowdown in the growth of new installed photovoltaic capacity, coupled with severe regional overcapacity and the rise of trade protectionism, China's photovoltaic industry is almost the whole industry loss after the investment boom dissipated. At the end of 2011, the European debt crisis broke out, and eu countries cut photovoltaic subsidies, and the photovoltaic demand in

Europe declined rapidly, leading to a decline in the growth rate of global new photovoltaic installed capacity, and the development of photovoltaic industry fell into a bottleneck.

China's photovoltaic industry entered a stage of positive growth in the second half of 2013. This is mainly due to the introduction of industrial support policies by China in 2013, and the easing of the trade dispute between China and Europe on photovoltaic products. China's photovoltaic industry has once again entered a period of vigorous development.

Since 2013, China, Japan and the United States have replaced Europe in leading the scale of the photovoltaic industry, contributing mainly to the global installed capacity growth in these three countries. In 2013, a number of policies to support the photovoltaic industry, represented by the State Council on Promoting the Healthy Development of the Photovoltaic Industry, made investors flock there again. By now on, China has gradually replaced Europe as the world's largest photovoltaic market.

With the expansion of the scale of the photovoltaic market in the world under the policy support, all links of the industrial chain continue to reduce costs and improve benefits. The photovoltaic industry has entered the growth period, and the driving force of photovoltaic development has gradually shifted from policy-driven to market-driven. Since the 13th Five-Year Plan, the government has issued several supportive policies to improve the intensity of green emission reduction and accelerate the construction of ecological civilization.

In 2018, the introduction of the "531 New Deal" prompted the decline of photovoltaic electricity price, and forced the development power of photovoltaic to gradually shift from policy driven to market driven. The new policy requires to accelerate the decline of photovoltaic power generation prices, as soon as possible to achieve market drive. It stipulates that the benchmark on-grid price of newly operational photovoltaic power stations will be reduced by 0.05 yuan per kilowatt-hour. Photovoltaic subsidies are gradually withdrawn, and parity online has been basically achieved.

From 2021, the state will cancel the subsidies for new registered centralized photovoltaic power stations and industrial and commercial distributed photovoltaic projects, and the era of photovoltaic parity online will officially come.

2.2.2 Industry scale

In 2021, the total output value of photovoltaic industry exceeded 750 billion. In 2022, according to the announcement of enterprise information and industry association, the output of photovoltaic industry chain reached a record high in 2022, and the output of polysilicon, silicon, cells and modules increased by more than 55%; the total output value of the industry exceeded 1.4 trillion yuan, and the industry scale is expected to exceed 2 trillion yuan in 2023.

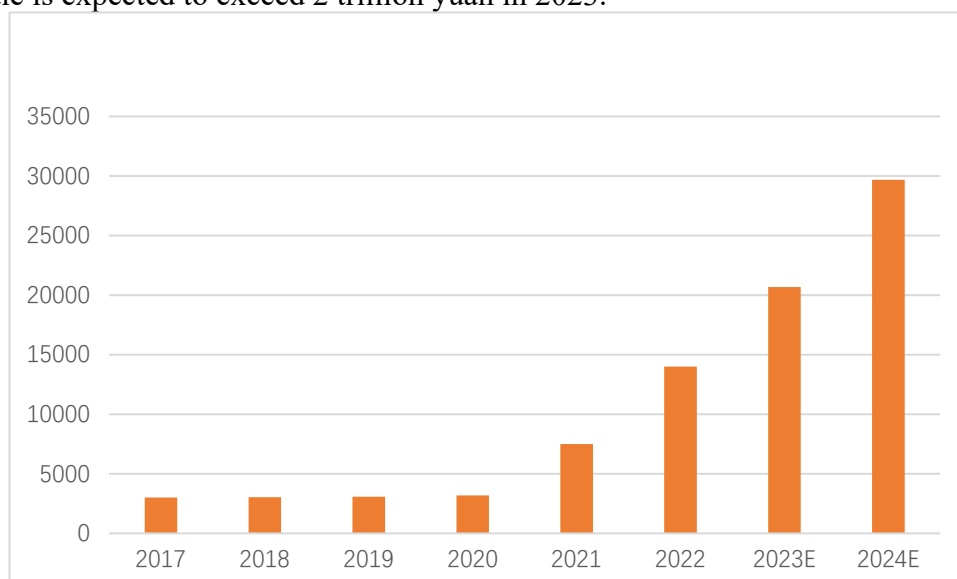


Figure 1 Market size of the PV Industry(Unit: 100 million yuan)

2.2.3 Industry competition structure

The following figure shows the photovoltaic industry chain. The upstream is mainly the manufacturing of high purity polysilicon and monocrystalline silicon materials and the production of silicon wafers, which mainly includes battery processing and module packaging, while the downstream is the photovoltaic application end, mainly centralized photovoltaic power station and distributed photovoltaic.

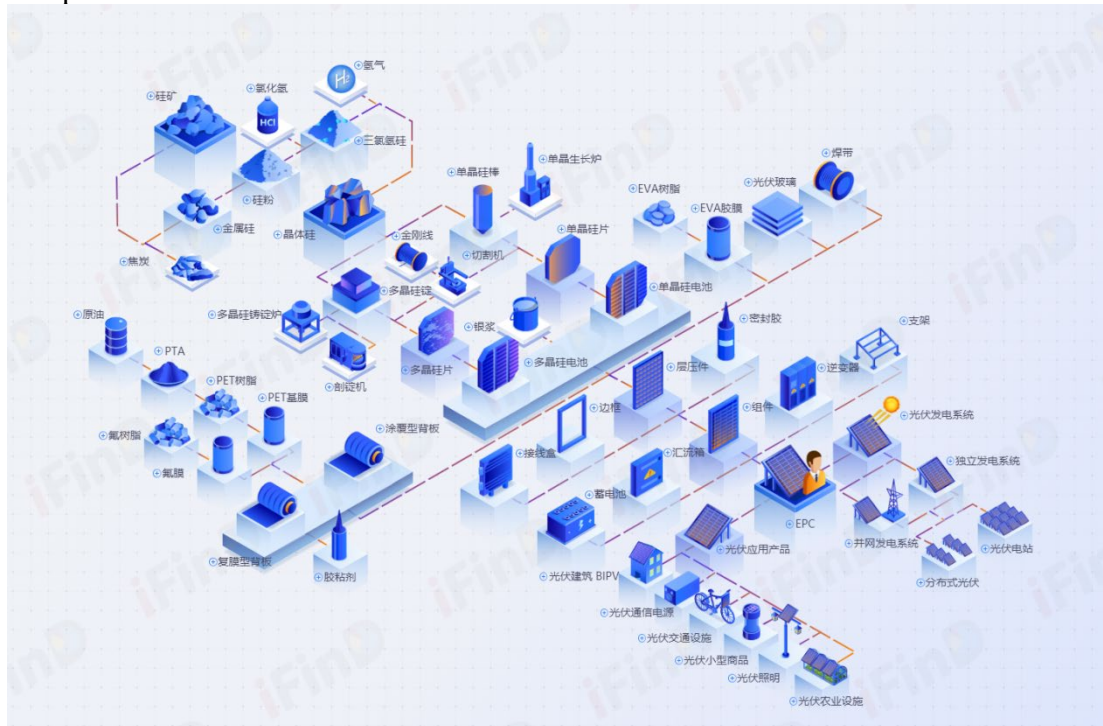


Figure 2 Panorama of the PV industrial chain

Figure 3 shows the market share of silicon wafers in China in 2021. It can be seen that Longi Green Energy has the highest market share, followed by TCL Zhonghuan.

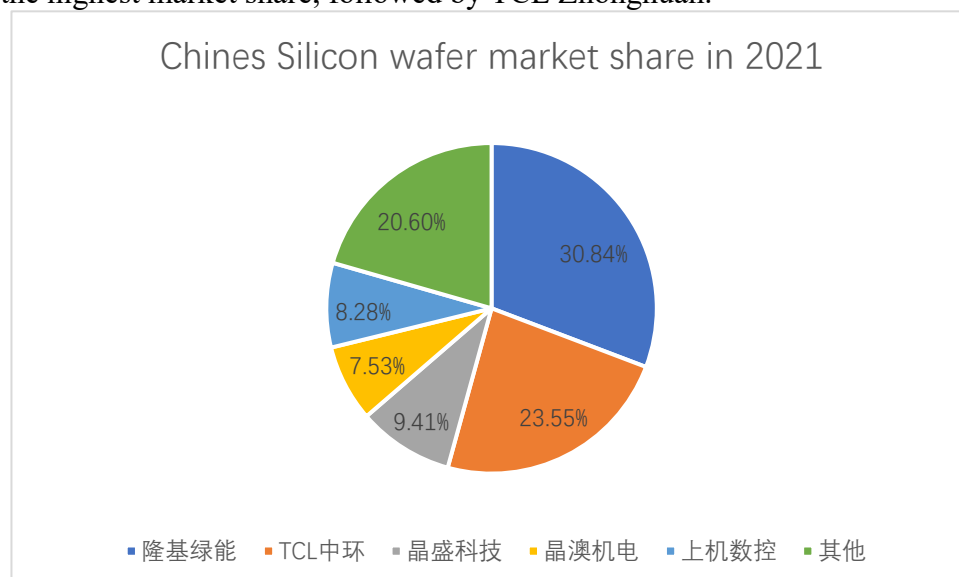


Figure 3 Chinese Silicon wafer market share in 2021

Figure 4 shows the statistics of the market share of cells in China in 2021. It can be seen that compared with silicon wafers, the market concentration of cells is slightly lower.

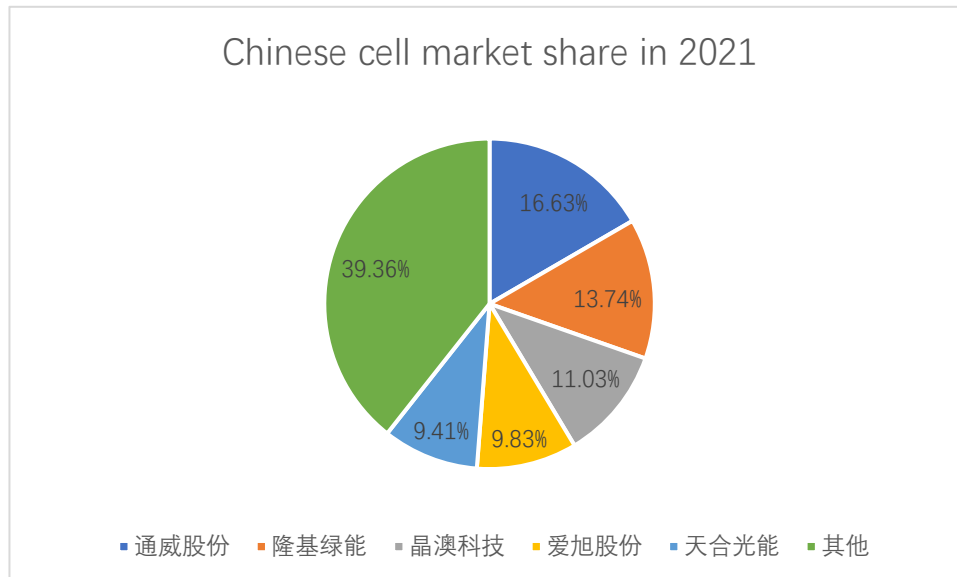


Figure 4 Chinese Cell market share in 2021

From the market share of China's new energy generation, the concentration of photovoltaic power generation in China is at a high level. According to the data of China Photovoltaic Industry Association, the photovoltaic industry will grow steadily in 2021, and the industrial concentration is also further improving. Silicon raw materials, silicon wafer, cell, photovoltaic module, the top five enterprises accounted for 86.7%, 84%, 53.9% and 63.4% in the domestic total output, respectively, and the top enterprises have obvious scale advantages.

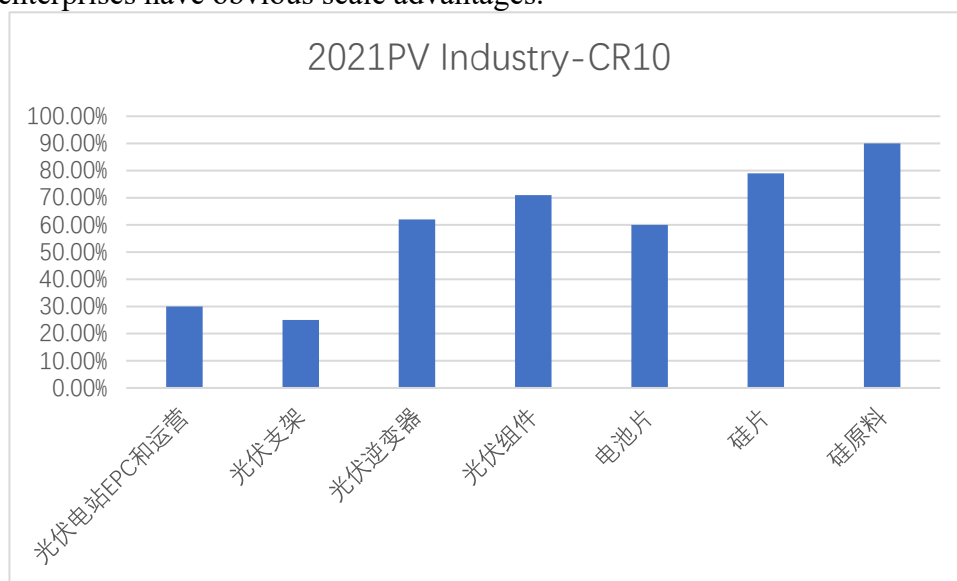


Figure 5 Concentration of photovoltaic industry in 2021

2.2 Longi green energy strategy analysis

Longi Green Energy's photovoltaic strategy: started from the single crystal silicon chip business. After acquiring Zhejiang Leye in 2014, it began to accelerate the layout of integrated modules. The company's silicon wafer production capacity is partly self-used production and processing of cells, and part of them is exported. The cell production capacity is mainly used for the manufacturing of photovoltaic modules.

The company is committed to the implementation of low carbon, focusing on providing efficient monocrystalline solar power generation products and solutions for global customers, mainly engaged in the research and development, production and sales of monocrystalline silicon rods, silicon wafer, batteries and components, has developed into the world's largest monocrystalline silicon wafer and component manufacturing enterprise. In addition, the company actively layout and cultivate new

businesses, providing products and system solutions for photovoltaic centralized ground power stations and distributed roof (BIPV) development. In 2021, the company established Xi 'an Longi Hydrogen Energy Technology Co., LTD., committed to becoming the world's leading large-scale green hydrogen equipment and solutions provider, providing green hydrogen solutions for the global green and low-carbon transformation. At present, the company's main products of monocrystalline silicon rod, in many domestic and foreign photovoltaic power station development and provide system solutions.

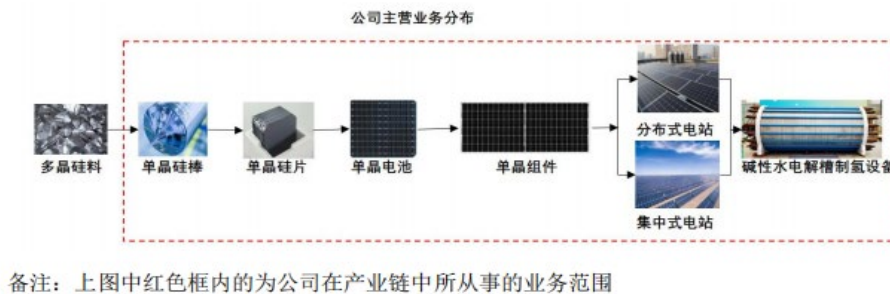


Figure 6 Main business distribution of the company

Longi green energy's strategic choice is a long and firm process. As early as 2006, Mr.Li Zhenguo led the team to conduct in-depth research and analysis of photovoltaic technology, and chose the single crystal route with the most potential to achieve the lowest photovoltaic cost as the technical direction of the company, and focused resources on long-term goals, focusing on the research and development, production and sales of single crystal products. Even in the beginning of a few years of polycrystalline market trend, still adhere to the single crystal route does not waver. Under the guidance of the company, the global market share of single crystal in the global world has increased rapidly, realizing the reversal and completing the market replacement of single crystal to polycrystal. At present, Longi Green Energy has developed into the world's largest single crystal photovoltaic manufacturing enterprise integrating research and development, production, sales and service, and the shipments of monocrystalline silicon wafers and components rank first in the world.

The company always adheres to the promotion of customer value as the core, adhering to the "stable and reliable, science and technology leading" product concept, through increasing investment in research and development, technological innovation to lead the industry technological change and promote the development of the industry, and constantly improve the market competitiveness of the company's products. In 2021, the company's R & D investment reached 4.394 billion yuan, a year-on-year increase of 69.55% compared with 2020. In the single crystal growth technology and quality control technology, single crystal growth technology, single crystal silicon wafer cutting ability, single crystal battery high efficiency, component technology industrialization application research, cost reduction and efficiency increase and intelligent manufacturing, iterative technology and new product reserves are sufficient, and the independent innovation ability has been continuously enhanced.

By the end of December 2021, Longi Green Energy has obtained 1,387 patents of various types, and a number of core technologies and products are in the leading position in the industry. At present, the mainstream crystal drawing technology RCZ technology and the diamond wire slicing process, which are widely used in the industry, are the first introduced by the company in the world. When the mortar cutting was prevalent, it created the domestic diamond wire industry chain, promoted the development of the domestic diamond wire industry chain, and once again went against the current and become the industry leader.

Again look back, Longi green can long-term planning in the field of photovoltaic power generation is undoubtedly successful, unswervingly adhere to the single crystal route, the introduction of diamond line slice process, is for Longi green can today's success, on this basis, Longi green can still continue to invest a lot of money on technology research and development, but also actively explore new profit growth point such as semiconductor, can say in the past decade of strategic planning is

successful, the integration of layout also provides the guarantee for the steady development of the future.

3. Financial analysis

3.1 Analysis of Profitability

3.1.1 Longitudinal analysis of profitability

The following table shows the change of the profitability index of Longi Green Energy from 2017 to 2021. The sales gross profit margin of Longi green energy is gradually declining, indicating that the profit and competitiveness of Longi green energy products are insufficient, which is greatly related to the impact of the price fluctuation of upstream silicon materials. Due to the gradual cancellation of the national electricity price subsidy policy, the return on equity of Longi Green Energy dropped from 30.14% in 2017 to 21.45% in 2021, indicating that Longi Green Energy has insufficient ability to profit in the business, so it needs to further increase R&D investment, reduce the cost of photovoltaic power generation. The return rate of total assets decreased sharply after the national electricity price subsidy, and rebounded in 2019 and 2020, but it dropped to less than 10% in 2021, indicating that the utilization efficiency of Longi green energy funds is reduced and the input-output ratio is too high.

Table 1 Longi green energy profitability horizontal analysis

Index	2017	2018	2019	2020	2021
Operating gross margin	32.27%	22.25%	28.9%	24.62%	20.19%
Net operating interest rate	21.69%	11.67%	16.89%	15.94%	11.21%
Return on equity	30.14%	16.71%	23.93%	27.23%	21.45%
Rate of return on total assets	13.64%	7.08%	11.23%	11.84%	9.79%

3.1.2 Horizontal analysis of profitability

The following table shows the 2021 profit indicators of Longi Green Energy and the four comparison companies and their codes which will not be showed repeatedly. Due to the similar size, these four companies are selected as comparison companies. As can be seen from the following data, the profit of Longi green energy is relatively weak in similar enterprises.

Although the net interest rate of Longi Green Energy is in the middle reaches of the company, and the return on equity is also in the upper middle reaches, there is still a certain gap between the gross profit margin compared with the company. The sales net interest rate of Longi Green Energy is relatively low, which not only shows that Longi Green Energy still needs to continue to improve the competitiveness of its products, but also shows that Longi Green Energy needs to expand its supply chain and reach a cooperative relationship with upstream suppliers. The ROE level is in the middle of the comparison company. The average return on equity of the photovoltaic industry is 20.12%, while Longi Green Energy is 21.45%, indicating that the profitability of Longi Green Energy investors is ok, but the ability of the enterprise to use net assets to achieve profit income needs to be further improved compared with other leading enterprises. Longi green energy's total asset return rate is in the middle of the company, the capital utilization efficiency is ok.

Table 2 Lateral analysis of profitability

index	Longi Green Energy	TCL Zhonghuan	Sungrow	Tongwei	Tebian Electric Apparatus
Code	sh601012	sz002129	sz300274	sh600438	Sh600089
Operating gross margin	20.19%	21.69%	22.25%	27.68%	30.27%
Net operating interest rate	11.21%	10.79%	7.06%	13.77%	16.01%
Return on equity	21.45%	17.97%	13.05%	24.24%	19.37%
rate of return on total assets	9.79%	6.48%	4.81%	23.48%	11.25%

3.2 Operation capability analysis

3.2.1 Longitudinal analysis of operational capacity

Table 3 Longitudinal analysis of Longi green energy operation capacity

index	2017	2018	2019	2020	2021
Accounts receivable turnover rate	5.26	3.02	3.91	5.48	8.17
Inventory turnover rate	6.17	5.13	4.4	4.62	5.06
Total assets turnover rate	0.63	0.61	0.66	0.74	0.87
Fixed asset turnover rate	1.51	1.66	2.13	2.23	3.25

It can be seen from the figure that the turnover rate of Longi Green Energy receivables decreased significantly in 2018, and then it steadily improved, indicating that Longi Green Energy itself has good accounts receivable management ability. The inventory turnover rate of Longi Green Energy decreased in 2018, and then increased steadily, indicating that the inventory management of Longi Green Energy is relatively stable. The turnover rate of fixed assets of Longi Green Energy has increased year by year, indicating that the utilization efficiency of fixed equipment such as plant and equipment has been improved and the management is effective. In recent years, the total asset turnover rate of Longi Green Energy has increased steadily to a certain extent, and its total asset management ability has been improved.

3.2.2 Horizontal analysis of operation capacity

In comparison, in addition to the highest total asset turnover of Longi Green Energy, the turnover rate of fixed assets is only lower than that of sunshine power supply. Meanwhile, there is a big gap between accounts receivable turnover and inventory turnover compared with TCL Zhonghuan which indicates that the operating strength of Longi Green Energy is still different from that of other comparable companies.

Table 4 Horizontal analysis of operation capacity

index	Longi Green Energy	TCL Zhonghuan	Sungrow	Tongwei	Tebian Electric Apparatus
turnover ratio of receivable	8.17	14.49	2.85	20.84	4.06
stock turnover	5.06	12.21	2.56	10.86	5.98
turnover of total capital	0.87	0.6	0.68	0.83	0.52
turnover of fixed assets	3.25	1.39	5.68	1.70	1.45

The accounts receivable turnover rate of Longi Green Energy is relatively low. After 2015, its business structure changes, and the proportion of photovoltaic modules has increased. According to domestic practice, the payment cycle of such modules is relatively long. Therefore, although this index is significantly lower than TCL Zhonghuan and Tongwei, but it is still understandable. In 2021, under the influence of the epidemic and the cancellation of state subsidies, Tebian Electric Apparatus Stock vigorously developed photovoltaic technology, with sales revenue increased more and receivables well controlled, which is worth learning to Longi Green Energy.

The inventory management of TCL Zhonghuan has developed well in recent years. Longi Green Energy should learn from it, formulate reasonable production and marketing plans, and improve the level of inventory management.

The fixed asset turnover rate of Longi Green Energy ranks second among the five companies, second only to Sungrow and far exceeds the other three companies, indicating that its management and utilization of fixed assets is good.

Comparing the asset use efficiency of the five major companies, it is found that the overall capital use efficiency of Longi Green Energy is the highest in the same industry, and the asset flow status is good and should be maintained.

3.3 Analysis of solvency

3.3.1 Longitudinal analysis of solvency

Table 5 Longi green energy solvency longitudinal analysis

index	2017	2018	2019	2020	2021
current ratio	1.53	1.54	1.52	1.28	1.39
quick ratio	1.34	1.25	1.26	1.01	1.06
cash ratio	0.1	0.08	0.33	0.26	0.29
asset-liability ratio	56.68%	57.58%	52.29%	59.38%	51.31%
equity ratio	1.31	1.39	1.12	1.48	1.06

The current ratio of Longi green energy has generally decreased overall. Although it has a certain recovery in 2021, it still shows that the business strategy of Longi Green Energy leads to the weakening of the company's asset liquidity. Although the quick ratio of Longi green energy is lower than that of 2017, it still remains above 1, indicating that Longi green energy has strong inventory management ability. Longi Green Energy's cash ratio has been rising in recent years, reaching 29% in 2021, controlling opportunity costs while making good use of current assets. From 2017 to 2021, the asset-liability ratio of Longi Green Energy was maintained between 51% and 58%. Although the property right ratio fluctuated, it finally decreased to about 1.06. In 2021, the asset-liability ratio and property right ratio of Longi Green Energy decreased to a certain extent, indicating that Longi Green Energy has good long-term solvency and good financial condition.

3.3.2 Horizontal analysis of solvency

Table 6 Horizontal analysis of the solvency

index	Longi Green Energy	TCL Zhonghuan	Sungrow	Tongwei	Tebian Electric Apparatus
current ratio	1.39	1.2	1.54	1.01	1.38
quick ratio	1.06	1.04	1.09	0.81	1.18
cash ratio	0.29	0.21	-0.07	0.27	0.27
asset-liability ratio	51.31%	46.62%	61.01%	52.8%	54.92%
equity ratio	1.06	1.14	1.67	1.24	1.57

The table shows the relevant index of the debt repayment ability of Longi Green Energy and the four comparison companies in 2021. It can be seen that the current ratio of Longi Green Energy and Tebian is 1.39 and 1.38, respectively, which is larger than that of other companies, indicating that these two companies have relatively good short-term solvency. Longi Green energy's cash ratio is also in the leading position, indicating that its accounts receivable management ability is good, and the overall short-term solvency is relatively good in the photovoltaic industry.

Looking at the long-term solvency, in addition to the sunshine power supply, the asset-liability ratio of the four enterprises in the table is below 60%, but its property right ratio is higher in the nature of its new energy enterprises than in other industries, because of the government financial subsidies, so the overall long-term solvency of photovoltaic enterprises is generally good. The asset-liability ratio and property right ratio of Longi Green Energy are in the middle and upper level of the comparison enterprises, and the ability to pay the long-term debt is relatively stable.

3.4 Analysis of development ability

3.4.1 Longitudinal analysis of development capacity

Table 7 Longitudinal analysis of development capacity

index	2017	2018	2019	2020	2021
Sales growth rate	41.9%	34.38%	49.62%	65.92%	48.27%
net profit growth rate	130.38%	-28.24%	106.4%	61.99%	6.24%

From 2017, to the 2018, when the subsidy decreased year, the sales growth rate slowed down, and accelerated in the next two years. By 2021, the growth rate slowed down, but the overall trend was above 30%, showing an upward trend, and the development prospect was good. In 2018, the net profit growth rate significantly decreased to negative due to the reduction of subsidies. In the following two years, the income tax increased, and the enterprise management results were good. However, in 2021, due to the increase of silicon materials, the growth rate of net profit was low and the development stagnated.

3.4.2 Horizontal analysis of development capabilities

Table 8 Horizontal analysis of development capabilities

index	Longi Green Energy	TCL Zhonghuan	Sungrow	Tongwei	Tebian Electric Apparatus
Sales growth rate	48.27%	115.7%	25.15%	43.64%	37.39%
net profit growth rate	6.24%	270.03%	-19.01%	127.5%	196.34%

As can be seen in the table, Longi green can sales growth rate in five comparable companies second only to TCL Zhonghuan, and net profit growth is far lower than TCL Zhonghuan, change especially electrician and tong wei shares, and lower than the industry average of 65.64%, so Longi green can need to learn from these companies development strategy, innovation technology, improve the efficiency of management cost.

3.5 Overall merit

This paper intends to use the Wall analysis method to comprehensively score the Longi green energy and other enterprises.

3.5.1 Index selection

The selection of indicators needs to follow the four principles of wide coverage, strong operability, strong authenticity, reflecting the characteristics of the industry. This paper will select the evaluation indicators in the four aspects of operating capacity, profitability, solvency and development ability.

Operating capacity mainly reflects the ability of the enterprise to use a certain class of assets. The main research objects of the operating capacity of this paper include the total asset turnover, accounts receivable turnover, inventory turnover and fixed assets turnover.

Profitability evaluation is a link that investors value very much. The profitability analysis of this paper mainly includes four parts: return on net assets, operating gross profit rate, operating net profit rate and return on total assets.

The investigation of solvency includes current ratio, quick ratio, cash ratio, asset-liability ratio and property right ratio.

Development ability is mainly for the outlook of enterprise prospects, mainly including sales growth rate and net profit growth rate.

3.5.2 Wall scoring method

The calculation logic of the traditional Wall scoring method is:

$$\text{score} = \sum \frac{\text{actual value}}{\text{standard}} \times \text{weight} \quad (1)$$

The score represents the comprehensive score, actual value represents the actual value of an indicator, and standard represents the industry standard value.

However, the final result of this calculation method is susceptible to outliers. If there are outliers, it may lead to inaccurate results and affect the final judgment: if an abnormal large value appears in the actual value, then the company's score may be inflated; and vice versa. In order to avoid the influence of abnormal values on the ranking results and reduce the influence of the abnormal index on the final total score, the modern Wall scoring method: First, calculate the weight of the index as the basic score of the index and calculate the final score of the index score; the highest score is 1.5

times of the standard value; the lowest score is the lowest score which is 0.5 times of the standard value. If the scope, the boundary score is taken to get the final score.

In this paper, the calculated average value of 20 enterprises in the industry will be used to remove the highest value and the lowest value as the standard value to eliminate the influence of outliers. Finally, the standard value of each index is shown in the table.

Table 9 Standard value of the Wall scoring method

index	Min	Max	standard value
Return on equity	0.61	29.29	18.76
Operating gross profit margin of	11.2	45.63	24.62
Operating net profit margin of	0.65	29.25	13.19
rate of return on total assets	0.32	23.48	10.08
turnover of total capital	0.43	1.26	0.72
average accounts receivable turnover ratio	2.3	26.31	8.32
inventory turnover ratio	0.83	11.65	4.98
fixed asset turnover	1.39	14.66	3.87
current ratio	0.93	7.37	1.81
quick ratio	0.68	5.69	1.37
cash ratio	-0.07	0.52	0.19
asset-liability ratio	10.94	70.65	51.12
equity ratio	0.12	2.47	1.31
Sales growth rate	16.88	132.23	55.20
Net profit growth rate	-94.73	270.03	65.64

3.5.3 Determination of the index weight

Under the original Wall scoring method, Wall gave a fixed weight to the seven indicators, but the original Wall scoring method did not explain the reason for the assignment of each index when assigning value, and the artificial weight has great subjectivity, and cannot objectively reflect the importance of each index. In order to ensure the objectivity and accuracy of the index assignment, the objective assignment method will be chosen to assign the value to each index.

The entropy weight method uses the principle of information entropy, which can use the entropy value to judge the dispersion degree of an index, and determine the final weight according to the dispersion degree of the index. In this paper, the entropy weight method is used for value assignment.

The main steps are:

1.Data standardization.

This paper gives 13 indicators, set as $X_i = \{x_1, x_2, \dots, x_{13}\}, i = 1, 2, \dots, 13$, Assuming the normalized value is Y_{ij} , $Y_{ij} = \frac{X_{ij} - \min(X_i)}{\max(X_i) - \min(X_i)}$ (positive indicator, if negative indicator, -1)

2.Find the ratio of each index under each scheme.

$$P_{ij} = \frac{Y_{ij}}{\sum_{i=1}^{13} Y_{ij}} \quad (2)$$

That is the proportion of the i-indicator in the j scheme.

3.Find the information entropy of each index.

According to the definition of information entropy in information theory, the information entropy of a set of data is

$$E_j = -\ln(n)^{-1} \sum_{i=1}^n p_{ij} \ln p_{ij} \quad (3)$$

$$E_j \geq 0$$

According to the calculation formula of information entropy, the information entropy of each index is calculated as E_1, E_2, \dots, E_{13} .

4.Determine the weight of each indicator.

The weight of each index is calculated through the information entropy:

$$w_j = \frac{1 - E_j}{k - \sum E_j} (j = 1, 2, \dots, 13) \quad (4)$$

5. Finally, the final score of each scheme, that is, for each company, is calculated. In this paper, this step is replaced by the wall scoring method.

By the data of this paper, the comprehensive weight of each indicator is as follows:

Table 10 Comprehensive weight

entropy weight method	
term	weight (%)
Return on equity	2.72
Operating gross margin	3.46
Net operating interest rate	4.39
rate of return on total assets	4.39
Total assets turnover rate (secondary)	6.09
Accounts receivable turnover rate (times)	12.41
Inventory turnover rate (times)	9.38
fixed asset turnover	13.55
current ratio	11.54
quick ratio	3.15
cash ratio	5.09
asset-liability ratio	13.01
equity ratio	2.74
Sales growth rate	5.13
Net profit growth rate of (%)	2.95

2.3.4 Comprehensive evaluation of financial statements

In summary, the calculation results of the index assignment, standard value, highest score, lowest score, each score ratio of each index are shown in the following table, and the calculation data of the index comprehensive score and index ranking are shown in Table 13.

Table 11 The ing ratio of Wall analysis analysis

	Specific indicators	weight (%)	standard value	Max/Min	top score	The lowest score	Ratio per cent
profitability	Return on equity	2.72	18.76	29.29	4.08	1.36	7.74
	Operating gross margin	3.46	24.62	45.63	5.19	1.73	12.14
	Net operating interest rate	4.39	13.19	29.25	6.58	2.19	7.32
	rate of return on total assets	4.39	10.08	23.48	6.59	2.20	6.10
	turnover of total capital	6.09	0.72	1.26	9.14	3.05	0.18
operation capacity	average accounts receivable turnover ratio	12.41	8.32	26.31	18.62	6.21	2.90
	inventory turnover ratio	9.38	4.98	11.65	14.06	4.69	1.42

	fixed asset turnover	13.55	3.87	14.66	20.32	6.77	1.59
	current ratio	11.54	1.81	7.37	17.31	5.77	0.96
	quick ratio	3.15	1.37	5.69	4.73	1.58	2.74
soveny	cash ratio	5.09	0.19	0.52	7.64	2.55	0.13
	asset-liability ratio	13.01	51.12	10.94	19.52	6.51	-6.17
	equity ratio	2.74	1.31	0.12	4.11	1.37	-0.87
	Sales growth rate	5.13	55.20	132.23	7.69	2.56	30.05
Development ability	net profit growth rate	2.95	65.64	270.03	4.43	1.48	138.57

Comprehensive score:

Table 12 Final comprehensive score and ranking

company		Longi Green Energy	TCL Zhonghuan	Sungrow	Tongwei	Tebian Electric Apparatus Stock
profitability	score	14.63	13.70	12.33	18.20	16.08
	ranking	3	4	5	1	2
operation capacity	score	34.57	39.24	27.10	42.64	31.67
	ranking	3	2	5	1	4
soveny	score	34.70	37.39	34.73	33.85	33.99
	ranking	3	1	2	5	4
Development ability	score	16.02	16.78	14.46	15.69	15.48
	ranking	2	1	5	3	4
overall merit	score	99.93	107.10	88.63	110.38	97.22
	ranking	3	2	5	1	4

Among the five companies, TCL and Tongwei finally exceeded the industry evaluation standard, Longi Green Energy and Tebian are very close to the industry standard, only a few indicators are slightly lower than the industry average, and the comprehensive ability of solar power supply is poor. In a comparative analysis between the five companies, The profitability of Longi Green Energy is different from Tongwei and Tebian Electric, Need to strengthen the management of photovoltaic power generation costs; The operating capacity is overtaken by Tongwei Shares and TCL Zhonghuan, Should strengthen the management of inventory and accounts receivable; Strong solvency, Consider maximizing the use of assets to form cash inflows; Low development capacity, Businesses need to reinvigorate, Developing technology; Although the comprehensive strength of Longi Green energy in the previous years is in the upstream of the industry, But there are no two emerging companies, Tongwei Shares and TCL Zhonghuan, It's just at the industry-standard level right now, Mainly due to the lack of development in recent years, Neglect the innovation vitality and cost management of enterprises.

4. Summary

Based on the above strategic analysis, financial analysis and value estimation of Longi Green Energy Company, this paper believes that the comprehensive strength of Longi Green Energy is strong. Although the development vitality is not as good as that of other emerging enterprises in recent years, it is still rising steadily, adheres to the correct strategy and occupies the majority of monocrystalline silicon market. References.

The main conclusions of this paper are summarized as follows:

(1) The photovoltaic industry where Longi Green Energy is located has a broad market prospect and is supported by the government. It is a leading enterprise in the industry with a good momentum of development and leading the development direction of the industry.

(2) After financial analysis, it is found that Longi Green Energy lacks profitability and low gross profit margin, which may be due to the increase of silicon materials and its failure to handle the supply chain relationship; its operating capacity is improved and its development capacity is insufficient compared with emerging enterprises in recent years; the solvency has maintained excellent level and developed steadily.

(3) According to the results of the Wall scoring method, although the development of Longi green energy has slowed down in recent years, the comprehensive strength of Longi green energy in the industry is still strong due to its accumulation of experience and profits.

Here are some of his suggestions:

(1) The profitability of Longi Green Energy is different from that of upstream companies in the industry, which is greatly affected by the rising price of polysilicon. It is necessary to strengthen the management of photovoltaic power generation cost and expand the relationship management of upstream supply chain;

(2) The growth of operating capacity in recent years is almost equal to that of other companies. Although it is related to the changes of its business structure in recent years, the management of inventory and accounts receivable should still be strengthened;

(3) Strong solvency, so we can consider maximizing the use of assets to form cash inflow;

(4) The development ability is lower than that of other companies, so enterprises need to enhance their vitality and develop technology. Although the comprehensive strength of Longi Green Energy in the past few years was in the upstream of the industry, its vitality has declined in recent years, and now it is only at the industry standard level. In the short term, it is due to the rising price of silicon materials, but in the long run, the innovation vitality and cost management of enterprises should be strengthened.

To sum up, Longi's strategic direction is correct and firm, and it should continue to maintain its unique sense of industry, develop technology, build a collaborative supply chain, and lead the development of the whole industry.

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