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Assessment of the Effectiveness of Investment Strategy in Solar Photovoltaic (PV) Energy Sector: A Case Study

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Abstract

Solar photovoltaic (PV) energy is now promising to offer potential solutions for sustainable development, especially in China. A representative Chinese solar PV manufacturer - Shunfeng International Clean Energy Limited (SFCE) - is therefore assessed in this paper, including (1) investment strategies in China's recent macroeconomic exposure; (2) the market exposure and vulnerability. The macroeconomic challenges in case of China's continuous GDP growth would have significant implications for SFCE's investment strategy. Although SFCE's vulnerability is high, it has mediated its macro exposure and protect itself by advanced non-pricing competition, product/service differentiation, vertical and horizontal integration, and high-profit diversification etc. The research result is expected to offer useful indications for solar PV companies to adapt and succeed in the future energy industry and simultaneously help the world to mitigate climate change.

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Keywords: *PV industry; Economic assessment; Market exposure; Vulnerability*

1. Introduction

Solar energy, as a major renewable and eco-friendly energy source with the most prominent characteristic of inexhaustibility, is promising currently to offer potential solutions for sustainable

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development. One of the most common solar technologies nowadays is solar photovoltaic (PV), which contributes significant share of energy supply in the world. With continuous technical development, increased installation volume, reduced price, and encouraging legal policies, PV technology will certainly maintain its fast-growing pace and eventually become a significant energy supplier across the world. Asia Pacific, especially China, will become the super markets for Solar PV.

Investment strategy is considered as the core of business, which defines how a company tends to spend time and resources for a profit. An effective investment strategy would create more values by improving the overall competitive strengths from all perspectives [2]. Many literatures of PV investment evaluations have conducted from the aspects of global, governmental, industrial, R&D or even end users [2-6]. It is lack of research from the point of PV companies' views in different regions. The related assessment of a PV company's investment would benefit its manufacturing decisions, energy management, supplier selection, competitiveness and the performance of the businesses, which, from the other side, drives the sustainable and healthy development of the PV industry.

This paper is thus to conduct a case study of a representative Chinese PV company, Shunfeng International Clean Energy Limited (SFCE), through the examinations of macroeconomic exposure, market exposure and vulnerability.

2. Research Methodology

The case study research method is structured in Fig. 1 with the objective of identifying the effectiveness of PV investment strategy of SFCE. 3. Macroeconomic exposure is evaluated by the dynamic Aggregate Demand and Aggregate Supply (AD-AS) model as well as the primary economic indicative indexes. Market exposure is examined through the Supernormal profit model on basis of its financial statistics. Vulnerability and cost are considered by the ratio of fixed cost (FC) to total cost (TC) and the Short-run average total cost curve (SRATC). Each process is explained to present how the author accomplishes the study step by step.

Fig. 1: Case study research methodology

3. Macroeconomic exposure

Since SFCE's main business and market are based in China, a macroeconomic exposure analysis in China context would have significant implications for SFCE's business strategy. The global economic crisis in 2008 greatly affected China's economy (especially export sector). China's real GDP growth fell from 12.7% in 2006 to 9.2% in 2009. The government then implemented an economic stimulus package and loosening monetary policies that boosted domestic investment and consumption. From 2009 to 2011, China's real GDP growth averaged 9.6%. However, it has slowed in recent years from 10.4% in 2010 to 7.3% in 2014 due to significant decreases in export and fixed investment. Although the IMF projects that China's real GDP growth will slow to 6.8% in 2015 and to 6.3% in 2016 -2020, it will be still the enormous increase in the economy quantity. According to the dynamic AD-AS model in Fig. 1, increases

in China's economy (caused by improvements in productivity and expansion of labor force, capital stock and technological change etc) shift long-run aggregate supply from LRAS1 to LRAS2. These same factors lead to short-run aggregate supply to shift from SRAS1 to SRAS2. Growing economy also shits aggregate demand shifts from AD1 to AD2 which indicates that those spending by consumers, firms, and the government increases during the year.

Nowadays, China's economic faces large internal imbalances, characterized by high savings and fixed investment and relatively low private consumption [7]. In the past several years, gross fixed investment was the largest contributor to China's real GDP growth (more obvious since 2009). Fortunately, it is projected that China's private consumption will be the largest contributor of real GDP in 2016. The disposable personal income is expected to be over 30,000 CNY next year [8]. Although China is the world's largest merchandise trading economy, the shares of exports and imports of its GDP decreased gradually from peak 35.66% and 28.01% in 2006 down to 22.61% and 18.92% respectively in 2014. An obvious drop in both exports and imports in 2009 was found due to the economic shock. Chinese wages continue to increase and even become sharper after 2009's economic crisis [9]. The advantage of China's relatively low wage gradually disappears in recent years. This also drives the government to focus on enhancing the nation's innovation and productivity levels. In the meanwhile, China's GDP growth would consume much more energy during its further development [9]. This also opens chances for energy production firms. The real interest Rate in China was lowest of -2.3% in 2008 and highest of 5.4% in 2009 owing to the economic crisis and the Chinese government's package/policy [9]. It states the deposit interest rate is slightly higher or below than the inflation rate that lowers customer's income. This situation calls up new business or banking models to return customers' investment at higher rate.

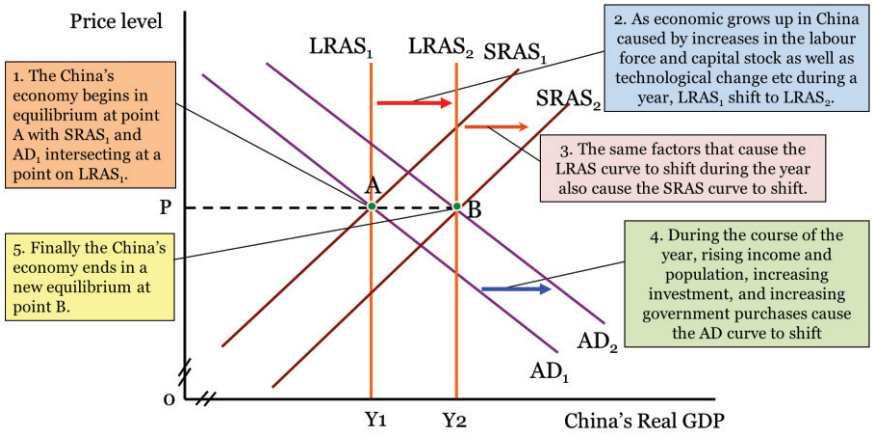

Fig. 2: Dynamic AD-AS analytical model

4. Market exposure

SFCE's financial performance is analyzed by supernormal model in Fig. 3 [10]. After the economic crisis in 2008, SFCE's net profit margin increased gradually along with China's GDP until 2010 when the governmental economic stimulation ended and the PV price continue to fall down dramatically, which then resulted in the significant reduction of net profit margin in 2011-12. When SFCE started to expand in 2013, the net profit margin declined more sharply due to the large acquisition of Suntech. This even worsened the profit margin ratio. The primary reason for the excellent financial performance in 2014 is

due to the significant sales increase after expansion. As seen from Fig. 4, SFCE locates exactly in the supernormal profit region (1.2-2.6 RMB/W) when it offered 1.77 RMB/W for PV in 2014.

SFCE operates in a monopolistic competition case. There are many firms in PV industry each with small market shares, but each can differentiate its product/service to some degree. Imperfect competition affects PV price with considerable heterogeneity across geographic locations depending on financial incentives. Europe dominates the PV market but Asia's share grew fast, especially China/Japan. PV price is now declining owing to expanded production, improved efficiencies, and advanced materials. A price elasticity of demand for PV industry is estimated at around minus 2 as there are many factors influencing demand, i.e. competitive pricing, oil & gas price, relative cost of substitutes, perceived value, and incentives. Low entry barriers fragment the photovoltaic module market. Currently, the threat of new entrants in the industry remains low due to low PV cell prices and the high capital costs of building PV cell manufacturing units. However, economies of scale and increased integration in the industry will make it difficult for new players to compete with the incumbents. Competition in the PV industry is primarily driven by technology (efficiency). Crystalline PV cells, relatively higher efficiency than thin-film ones, enjoy around a 90% market share. SFCE is one of the top producers of crystalline cells and does nothing in thin-film PV. Government policy, particularly in China, presents significant exposure to overall supply demand balance. China continues to support PV industry by offering incentive subsidies and set aggressive domestic deployment goals by launch of the 13th Five-Year Plan (2016-2020) for targeting 100 GW of accumulative installations by 2020.

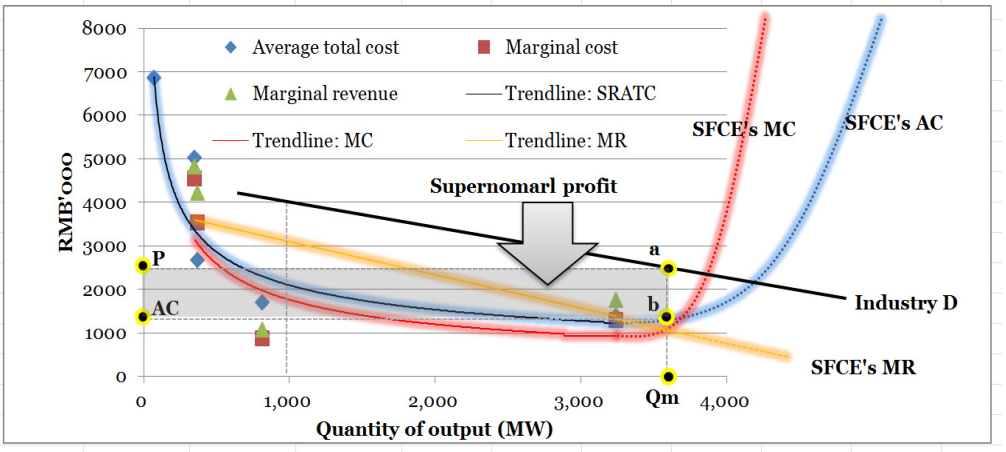

Fig. 3: SFCE's Profit analysis

5. Vulnerability and cost

SFCE's business faces the vulnerability that reinforced risks of high macroeconomic exposure. The capital outlays on PV manufacturing units can be significant and it also requires large number of highly skilled employees - 'quasi fixed' capitals. The average ratio of FC to TC in SFCE is high up to 96% during 2010-2014. This makes the SFCE's business more vulnerable to external shocks. Fortunately during 2010-2014, the huge increase in demand and output resulted in a significant decrease in average total cost, which greatly enlarges profitability of SFCE. That's why SFCE recovered dramatically after 2008 when market and macro conditions improved. Although demand will increase continuously in China

during the next few years, SFCE still faces the high risk that if further cuts in demand occur, its asset utilization and financial performance would be worsened dramatically.

In the intensive PV manufacturing businesses, large labor capital cost is quasi fixed and becomes another source of the vulnerability. Although the normal fixed cost, i.e. property, plant and equipment, occupies the most fixed cost, the labor cost increased gradually each year due to the increased product output and wage in China. In 2014, the labor cost soared up to 12% of the total cost as SFCE completed the big acquisition and expanded its scale. The behavior of variable labor costs imposes the impact on the steepness of the SRATC curve, especially when SFCE benefits from increasing returns to labor (IRL). IRL reduces variable cost when output increases and therefore it make the SRATC curve steeper. IRL affects most obviously at low levels of output. This adds to the investment vulnerability.

6. Effectiveness of SFCE's investment strategy

Adapting to exposures in the macro condition is one of the key challenges for SFCE to ensure its survival and longevity in the future energy industry.

- *Non-protection of vulnerability*

SFCE has no protection of the business vulnerability. SFCE continues to expand by investing or acquisition of many other energy companies including their equipment, manufacturing line, employees and inventories, which decrease capital's effectiveness and further rise up FC-to-TC ratio for the high macroeconomic exposure. It also resulted in negative net cash position for several years, putting itself into a very high risk level. SFCE currently seems very interested in PV supplier business to supply the outsourced production for different outsourcers. Although such business strategy enables it to secure some cost savings due to the lower average fixed costs by increasing the scale of its production, it increases its vulnerability significantly.

- *Non-price competition*

SFCE has the core competency in the integrated full streams across the solar business. It has very low cost to build the solar power plant by itself. It also leads the Engineering Procurement Construction (EPC), design and operation of solar power plant and service in China, providing flexible financial models for PV business. In addition, SFCE has signed several strategic cooperation agreements with the local governmental and established long-term/stable relationship with Chinese government to secure its future business contracts in the solar power plant.

- *Product & service differentiation*

PV is becoming commodities and SFCE strikes back with the features that differentiate its products/service including efficiency, quality, reliability, application, after-sale service etc. SFCE indeed offers some improvements over existing panels, i.e. less power loss, strong anti-pressure ability, more durable, and better performance in low light conditions (foggy Days – this happens in China quite often).

- *Vertical and horizontal integration*

Through horizontal integration of Suntech, SFCE enlarges its wafer, cell, and module production and avoided the vulnerability of price changes in the market. Meanwhile, horizontal integration also greatly reduced PV manufacturing cost for SFCE and thereby increased its profit margins. Such integration of the value chain incentivized R&D and knowledge exchange, which helps SFCE to upgrade the product overall. SFCE also integrated with upstream and downstream players. S.A.G. extends SFCE's EPC services in Europe and enhances its solar module sales pipeline. Sunways AG enables SFCE stepping into inverter business and Building Integrated PV (BIPV) business. Powin Energy helps SFCE enter in energy storage battery management technology. Through the vertical integration, SFCE largely enjoys the additional profit margin from the front supply to the end user, which allows it easily shifting to solar power plant service business.

- *Diversification*

SFCE has huge ambitions in the global clean-energy industry. It wants to become a leading and distinctive renewable and clean energy enterprise with interests spanning different renewable sources. SFCE covers widespread business in solar power station constructions and operations, solar products manufacturing, solar energy storage and other forms of clean. It provides customers at levels of cities, communities, and commercial-facilities with low-carbon integrated solutions for project development, design, construction, operation and maintenance through different business models, delivering the internal rates of return (IRR) in the high teens – this will become very attractive when comparing with the general real interest rate in China.

7. Conclusion

SFCE is now a major solar developer across the world and it saw its revenue and gross profit recently. It is quite health and promising in the solar power sector without any bad investment bets. SFCE is conducting a successful business with impressive financial performance in China's macroeconomic exposures. Although SFCE's vulnerability is still high, it has mediated its macro exposure and protect itself to some extent by the advanced non-pricing competition, product/service differentiation, vertical and horizontal integration, and high-profit diversification. The research result is expected to offer useful clues for solar PV companies to adapt and succeed in the future energy industry and simultaneously help the world to mitigate climate change.

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