

# Analysis of the Prospects of Energy Development in Terms of the Blue Ocean Strategy—A Case Study of Solar Energy Development in Taiwan

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**Abstract.** The global warming is now becoming the top priority of the global environmental issues. Meanwhile, the "Blue Ocean Strategy" has been the most popular idea in Taiwan's business community in recent years as it emphasizes remodeling and innovation of values. Therefore, we employ the four actions framework—Raise, Reduce, Eliminate, and Created—to successfully create new values for the solar industry.

**Keywords:** Solar energy, Blue Ocean Strategy, Red Ocean, Strategic moves .

## 1. Introduction

Taiwan is a densely populated, industrially productive and economically active island-state. The energy consumption is so large that Taiwan must rely on imports for 98% of its energy use. Under the environmental constraints, the Taiwanese Government must figure out another different approach and devote long-term plan to uphold solar energy as an alternative energy.

Located in the subtropical area, Taiwan hopes to satisfy most of the energy demands with its rich solar energy resources, and builds a solar power plant like that constructed by the U.S. scientists in Western United States. The solar power plant in the U.S is expected to replace 69% of electricity and 35% of energy by 2050. However, the Taiwan Government and people must also devote plenty of efforts to realize the expectations.

## 2. Research Conditions

### 2.1. Increasingly Severe Energy Crisis

- All Fossil fuel reserves around the globe are not unlimited.
- Crude oil will be exhausted in the next 40 - 60 years, and natural gas reserves can only supply for 80 – 100 years.
- The gap between oil supply and demand will continue to widen in less than 20 years.
- The energy crisis should refer to the oil crisis. This also means the food shortage crisis as modern agriculture depends on the uses of chemical fertilizers, which requires plenty of energies during the manufacturing processes.

### 2.2. The Fast-Growing Solar Industry

However, the greenhouse effect and global climate anomalies have also stirred up the environmental protection and endless calls for the renewable energy development. Among all renewable energy resources, solar power has been chosen as the most promising alternative energy resource. As energy strategies represent a nation's development scheme for the next hundred years, each government jumped on the Renewable Energy train and offered policy support in recent years, which in turn bolstered the global solar energy industry and led to a sharp rise on the growth curve.

### **2.3. Global Solar Energy Policies in Focus**

A careful analysis over the global solar energy policies focusing on the major production regions – such as Germany, Japan, the United States, and Taiwan - will help depict the outline of priorities and development trends of the solar energy industry.

- The German Government is still taking a strong lead.

The “100,000 Roofs Project” and the “Renewable Energy Act (the Erneuerbare-Energie-Gesetz, EEG)” have jointly elevated the amount of solar photovoltaic panels installed upon house roofs and contributed to the growth in the domestic market mainly through Tax Incentives and the Solar Power Buyback Program. However, in recent years, the German Government had decided to gradually reduce subsidies for the solar energy industry. For example, in 2007, the German Government proposed to accelerate the reduction of government subsidies and planned to decrease the electricity repurchase price annually by 7% instead of the original 5%. It is worth keeping track of whether this will have an impact on the growth of the German domestic market in the future.

- The Japan Government decided to return to Market Mechanisms.

We have to concurrently focus on the very two aspects - Technology and Market – to investigate the development of Japan's policies towards the solar energy industry. From a technical point of view, Japan focused on silicon wafer-based solar cells (first-generation solar cells) before 2000, but on thin films and high-efficiency solar cells after 2000. Recently, Japan veered towards the development of advanced technologies such as organics, ball-silicon, quantum dots and nanotechnology. On the other hand, from the point of view of the market development, the Japan Government launched the Subsidy Policy and Solar Power Buyback Program in the early stage to increase the use of solar power facilities and expand the scale of domestic market. However, as Japan’s Subsidy Policy terminated in 2005 and the entire development returned to market mechanisms, the industrial growth begun to wane in recent years.

- The U.S. Government had reviewed its Subsidy Policies.

In the U.S., solar energy related policies could be divided into federal and state policies. The federal government passed the Solar America Initiative (SAI) to implement the domestic renewable energy policies, enhance energy selectivity and reduce oil dependence. Meanwhile, the Solar America Initiative also included training the next-generation energy scientists and engineers, establishing laboratories and infrastructures, and integrating both fundamentals and applications in the work of R&D.

On the other hand, the state governments proposed to implement tax subsidies and incentives, and increase the renewable energy ratio. In 2006, the California state government passed a million housing bill, which greatly bolstered the U.S. solar market. However, in 2007, the U.S. federal government passed another new energy bill and reviewed all relevant subsidy policies concerning the solar energy industry.

- The Taiwan Government has identified the Solar Industry as a Priority Industry.

Taiwan has a good foundation for the development of the semiconductor industry, which could help Taiwan to come from behind in the development of solar energy industry. Silicon material shortage problem in recent years not only slowed down the growth of the wafer solar cell industry but also accelerated the mass production of other types of solar cells, especially thin-films and concentrators. From a technical point of view, thin-film solar cells and the flat panel display industry have common basic technologies, whereas the high-efficiency concentrator solar cells and light emitting diodes also have many similarities. In addition, Taiwan's flat panel display industry and the light-emitting diode industry have developed a complete and mature industry chain, which is beneficial for solar industry in Taiwan.

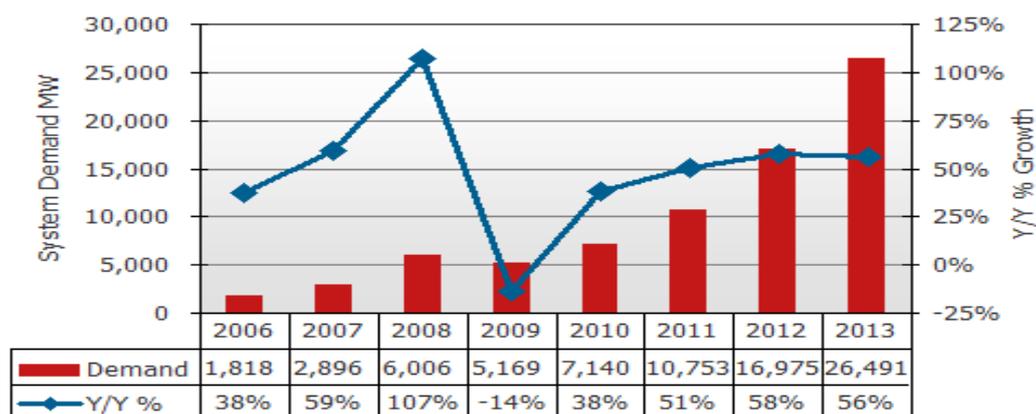


Fig.1: Global solar cell end demand market Source : Display Search, 2009

### 3. Problems during the Implementation of Energy Policies in Taiwan

- **No adequate land**

Under conditions of land scarcity, Taiwan can only develop solar cells for power generation, and has to face some thorny issues, especially the installation environment. In other words, due to inadequate installations, 77% of the power users will not be able to use solar power as the alternative energy solution. If the environment cannot be thoroughly changed, then solar cells in Taiwan will not become an important alternative energy resource like that in the United States.

- **A solution from non-solutions**

If we purely look at energy supply, there is no solution to Taiwan's energy imports. No matter how much effort Taiwan had devoted to the development of new or renewable energy resources, energy demands can never be fully satisfied. Though this time the government may propose incentives and subsidies to accelerate the promotion of renewable energy when there is no economic incentive, the government must also make good use of those policy tools with caution in order to maximize effectiveness.

- **Raw Material Shortage and the Shrinking Industry Chain**

Although the solar energy industry appears promising in Taiwan, there are some challenges. The biggest problem that manufacturers faced is that one of the main raw materials for the production of solar photovoltaic products—silicon—is not only expensive but also scarce.

Chiayi Liu, an analyst from the Industrial Economics & Knowledge Center (IEK) of the Industrial Technology Research Institute (ITRI), also pointed out that Taiwan's solar energy industry supply chain is not complete. For example, solar cells, one of the best developed products, are shrinking in terms of the whole industry chain because there are neither upstream material markets nor downstream customer markets.

- **China, a strong competitor as it has technologies of equal quantity and quality**

As Taiwan needs to launch the solar energy industry, Taiwan also has to face the fierce competition from other countries. Owing to the continuous efforts devoted by the government officials and experts, the fruits are ripening gradually in Germany and Japan with their most mature solar technologies around the globe.

Taiwan's solar photovoltaic industry has developed better in the field of solar cells. However, Germany and Japan are the best two countries around the globe in the development of solar cells. As far as shipments and technologies are concerned, China can be the main competitor against Taiwan.

Taiwan's chip production ranks top in the world. In fact, the development of the solar photovoltaic industry is closely related to the semiconductor industry. If the entire industry can further develop technical applications and expand the industrial scale, there will be opportunities for Taiwan to develop the solar energy industry and target the global market.

- **Limited applications and high costs as the main causes of bottlenecks**

The biggest bottleneck that hinders the use of solar cells in Taiwan is the low penetration of applications. It is difficult to install the solar cells unless users choose to install storage batteries. However, as the life of

storage batteries may persist four or five years and solar panels could work for up to twenty years, consumers have to change the batteries every four or five years, which is not only cumbersome but also expensive.

- **Taiwan could emulate the Subsidy Policies of Germany**

The government should uphold the industrial development with relevant policies. If the complete industrial chain can be formed with the right strategies and directions, Taiwan's solar photovoltaic industry will be able to export products, promote the development of related industries, and thereby becomes more competitive around the globe. Nonetheless, all of these will depend on the vigorous promotion and counseling of the government. For example, Germany used policy guidance so as to assist the installations of solar panels. As civil homes became installed with solar panel and started to generate power, the government proposed the Electricity Buyback Program, where local civilians would receive subsidies as they sold the electricity power to the government, which in turn prompted local civilians to install solar panels on their roofs. The German approach can be used as a reference if Taiwan would like to expand the domestic market.

#### **4. Strategies and Practices in this Study**

The "Blue Ocean Strategy" has been the most popular idea in Taiwan's business community in recent years as it emphasizes remodeling and innovation of values, rather than paranoid technological innovation or breakthrough technological development. Besides, the "Blue Ocean Strategy" is not confined to a certain period, industry, nation, scale or corporate history. The industries in Taiwan must think outside the box of the Red Ocean Strategy, which focuses on cost competitions, draw from successful experiences and find their own value innovation and Blue Ocean to escape the bottleneck of cost competition for value innovation. As Taiwan is a maritime nation surrounded by the sea, the "Blue Ocean Strategy" can have more special significance.

The "Blue Ocean Strategy" is a book written by W. Chan Kim and Renee Mauborgne. Both of the authors are distinguished scholars from the INSEAD. In this book, they analyzed 150 more strategic moves from 30 more different industries during the past 120 years and found that most enterprises had been engaged in price competition, which only resulted in a Red Ocean of fierce fighting. The Red Ocean is the main cause of market shrinkage. Enterprises need an incessant spirit of innovation as well as the concept of cost competitiveness in order to achieve sustainable success and stay in the Blue Ocean.

The "Blue Ocean Strategy" has repeatedly emphasized the logic to win all in the marketplace—Market operators should not take competition as a benchmark. Instead, they should surpass the competition and create their own blue ocean opportunities. Therefore, we employ the four actions framework—Raise, Reduce, Eliminate, and Created—to successfully create new values for the solar industry, as if the market is like a wide blue ocean in absence of competition:

- **Raise**

Taiwan is entirely dependent on imports for petroleum. With a low-tax, low-price policy, if energy prices cannot reasonably reflect external costs, it will inevitably be less effective to promote energy saving and carbon reduction measures. Only when the domestic oil prices and electricity prices are elevated to a reasonable level can Taiwan improve the productivity of energy. In particular, energy price adjustment should be based on market principles in order to achieve the most effective allocation of resources.

- **Reduce**

Cost reduction is the key to the self-sustaining solar industry, whereas the cost of power generation includes the necessary expenses of initial investment of the device construction, fuel, maintenance, etc. As solar power generators need neither fuel nor much mechanical maintenance, the cost will almost remain the initial investment. The market will certainly expand as the cost of solar cells smoothly declines to a level equal to the power grid. If the market demand continues to expand, the solar industry will be technically independent and needs subsidies and awards no more.

- **Eliminate**

In the widespread global economic downturn, the government should eliminate "speculative bubbles" in the solar industry, entirely get rid of the OEM model low profit margins, and push towards the development of high added value products. In the long run, investment in new energy to stimulate the economy will be

strengthened rather than weakened. As we look ahead and search for an industry with long-term bright prospects and sufficient capacity, the solar industry is definitely second to none.

- **Created**

Solar applications have in fact the largest potential development in Taiwan. In addition to the most potential applications market— (Building Integrated Photovoltaic; BIPV), in the eyes of most solar industrialists, the power supply of the various types of electronic products, including NBs, mobile phones and other portable products, could also be connected with the solar photovoltaic energy or other renewable energy resources based on Taiwan's years of devotion to the electronics field to rapidly demonstrate effects and competitive advantages.

Judging from the overall arrangement of international solar cell manufacturers, including both upstream and downstream integration and technical diversification of the Japanese Sharp and Germany Q-Cells, Taiwan can still find another market niche. The lack of polysilicon material sources has instead created time and space for Taiwan to think about such issues.

## **5. Conclusions and Suggestions**

In order to ensure energy independence and achieve the goal of reducing greenhouse gas emissions, governments are putting in plenty of manpower and material resources to the development of green energy. As solar energy is a relatively mature technology, more sustainable, and no subject to geographical constraints, it becomes a green energy resource on top of many countries' development agenda and has begun to rapidly grow at around 40% per year since 2003.

Solar power has been subject to multiple constraints so that it has not become an inexpensive source of electricity. However, as this trend and huge potential business opportunities are out there, companies around the world are rushing to reduce the cost of power generation and enhance penetration through the next-generation technological R&D as early as possible. As the solar industry in Taiwan has gradually emerged as an internationally famous industry, we propose three following pieces of advice in terms of the "Blue Ocean Strategy":

- Lower the cost at a high penetration rate of solar panels.
- Build independent capabilities of next-generation solar energy technologies.
- Levy energy taxes reasonably.

Through technical innovations, the solar energy in Taiwan will in the future improve its own economics of power generation units and seek to expand the independence and penetration rate of solar power installations. Meanwhile, in the mass adoption of solar power installations, we not only need high efficiency and low cost but also need to address the issues of networking, basic electricity facilities, and even need to consider new norms and standards for market entry.

In the age of Globalization/Global Village, the Fukushima nuclear disaster in Japan had set off a wave of anti-nuclear sentiment in Taiwan. It is a crisis but also a turning point. The greatest challenge confronting ourselves is the rigid thinking that we have. The Red Ocean is everywhere and everywhere is the Blue Ocean.

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