

A Research on the Development of Photovoltaic Industry in Terms of Industry Cluster

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Abstract. With the dramatic development of Chinese economy, energy need becomes the major issue not only in people's life, but also in international competition. This paper tries to analyze photovoltaic development in terms of industry cluster, and the potential threats which will burden this industry. The purpose is to find a way to solve the problems which can bring a clean environment for people to live in and seek an international position to develop its research in photovoltaic field.

Keywords: Photovoltaics; barrier; industry cluster; high- technology.

1. Introduction

With the continuous developing of energy technology, solar energy becomes the main energy in human's society, the advantages of solar energy in distribution makes it have a broader market in the future. America has drawn up the new energy strategies, positively makes scientific research and the application of renewable energy. Affected by the European debt crisis, the world photovoltaic market has shrunk. After the financial crisis, by emerged of the industrial reformation, photovoltaic industry has a fast growth in China, the market share also gradually beyond Europe and America. Among the top ten world's photovoltaic product manufacturers, China has four companies, whose technology, quality, brand and capacity are all at the forefront of the world.

In China, photovoltaic products have been applied in many fields, like in the power stations, in buildings, in transport, Standalone devices, solar roadways, spacecraft applications and so on. Shanghai Hongqiao International Airport of China, has assembled photovoltaic products on its roof of cargo building, and almost 90 percent of electric power is produced by the photovoltaic products every year, because it can save more than ¥ 300,000 for the airport (<http://www.china5e.com/news/news-343742-1.html>).

According to the report, Chinese photovoltaic industry has developed at a very fast speed, and the development of Chinese photovoltaic market was potential, but its market and development of the industry still faces some problems and obstacles, including its domestic factors and international competition, so how to develop this new energy field in a healthy way should be seriously put into consideration. This paper tries to figure out what factors there are to influence this industry in a negative way and the purpose is to find out positive components to solve the problems.

2. Experimental section

Industry cluster was introduced and popularized by Michael Porter in *The Competitive Advantage of Nations* (1990). The importance of economic geography, or more correctly geographical economics, was also brought to attention by Paul Krugman in *Geography and Trade* (1991). Cluster development has since become a focus for many government programs. The underlying concept, which economists have referred to as agglomeration economies, dates back to 1890, and the work of Alfred Marshall.

Photovoltaic is a method of generating electrical power by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. Photovoltaic power generation employs solar panels composed of a number of solar cells containing a photovoltaic material. Due to the increased demand for renewable energy sources, the manufacturing of solar cells

and photovoltaic arrays has advanced considerably in recent years (Wikipedia, <http://en.wikipedia.org/wiki/Photovoltaic>).

According to the research, photovoltaic industry is frustrated in international trade because of the barrier among different countries.

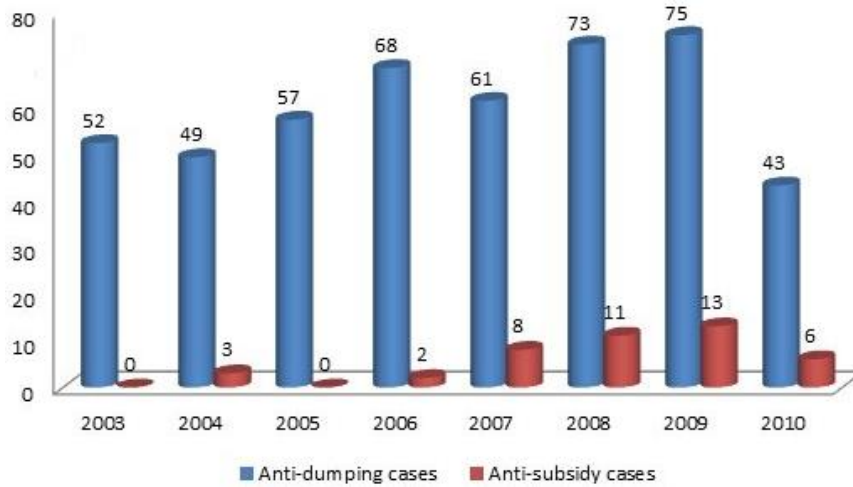


Figure 1. Comparison between anti-dumping & anti-subsidy cases

According to Figure 1, it is obviously that the number of anti-dumping and anti-subsidy cases is increasing. From 2006 to 2008, in the three years, the anti-dumping cases and the anti-subsidy cases have reached the high top, and their proportion of the world is also keep increasing, especially in 2009, the number of anti-dumping and anti-subsidy investigations is the highest in the 8 years.

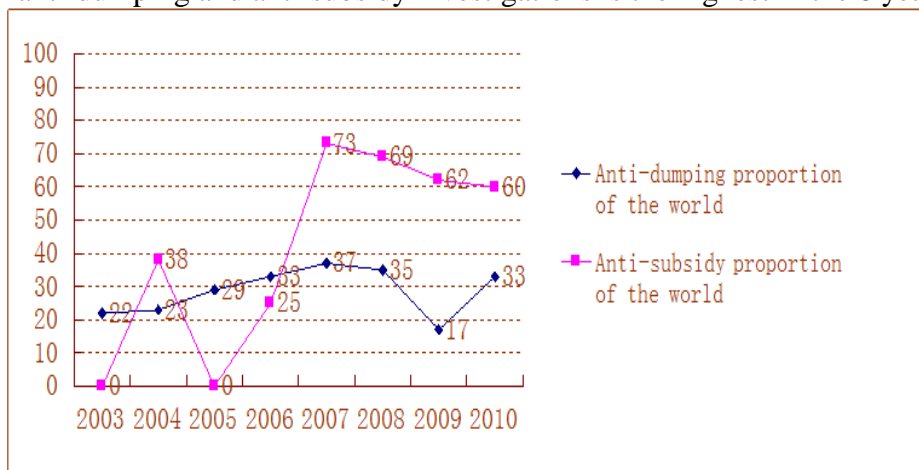


Figure 2. Proportion of anti-dumping & anti-subsidy cases

While from Figure 2, the growth rate of the anti-dumping proportion and the anti-subsidy proportion of the worldwide also is increasing, especially from 2005 to 2007, the anti-subsidy proportion of the worldwide has a great gap, in 2005 is zero, but in 2007 is 73 percent. For the anti-dumping proportion of the worldwide, only from 2008 to 2009, the proportion decreased, and other years all increased, but the growth rate isn't as fast as the anti-subsidy proportion.

The anti-dumping and anti-subsidy investigations directly affected three photovoltaic enterprises went bust constantly in America. Solyndra, which had been high hopes for the solar energy announced for bankruptcy protection in September 1st, 1100 employees were fired. Before this, two solar panel manufacturers, Evergreen Solar and Spectra Watt also had filed for bankruptcy protection in August 15th and 19th, three enterprises had bankrupted constantly within one month, which alerted American government and other enterprises to review the American photovoltaic industry. And in the bankruptcy declaration of the three enterprises, it stated that the reasons led to the bankruptcy were the decline of the global demand and the fierce competition, especially competed with Chinese photovoltaic enterprises. Most of Chinese photovoltaic products were exported to America. If America started the anti-dumping and anti-subsidy investigations, it would have a big impact to

Chinese photovoltaic industry. So America began the anti-dumping investigation to prevent Chinese photovoltaic products into American market and protect its own photovoltaic industry.

The way of subsidy in China is different from the EU and America. The EU and American government provide subsidies directly in the installation chain, the direct beneficiary is the consumers. However, Chinese government always provides a large amount of cash or through other ways to the photovoltaic enterprises, such as declining the tax, preferential prices for raw materials, billions of preferential loans dollars, export subsidies and export insurance. Chinese government always supports the enterprises in the production chain. This makes that Chinese photovoltaic products have the lower price than the other photovoltaic products in the international market, and the advantage of the low price is also the reason that causes the anti-dumping and anti-subsidy investigations on Chinese photovoltaic industry by America, the European Union and other countries.

According to "2012 world energy statistics", in 2011, China as the world's largest energy consumer in the world, the proportion of energy consumption accounts for 20.3%, and the coal consumption also accounts for 70.4%. America ranks the second position, it accounts for 19.2% of the world energy consumption, and the oil consumption is 37%. It is visible that both countries discharge large amounts of carbon dioxide in the process of energy consuming. Both countries realize that developing the new energy industry and optimize the energy consumption structure is very important if a country isn't subject to the carbon tariff policies of other countries. The development and the competition of new energy industry between China and America will become an important field in a new round of technological and industrial competition, especially American government. After the financial crisis, the new energy industry becomes the new economic growth point for America. The American government hopes through the development of new energy industry to make American manufacturing to regain international competitiveness, so America investigates Chinese photovoltaic products is forbidding the development of Chinese new energy industry (Y Zhang, 2006).

3. Results and discussion

Although the anti-dumping and anti-subsidy investigations affects Chinese photovoltaic industry, it also exposes many problems of Chinese photovoltaic industry, and the problems can be concluded as follows:

1) Industry and market disorder

The capacity of Chinese photovoltaic industry ranks the first position in the world, but more than 90 percent photovoltaic products are export to other countries, this phenomenon makes Chinese photovoltaic industry rely on the international market seriously. And in the past years, the photovoltaic products were very expensive, in people's ideas, they were luxury goods, so they photovoltaic products were rarely used in the domestic market, most of them wear sold in the foreign market. The domestic market hasn't open fully, it contradicts with the fast development of Chinese photovoltaic industry, so domestic photovoltaic enterprises have to seek international markets. Another aspect, the development of Chinese photovoltaic enterprises has not formed a good economic cycle. Raw materials, the core technology and equipment, the market demands are all in the international markets. Nearly 80 percent of the raw materials are imported from other countries, at the same time, there are more than 90 percent of the photovoltaic cell modules are exported to foreign countries. Because of the heavily dependence on foreign markets, it makes the domestic photovoltaic industry extremely to be influenced by the international economy and political factors, the ability of resisting the risks is also very poor.

2) Over-capacity

Nowadays, the main development problem of Chinese photovoltaic industry is the over-capacity. The unreasonable industrial development and excessive investment caused the over-capacity has become another restricting factors for Chinese photovoltaic industry. Affected by the financial crisis and the European debt crisis, some enterprises have to face the bankruptcy. The UK, Greece, Switzerland, Germany, Italy and Spain and other European countries have stopped or cut down the

photovoltaic subsidies, the photovoltaic products' demands in American and European markets are seriously reduced. What's worse, the anti-dumping and anti-subsidy investigations have led a chain reaction: Not only the European Union has followed America to investigate Chinese photovoltaic products, other countries also start the investigation. Under the problems of the domestic over-capacity, the shortage of domestic demand and the shrink of the European and American markets for the photovoltaic products, adjusting the layout of the market is an inevitable choice for the development of Chinese photovoltaic industry (E Min, 2012).

3) The value of the industrial Chain on low-end

Chinese photovoltaic industry has gradually infiltrated into the chain of global photovoltaic industry, but most of Chinese photovoltaic enterprises are at the end of the photovoltaic industry chain link, the advantages of Chinese photovoltaic industry are mainly concentrated in the battery package and the photovoltaic modules manufacturing, which are at the end of the value chain, and the assembly enterprises accounts for about 70 percent in the whole industry. So Chinese photovoltaic products in international trade can only rely on the low cost, the large quantities as the advantages to compete with other countries. But the level of solar photovoltaic technology is not very high, the core technologies is basically dependent on the foreign countries.

Then the proper strategies should be put forward to stop the potential threatens or even the conflicts. Firstly, to decrease the export and consolidate foreign markets will be effective. On the one hand, Chinese government should consolidate the European and American markets, appropriately encourage and guide photovoltaic enterprises to invest and establish factories in Europe and America, it can avoid the constraint of anti-dumping and anti-subsidy investigations. On the other hand, the Chinese photovoltaic enterprises should enhance the cooperation with Europe and America through participating in the investment for American photovoltaic enterprises, it is good to reduce the economic loss by the anti-dumping and anti-subsidy investigations.

Secondly, to open domestic and new market in China can strengthen the competitiveness of photovoltaic products in the process of adjusting the export strategies. The photovoltaic enterprises should realize that in recent years the government has paid much attention to the application of photovoltaic products, it has the great potential of demands in the domestic market. If domestic photovoltaic enterprises depend more on European and American markets, the destructive impact of anti-dumping and anti-subsidy will be more. Therefore, photovoltaic enterprises should pay attention to the development of the domestic market and reduce the dependence on other countries.

And seeking new market also is imperative. The anti-dumping and anti-subsidy investigations' goals are mainly silicon solar cells of China. If the manufacturing bases can be transferred out of the domestic bases, then export photovoltaic products to America, it can avoid this problem. The development of photovoltaic industry in Southeast Asia is very backward, the low labor costs and the low transportation costs are the great advantages. If Chinese photovoltaic market is transferred to Southeast Asia and India, it is good for occupying their market first, and solve the problem of over-capacity of Chinese photovoltaic industry and the reduction demands of photovoltaic products in European and American market, it also can save the cost of manufacturing the photovoltaic products (Marketbuzz, 2006). The Chinese government should strengthen communication and coordination with those countries, get to know the market needs and characteristics, draw up the relevant strategies, guide and encourage Chinese photovoltaic enterprises to invest and set up factories in foreign countries.

Thirdly, to establish the chain link and specify the subsidy policies will lead the whole chain of photovoltaic industry (JB Chen, 2012). China is in the intermediate links of manufacturing photovoltaic modules, and among the exported photovoltaic products, 75 percent of raw materials and equipment are imported from the foreign suppliers. The American enterprises finally finish the application link of the downstream. Photovoltaic enterprises should increase the scientific funds for application of downstream link system, build the application system of photovoltaic industry in the domestic, at the same time, producing the equipment required in the upstream, and finally establish the industry chain of photovoltaic industry. It can help Chinese photovoltaic enterprises achieve the

domestic sales of products and reduce the dependence on American market. Different from the traditional development of industrial division principles, this development of strategies are suit for new energy and high-tech industries, these industries emphasize techniques at first. Therefore, training the excellent technical talents and developing the new technology for photovoltaic industry is imperative.

As the rule of WTO, it won't cause the anti-subsidy investigation if the member country provides subsidies on the scientific research and education, remote areas and environmental protection. So Chinese government should make more normative development policies for photovoltaic industry, provide more subsidies into it, the downstream development and personnel training of photovoltaic industry, support the development of the core technologies and make the photovoltaic enterprises become the real beneficiaries.

4. Conclusion

Trade protection has become an important means of protection for developed countries to achieve the development of local enterprises and industries. At present, the anti-dumping and anti-subsidy investigations have not ended, Chinese photovoltaic enterprises still will suffer the anti-dumping and anti-subsidy investigations in the future. What's worse, because affected by the financial crisis and the debt crisis, the European countries and American trade protection against China will be heavier and heavier, trade disputes also will be more and more. This requires Chinese government, departments and photovoltaic enterprises must prepare well to struggle with foreign countries in a long-term against their trade protection, and actively take measures to reduce the impact of the trade protection to Chinese photovoltaic enterprises, which means taking advantage of industry cluster.

Chinese photovoltaic enterprises also can learn experience from Huawei, it uses the anti-monopoly law to win the suit with IDC Company. But the anti-monopoly suit needs very professional persons. So the government should establish the relevant institutions to train the professional groups for the anti-monopoly suits. Chinese photovoltaic enterprises should use the law to win the anti-dumping and anti-subsidy investigations, then the enterprises can reduce the economic losses and protect their benefits.

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