中国和韩国风电企业竞争优势分析

Analyzing Competitive Advantages for Sino-Korean Wind Power Enterprises

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Analyzing the Competition in China's Wind Power Market

At present, the total accumulated installed capacity of the wind turbine generator systems (WTGs) in China accounts for 10% of the total global wind power market, and China is one of the top five wind power markets in the world. China's wind power technology has basically matured, but the manufacturing cost of WTGs in China is expected to drop, while some key components continue to be imported. Though the price of foreign WTGs is over 20% higher than that of Chinese WTGs, foreign WTGs can still achieve a higher market share because of their advanced technology. When the Chinese wind power manufacturers faced a technological disadvantage, the global wind power giants introduced advanced technologies and manufacturing experiences in China to develop wind power technology by establishing foreign companies or entering into joint ventures. For example, the Spanish enterprise Gamesa, the world's second largest wind power manufacturer, built a wind turbine manufacturing base in Tianjin, China. Thus, the global wind power giants may not only decrease the manufacturing and transportation costs but also meet the local production rates of wind power equipments, regulated by the National Development and Reform Commission of China. This situation will intensify the competition in China's wind power market. The statistical data of wind power in 2006 (Shi Pengfei, 2007) show the following: with regard to the accumulated installed wind power capacity, the foreign and Chinese enterprises account for 65.8% and 30.9%, respectively, while for the newly installed wind power capacity, they account for 55% and 41.3%, respectively, and the remaining share is accounted by joint venture enterprises in China. In addition to the Chinese enterprise Goldwind[1], the market shares of other Chinese enterprises are smaller than those of the foreign enterprises in China. However, the development trend indicates that the Chinese enterprises are developing rapidly, and the market share of the newly installed wind power capacity of the Chinese enterprises has kept increasing steadily during the last three years.

At present, the market for the manufacture of MW-scale WTGs in China is imbalanced in terms of the demand exceeding the supply. Therefore, many wind power enterprises attempt to acquire a larger market share in this business. Some manufacturers that produce complete sets of WTGs begin to produce interrelated components. These enterprises, as new entrants, not only utilize the technological advantages that they possess but also collaborate with foreign enterprises with the aim of dominating the market as early as possible. Under this situation, the competition has increased in the market of manufacturing components in China. Since the mainstream models of WTGs produced in recent years are of MW scale or larger, the Chinese enterprises are faced with technological obstacles. In order to overcome the technological disadvantages and bring about a change in the market monopolized by the global wind power giants, the Chinese enterprises have to introduce and assimilate foreign technologies through various initiatives such as joint design and acquiring production licenses. Some Chinese enterprises that have advantages in manufacturing will be presented with the opportunities to develop rapidly and occupy the desired position in the wind power manufacturing market in China.

1、Goldwind Science & Technology Co., Ltd

Evaluation Method for the Competitive Advantages of Enterprises

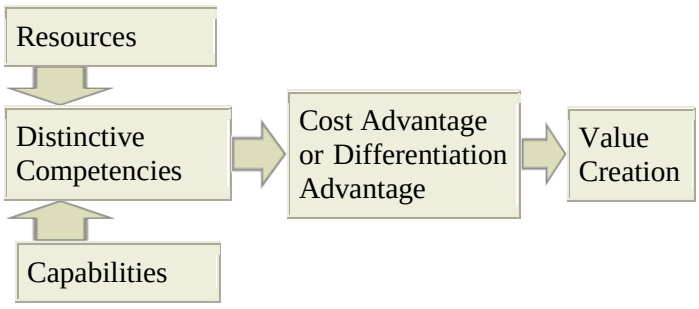
On the basis of the analysis of the competitive situation of China's wind power market, the competitive advantages of wind power enterprises between China and Korea will be compared and analyzed on the basis of the conceptions of competitive advantage as follows.

Conception of Competitive Advantage

When a firm sustains profits that exceed the average for its industry, the firm is said to possess a competitive advantage over its competitors. The objective of a business strategy is to achieve a sustainable competitive advantage. Michael Porter, a famous economist, identified two basic types of competitive advantages: cost advantage and differentiation advantage. A competitive advantage exists when the firm is able to deliver the same benefits as its competitors do but at a lower cost (cost advantage) or deliver more benefits than the competing products offer (differentiation advantage). Thus, a competitive advantage enables a firm to create a superior value for its customers and higher profits for itself.

A resource-based view emphasizes that a firm utilizes its resources and capabilities to create a competitive advantage that ultimately results in a superior value creation. The diagram given below (Figure 1) combines the resource-based and positioning views to illustrate the concept of a competitive advantage.

「Fig. 1」A Model of Competitive Advantage Analysis



According to the resource-based view, in order to acquire a competitive advantage, the firm must have resources and capabilities that are superior to those of its competitors. Resources refer to the firm-specific assets that are useful for creating a cost or differentiation advantage and are something that a few competitors can acquire easily; patents and trademarks, proprietary know-how, established customer base, firm's reputation, and brand equity are some examples of such resources. Capabilities refer to the firm's ability to utilize its resources effectively; for example, the ability of a firm to launch a product in the market earlier than its competitors. Such capabilities are embedded in the organization's routine activities.

The firm's resources and capabilities together form its distinctive competencies. These competencies enable innovation, efficiency, quality, and customer responsiveness, all of which can be leveraged to create a cost or differentiation advantage. Competitive advantage is achieved by using resources and capabilities to realize either a lower cost structure or a differentiated product. A superior value is achieved through lower costs or differentiation. To achieve a competitive advantage, the firm must perform value creating activities such that an overall value superior to that of its competitors is created.

Establishing an Indicator System for Evaluating Competitive Advantage

On the basis of the concept of competitive advantage described above, the study established a series of correlative indicators to reflect a wind power enterprise's competitive advantage from the perspective of resources, capabilities, cost, and differentiation. The evaluation indicator system is presented in the table given below (Table 1).

〈Table 1〉 Indicator System for Evaluating the Competitive Advantage for Wind Power Enterprises

Indicators	Description of the Indicators for the Wind Power Industry
Resources Technology acquiring type, Financial strength, Proprietary know-how, Patents and trademarks, Background resource	"Technology Acquiring Type" indicates the degree to which the enterprise independently owns technology. "Listed Companies" indicates the enterprise's financial strength.
	"Research and Manufacturing Capability" indicates the level of localized manufacturing capability. "Patent and Certificate" indicates the technological quality of WTGs produced by the enterprise. "R&D Start Date" indicates the degree of technology maturity.
	"Background Resource" indicates the enterprise's resource advantage accumulated over time.
Capabilities Development achievement; Development potential; Reputation and image-building; Technology service;	"Accumulated Installed Capacity" is explains the enterprise's development achievements. "Planed Production Capacity" indicates the enterprise's development potential in the future.
	"Business Field" indicates the consistent production capacity by the enterprise's internal self-supporting infrastructure. "Cooperation Relationship" indicates the enterprise's collaboration with a component manufacturer, for supporting its consistent production capacity. "Technology Service" indicates the enterprise's reputation with regard to product quality and technology service for their users.
Cost	"Cost" indicates the cost per kW incurred by the enterprise for the installation of WTGs.
Differentiation(superior benefits)	"Profit Rate" indicates the enterprise's profit-making ability.

Analyzing the Competitive Advantage between Sino-Korean wind power enterprises

There are four main objectives for carrying out a comparison analysis on the competitive advantages of Sino-Korean wind power enterprises: (1) to accelerate the understanding among the enterprises of the two countries, that is, China and Korea，(2) to compare the advantages of the enterprises under the same evaluation indicator system in order to enable the Korean enterprises to gauge their competitive capability relative to Chinese enterprises, (3) to identify the barriers and demand in China's wind power market，and (4) to conduct a basic work for identifying and exploiting potential cooperation opportunities for Sino-Korean enterprises. On the basis of these objectives, the Sino-Korean wind power enterprises will be the focus of this study, and the global wind power giants operating in China will be considered as possessing superior competitive advantages. The detailed analysis is provided as follows.

Technology Acquiring Type and Financing Strength

"Technology Acquiring Type" indicates the enterprise's capability of independently holding technology. There are five ways of acquiring technology among China's wind power manufacturers. The foreign companies established factories in China to carry out production using advanced technology developed by them. Joint venture companies carry out production through technology transferred from the foreign companies. The Chinese companies have three means of acquiring technology: (1) production license—the Chinese company obtains the production right of foreign technology by paying the cost of the technology transfer,(2) joint design:—the Chinese company hires foreign specialists by paying a consultant fee, and (3) independent design—the Chinese company employs autonomously researched and developed technology. Technology acquiring type, as mentioned above, indicates that if an enterprise owns technology developed independently by its own R&D, it is considered to possess the best capability of independently holding technology. Except foreign enterprises, the Chinese enterprises Windey[2], Huayi[3], and New Unite[4] and Korean enterprises Unison[5]

[2] Zhejiang Windey Engineering Co., Ltd.
[3] Huayi Elec. Apparatus Group Co., Ltd.
[4] New Unite Wind Turbine Generator Co
[5] Unison Co., Ltd.

and Hanjin[6] have the advantage of independently holding technology owing to the WTG technology developed through their independent R&D. Chinese enterprises Goldwind, DEC[7], Mingyang[8], and SHHE[9], who have gained technology innovation on WTGs on the basis of the technical joint design with foreign companies, also show a better capability of independently holding technology.

"Listed Companies" is used to evaluate the financial strength of enterprises. Generally, the listed companies have greater financial strength; hence, the Chinese enterprises Goldwind, DEC, and XEMC[10] and the Korean enterprises Unison and Hanjin have an advantage in this respect.

Research and Manufacturing Capability

At present, most of the manufacturers in China produce WTGs by relying on imported foreign technologies. The operation efficiency of WTGs produced in China is lower than that of WTGs produced overseas because of the differences in the infrastructure and in the quality of locally manufactured components. Therefore, the Chinese manufacturers must possess the capability to innovate WTGs and regeneration systems on the basis of foreign technology in order to meet special demands in the Chinese market. However, the Chinese enterprises are facing the challenges with regard to independent R&D for developing WTGs and the localized manufacturing of key components. The Chinese enterprises lack these capabilities, leading to an inconsistent production capacity.

A comparison of the enterprises' R&D capability in manufacturing MW-scale WTGs reveals that Chinese enterprises Goldwind, Mingyang, Sinovel[11], XEMC, and DEC and Korean enterprises Unison and Hanjin have outstanding advantages. Their product quality has been certified by international standardization organizations. In particular, the Korean enterprise Unison shows a better advantage because it has received a high number of certificates such as the International Design Certificate (Germanischer Lloyd), International Type Certificate (DEWI-OCC), Wind Turbine (10-0695012-00-00), Rotor for Wind Turbine and Assembling Method (10-0703564-00-00), and Wind Turbine with Single Main Bearing (10-0703564-00-00). Goldwind, Sinovel, and DEC started their R&D activities early during 2003 and 2004, and these enterprises are considered to possess technology maturity and a better competitive advantage. On the other hand, Korean enterprises started their R&D activities later during 2006 and 2008, and their degree of technology maturity is similar to that of XEMC, CZE[12], and SHHE.

Some enterprises such as Goldwind, Mingyang, and Sinove possess over 90%of the localized production of MW-scale WTGs, while some such as Unison (85%), XEMC, Windey, DEC, and SHHE possess 74.5%–85%. The other enterprises need to enhance their capability of localized production. The average technology level of manufacturing WTGs in Korea is still behind the world-leading technology. Manufacturing technology for wind turbine blade and gearboxes in Korea has reached 70% of the world-leading technology, and generators and towers 90% and 100%, respectively. Recent development shows that the capability of localized R&D for the development of MW-scale WTGs has rapidly enhanced in China. For example, Mingyang successfully developed 1.5-MW WTGs by owning independent intellectual property rights, and exported the products to the USA.

[6] Han Jin Ind. Co., Ltd.
[7] Lanzhou Great Wall Electrical Co., Ltd..
[8] Guangdong Mingyang Fengdian Power Electronics Ltd.
[9] Shanghai Electric
[10] Hunan Hara XEMC Windpower Co., Ltd.
[11] Sinovel Wind Co. Ltd.
[12] Changzheng Electric

A comparison of the capacity of MW-scale WTGs reveals that Goldwind, Sinovel, Windey, DEC, and Hanjin produce 1.5-MW WTGs. Sinovel now plans to produce a series of MW-scale WTGs from 1.5 MW to 3 MW and 5 MW in 2010, and XEMC, SHHE, and Unison plan to produce 2-MW WTGs—these enterprises are considered to possess a better capability of holding advanced technology.

Development Achievement and Potential Production Capacity

The data of the total accumulated installed wind power capacity in 2006 show that Goldwind achieved the highest share in China's wind power market and had become one of the world's top ten wind power equipment suppliers. Relative to Chinese enterprises, the Korean enterprise Unison's development achievement is lower than that of Goldwind and higher than that of all the other enterprises; it therefore has an obvious advantage in wind farm development. The data on planned production capability of wind power in 2010 show that the annual production capability of Goldwind, Sinovel, XEMC, Mingyang, and DEC exceed 1000 MW. In comparison with these enterprises, the Korean enterprises have achieved a medium-level production capacity and should exploit some potential production capacity. Detailed information with regard to the production capacities is presented in Table 2.

〈Table 2〉 Development Achievement and Potential Production Capacity by Enterprises

	Accumulated IC (MW) in 2006	Planed Producing WTGs (in terms of MW) in 2010
Goldwind	445.2 (25.68%)	1660 sets (1.5 MW) in 2009 (2490 MW)
Sinovel	75 (2.89%)	800 sets (1.5 MW) in 2009 (1200 MW) and 1000 sets (1.5 MW, 3 MW, 5 MW) in 2010 (1800 MW)
Windey	31.75 (1.22%)	400 sets (1.5 MW) in 2010 (600 MW)
DEC	15 (0.58%)	900 sets (1.5 MW) in 2009 (1350 MW)
XEMC		300 sets (2 MW) in 2009 (600 MW) and 1000 sets (2 MW) in 2010 (2000 MW)
Mingyang		800 sets (1.5 MW) in 2010 (1200 MW)
SHHE		400 sets (1.25 MW) and 100 sets (2 MW) in 2009 (700 MW)
Huayi		300 sets (1.5 MW) in 2009 (450 MW)
Unison	138.6 (90%)	330–660 MW in 2010
Hanjin		270 MW in 2010

Note: IC stands for Installed Capacity.

Reputation and Image-Building

The strength of an enterprise having diverse and comprehensive business fields may be reflected in its production resources and consistent production. The enterprises DEC, Goldwind, Sinovel, XEMC, CZE, SHHE, and Windey have forayed into diverse business fields including R&D wind turbines, manufacture of complete sets of WTGs, and development of wind farms. As compared with Goldwind, the Korean enterprise Unison has more advantages in this respect. In addition to those mentioned above, Unison produces tower and tower flanges for WTGs and is a major global supplier of tower flanges. Hanjin has a narrow business field and only focuses on R&D for producing 1.5-MW WTGs and off-grid small wind power.

A manufacturer of complete sets of WTGs needs to set up a collaborative network with component manufacturers for supporting its consistent production. Possessing a steady supply network could be an indication of the enterprise's capability of utilizing its reputation to maintain a cooperative relationship with the component manufacturer. Goldwind, Sinovel, XEMC, and SHHE have formed a steady and comprehensive supply network of component manufacturers. These enterprises show a greater strength in terms of consistent production capacity using resources borrowed from outside. A comparison of these enterprises reveals that Unison has a superior capability in terms of its broad business field on manufacturing

WTGs and components and a better supply network from other enterprises owing to its good reputation.

Enterprises can acquire a high reputation and image if they focus on ensuring their product quality through technology services. The technology services refer to a series of services provided by enterprises for their products and consumers. Broad technology services for wind power development include presale services (such as wind measurement), ancillary sale services (such as installation and assembly process), and after-sales services (such as maintenance).The information on the enterprises' business fields shows that numerous wind power enterprises only focus on the achievement of wind farm development and do not give adequate attention to the maintenance and repair of their WTG products. There are few enterprises engaged in providing professional technology service for wind power development. Thus, there is a shortage of specialized technology services for wind power systems in China's wind power market.

Enterprise's Background Resources

"Enterprise's Background Resources" indicates the resource advantage of the enterprise, accumulated over a long period, in terms of possessing outstanding capability of manufacturing large-scale equipments, achieving good business gains, possessing excellent management institutions and a considerable number of professionals, etc. Goldwind, XEMC, DEC, CCE[13], Huayi[14], Sinoma[15], and TWBB[16] possess advantages in terms of owning background resources. The Korean enterprises Unison and Hanjin have a long history of manufacturing large-scale equipments. Their products are highly reputed in Korea and international markets. Relative to Chinese enterprises, Unison and Hanjin have more advantages in terms of management experiences, professionals, manufacturing technologies, etc. These advantages translate as stronger financial strength and background resource.

Cost

Since it is very difficult to obtain data on the manufacturing cost per kW of WTGs in each enterprise, this study can only perform a qualitative analysis on the cost difference between the installation of foreign and Chinese WTGs; the analysis result will be used to evaluate the cost advantages of the enterprises. Further study is required to determine the method of evaluating the cost difference between Chinese and Korean WTG manufacturers.

With regard to the cost differences between the installation of Chinese and imported WTGs, the following factors should be taken into account:

- The import tariff rates for WTGs and components are 5% and 3%, respectively, based on the contract price in China.
- The import VAT rate is 17% based on the contract price less freight and insurance charges and customs.
- The overseas freight and insurance charges amount to 5% of the contract price.
- Transport cost at home: Generally, the costs for imported WTGs are higher due to their large scale. However, this cost is negligible relative to the total cost.
- Cost of the electricity transmission line in wind farms: The arrangement of transmission lines in wind farms would differ notably, depending on the installation of foreign or Chinese WTGs. Generally, the transmission lines for small-scale models would incur a high cost.

13 Lanzhou Great Wall Electrical Co., Ltd.

14 Huayi Elec. Apparatus Group Co., Ltd.

15 Sinoma Science & Technology Co., Ltd.

16 Baoding Tianwei Baobian Electric Co., Ltd.

- Cost of tower: The unit cost per kW of larger towers tends to be lower. As a result, imported WTGs are usually of large scales with lower unit costs for the towers.
- Cost of WTG base and wind farm land: Usually, the costs per kW for the base construction and wind farm land tend to be inversely proportional to the size of the WTGs. Therefore, the imported WTGs with larger capacity lead to a lower cost per kW for the base construction and wind farm land.
- The quoted price of imported WTGs is higher than that of the local ones because of higher manufacturing costs, labor costs in foreign countries, and more expenses such as import tariff, import VAT, overseas insurance, and freight charges.

The above comparison reveals that the imported and Chinese WTGs have different advantages and disadvantages with regard to cost. The total investment cost of the wind farms for imported WTGs is much higher than those for local ones; this indicates the advantage of locally manufactured WTGs. However, the imported WTGs have more favorable technology. Therefore, a combination of both options is desirable: introducing the latest technologies from abroad to facilitate the local production of WTGs. This strategy would enable China to acquire advanced technologies and simultaneously lower the cost for meeting the objective of the localized manufacturing of WTGs. A rough estimation based on an inquiry with Unison shows that the development cost is higher for Korean enterprises than it is for Chinese enterprises.

Profit Ability

"Rate of Profit" indicates the profit ability of an enterprise. As the gross and net profit rates differ and fluctuate according to the enterprises and years, the data for gross profit rates can only be referenced to reflect the profit ability of enterprises. Goldwind's gross profit rate was 33.20% in 2007, and analysts estimated that its gross profit rate would decrease to 22% in the next two years. DEC's gross profit rate was 7%–8% in 2006. XEMC's gross and net profit rates on WTGs are estimated to increase to 15% and 8%, respectively, in 2009. Huay's net profit rate on WTGs is estimated to reach 13.5% in 2008. Unison's 2007 income statement showed an annual sale of KRW 60.7 billion and a gross profit of KRW 18.7 billion. The roughly estimated gross profit rate is 30.89%. A comparison of the enterprises shows that Goldwind and Unison have a superior advantage with regard to the profit ability of enterprises.

Results

The study presented the scenario of wind power development, the demand in China's wind power market, the characteristic and strength of Sino-Korean wind power enterprises, and a comparative analysis of the competitive advantages between Sino-Korean wind power enterprises. There were four main objectives for carrying out the analysis and comparison on the competitive advantages of these enterprises. Based on these goals, the analysis results will provide reference for further analysis on the potential opportunities for cooperation among the Sino-Korean enterprises.

The results of the integrated evaluation shows that wind power enterprises such as China's Goldwind, Sinovel, DEC, and XEMC and Korea's Unison and Hanjin have superior competitive advantages over their competitors. These advantages are in terms of stronger financial strength and background resource accumulated over a long period of development, superior capability on R&D the development of MW-scale WTGs and their localized production, better development achievements in wind farms, and a larger development perspective. Moreover, the wind power enterprises such as China's Windey and Huayi have better competitive advantages as compared to the other enterprises. Detailed information is provided in Table 3.

〈Table 3〉 Integral Evaluation Result on the Competitive Advantage of Enterprises

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Goldwind	●	●	●	●	●	●	●	●	●	●	●		●	●
Sinovel	●	●	●	●	●	●	●	●	●	●	●		●	●
Windey	●	●	●	●	●	●	●	●	●	●	●		●	●
DEC	●	●	●	●	●	●	●	●	●	●	●		●	●
XEMC	●	●	●	●	●	●	●	●	●	●	●		●	●
Huayi	●	●	●	●	●	●	●	●	●	●	●		●	●
CCE	●	●	●	●	●	○	○	●	○	●	●		●	●
Miracle	●	●	●	●	●	○	○	●	○	●	●		●	●
TBEA	●	●	●	●	●	○	○	●	○	●	●		●	●
Sinoma	●	●	●	●	●	○	○	●	○	●	●		●	●
CZE	●	●	●	●	●	○	○	●	○	●	●		●	●
SHHE	●	●	●	●	●	○	○	●	●	●	●		●	●
TWBB	●	●	●	●	●	○	○	●	○	●	●		●	●
Global	●	●	●	●	●	●	●	●	●	●	●		●	●
Unison	●	●	●	●	●	●	●	●	●	●	●		●	●
Hanjin	●	●	●	●	●	○	○	●	○	○	●		●	●

Note: ● General, ● Better, ● Superior, ○ Non choice

A-Technology Acquiring Type; B-Financial Strength; C-Degree of Technology Maturity; D-R&D&M Capability; E-Patent and Certificates; F-Development Achievement; G-Developing Potential in the Future; H-Consistent Production Capability of Internal Self-supporting Infrastructure; I-Consistent Production Capability by Using External Resource; J-Technology Service(described later in detail); K-Enterprise Background Resource; L-Cost (qualitative analysis); M-Capability of Making Profit; N-Integrated Evaluation Result

In some aspects, the competitive advantages of the Korean enterprise Unison are relatively better than the top Chinese enterprises, especially in terms of the advanced technology for producing WTGs with larger capacities and gaining more technology-related certifications on WTGs and some of their key components.

On the basis of the outstanding competitive advantages, a preliminary conclusion obtained by this study reveals that Korean enterprises have the technological strength to develop in China's wind power market in the future. Further study is required to identify potential cooperation opportunities among these enterprises.

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