

WIND POWER TECHNOLOGY and CHINA RURAL ELECTRIFICATION

CTI/Industry Joint Seminar

Successful Cases of Technology Transfer in Asian Countries

March 8-9, 2006, Hanoi, Vietnam

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Abstract:

Renewable energy technology and products have great global market demands, especially wind and solar power. On other hand, Asian developing countries, particularly in China, considerable quantity of population who are living in remote villages or isolated islands are not able to access electricity. Providing electricity service is on the top list of most developing countries. These technologies are having been proved mutual in rural electrification. Transferring such technologies and localization of production is a highly appreciated way to low the production cost and it will benefit both enterprise itself and beneficiary population, especially in poverty alleviation. But developing business in another country, especially a western company getting into eastern country will encounter many unpredictable problems and difficulties. Deep feasibility study and enough psychological preparation will never be over estimated. This paper presents a case of transferring wind power technology in China and wind turbine and system development localization.

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1. BACKGROUND

Renewable energy technology and products have great global market demands, especially wind and solar power. On other hand, Asian developing countries, particularly in China, considerable quantity of population who are living in remote villages or isolated islands are not able to access electricity. Providing electricity service is on the top list of most developing countries. These technologies are having been proved mutual in rural electrification. Transferring such technologies and localization of production is a highly appreciated way to low the production cost and it will benefit both enterprise itself and beneficiary population.

1.1 Bergey Windpower and Renewable energy rural electrification

Bergey Windpower Company, Ltd. (BWC) was founded in Oklahoma, USA, since 1977, which is specialized in small wind turbine manufacturing. BWC concentrated on small horizontal-axis wind turbines for homes and industry. The first BWC 1000 was prototyped in 1979, and EXCEL 10 kW was introduced in 1983. It has three production lines now,

- XL.10: It is good for rural village power, military, ocean traffic control, and grid-tied applications.
- XL.1: It is also good for rural electrification, telecom, and other off-grid applications
- XL 50 is available now.

As for one of the major renewable energy resource, wind power and wind systems (Includes its hybrid system, such as wind/PV and wind/PV/diesel hybrids) have been widely used in rural electrification, telecom, military, and any remote sites where traditional grid is not available, especially, it is feasible solution to provide electricity service for those remote villages in developing countries. The renewable energy village systems can provide the following benefits to those villagers: providing lighting at night, watching TV, providing power for water pumping, which can be used for drinking water and irrigation. It also will improve local condition of communication, education and health care. More important, it will provide the power for small tool and machining shops, retail stores to improve income-gained production activities.

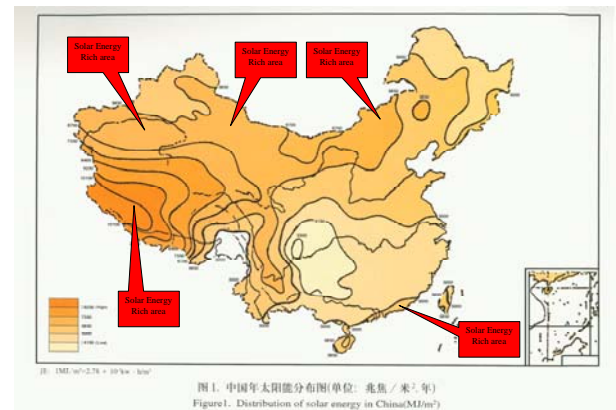
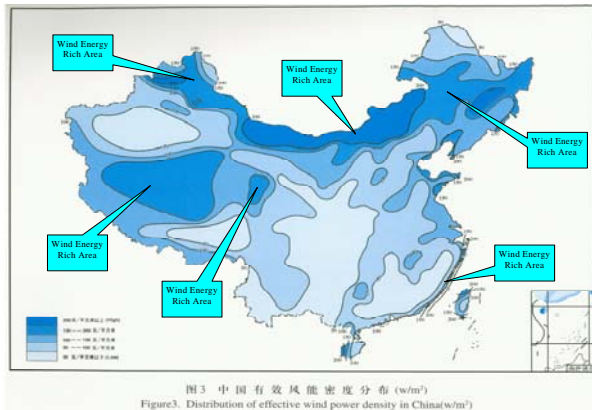
1.2. China rural power situation

Back to end of last decade, through the expansion of provincial electricity grids, development of local hydro resources, and, more recently, promotion of other renewable energy alternatives, China has achieved remarkable rates of electrification of over 95%. This far exceeds rates found in most developing countries. However, a single percent of the population in China represents thirteen million people. Furthermore, the achievements of the past mean that those communities remaining without access to electricity in China today are often living at very large distances from existing grids and usually at low populatons densities. Furthermore, under the ongoing process of power sector reform, in which provincial utilities are scrutinizing their balance sheets more closely, the prospect of a conventional solution to deliver modern energy services to these distant, low-load (and hence low or no profitability) markets seems further away than ever.

The latest statistics show that over 7 million households and over 29,000 villages are still without access to a reliable supply of electricity (Table 1.2). These counties, townships, villages and scattered families are principally found in remote areas of China's Western Provinces, and some on islands off the east coast. Some communities use diesel mini grids to provide electricity for a couple of hours at night, and most others use candles and kerosene lights and batteries for small-scale applications. However, Western China and the coastal island regions enjoy some of China's best wind and solar resources. In these locations it is therefore worthwhile to consider the potential of renewable energy applications as a least cost energy supply solution.

Rural Electrification Situation of China (End of 2000)

Total Number of Villages		Total Rural Households	
565,269		198,933,600	
Connected	Not connected	Connected	Not connected
543,709	21,560	176,848,710	7,053,790



2. BEIJING BERGEY WINDPOWER and TECHNOLOGY TRANSFER

To promote renewable energy rural electrification and develop the potential market in Asia and China, reducing production cost, US Bergey decided to develop a manufacturing enterprise in China. The business started in 1998, which was a joint venture of fully using BWC's mature design and technology to manufacturing EXCEL 10K wind turbines. After three years, both sides decided to dissolve the joint venture and BWC decided to develop a sole venture in Beijing, Beijing Bergey Windpower Co. Ltd. (BBWC). BBWC produces EXCEL 10KW machines, as well as BWC newly designed XL1 1000k small wind turbines, to target renewable energy market in China and Asia developing countries.

3. CHINA RURAL ELECTRIFICATION

3.1 China National Township Electrification Program (SDDX)

The village electrification using renewable energy resources is standing high on the agenda of China's national development in order to provide modern energy services to some 50 million people that have not been electrified. In 2001-2003, The Government implemented a bold programme titled Song Dian Dao Xiang (SDDX, i. e. sending electricity to townships) that successfully installed over 700 village power systems mostly in western China.

Since the SDDX program was launched in 2002, totally 964 off-grid renewable energy village power systems have been developed, which includes 662 PV, Wind/PV, PV/Diesel hybrid systems, with capacity 15,718.12kW, and 302 small hydro-power systems, with capacity 274,840.3kW have been built in seven provinces of western China, including Tibet, Qinghai, Gansu, Sinkiang, Sichuan, Inner Mongolia, and Shanxi.

Statistics of Station numbers and installed capacity of SDDX						
	PV Stations, Wind/PV hybrid Stations, PV/Diesel Stations (numbers)	Installed Capacity (kW)	SHS (number s)	Installed Capacity (kW)	Small hydro power stations (numbers)	Installed Capacity (kW)
Shanxi	9	100	0	0	16	21985
Qinghai	112	3943	No-info.	136	0	0
Gansu	20	995	0	0	8	35190
Sinkiang	110	1417.42	2886	144.3	1	110
Inner Mongolia	42	752	1525	610	0	0
Sichuan	40	1816.7	No-info.	No-info	205	202475.3
Tibet	329	6694	No-info.	No-info	72	15080
Total	662	15718.12	-	-	302	274840.3

Most of the systems are running smoothly under the efforts of both the PDRC (Provincial Development and Reform Commission) and the system integrators in the past three years and the maintenance and management are also on the rails.

3.2 Significance of SDDX

SDDX Program is the first dissemination program on the national level, it is astonished by the world regarding to the areas, scale and speed , which solved the living power consumption difficulties in the remote area and accelerated the local economic development, improved the living condition level. Around 30million population are benefited who were not able to access electricity before. It is an importance contribution to accelerate the modernization locally. Additionally, the adoption of renewable energy is significant to the environment protection, which is a good demonstration of environment friendly awareness. SDDX program is also becomes a momentum to promote the development of PV industry in China

SDDX is also a base for further larger scale dissemination. It is anticipated that the next phases of the SDDX electrification programme will be launched, which will draw on the experiences of the first phase and assign the priority to the sustainable operation and management in addition to the optimal design and effective installation of village power systems.

3.3 Results achieved for SDDX objective

Results 1: Installed off-grid RE systems supply power to the township in normal operation after test and acceptance procedure

Result 2: A power supply / service company is set up in each province and works following regulations. All working staff at the station are trained and qualified . Key technicians for trouble shooting service are positioned to keep the system in normal operation.

Result 3: Tariff policy for off-grid power supply issued in each of the project provinces under a leadership of SDPC, it shall be bearable by the remote villagers and cover the supply costs of the service company who shall gain reasonable profit from the business.

Result 4 : Power supply contract shall be signed between the service company and users. Responsibility, right and obligation shall be cleared and protected.

Result 5: Related Policies, regulations and standards are installed to launch follow-up program smoothly

Results 6: Condition for social and economical development is improved and living standard is raised in the remote townships.

3.4 BBWC's products and systems in SDDX and Case study

Before and in SDDX program, BBWC has developed more than 100 wind village power systems in China, which includes wind system, wind/PV hybrid system, and wind/PV/Diesel hybrid systems. BBWC is not only a turbine manufacture, but a system integrator as well. 90% of wind turbines used in SDDX were provided by BBWC.

Bergey's Systems in China and Asia



Case study 1: A largest renewable village power system developed in SDDX: Wind/PV Hybrid village power, Mazongshan, Gansu ,China

Location: Mazongshan, Gansu, China

Date of installation: Dec .2002

Basic info: Township government, bank branch, clinic, school, post office, etc., with 124 families. Max load 235kw.

System configuration: Wind turbine: EXCEL 10KVA x 21, PV 90KVA

Finance: China SDRC financed, local government co-financing.

Performance: Satisfy local needs except large production load.

Case study 2: UNDP-Wind/PV/Diesel Village Power Bulunkou, Xinjiang , PR China

Location : Bulunkou, Kirgiz , Xinjiang , China

Date of installation: Nov .2002

Basic info: Electrifying 500+ families with 2500+ population

System configuration: Wind turbine: EXCEL 10KVA x 8; PV : 10KVA

Diesel genset : 30KVA x 3 , 15KVA x 2

Finance : UNDP's demonstration , local government co-financing .

Performance : Provide lighting TV , and tourist facility .

4. OPPORTUNATY and CHANLLENGE

Eight years technology transferring and market developing in China have given us valuable experience and lessons.

4.1 Feasibility study

As a western enterprise, to develop its business in Asia or China, the significance of a careful and deep feasibility study will never be over estimated. The study should at least include the following aspects:

- Study Legal issues
 - Market survey_ Great market potential vs. Uncertain picture
 - Policy survey
 - Partners/competitors survey
 - Process/legal survey
- Identify Business modes
 - Local distributor
 - Marketing/sales subsidiary
 - Licensing
 - Direct foreign investment
 - Joint venture
 - Sole venture
- Select partner
 - Partner (State-owned vs. Private),
 - Location (Close to market, resource, also incentive policies)
 - Top level administrators (Technical qualification vs. Cultural or political talents and sensitivities)

4.2 Completely aware of differences

The differences between western and oriental partners are coming from all aspects: Culture background, social system and economic practice. Typical differences are:

- Independence vs. Team
- Quantitative thinking vs. Qualitative thinking
 - In Western: When a contract is signed, the deal is done.
 - In China: When a contract is signed, the negotiation is just starting.
- Private owned vs. State-owned
 - Western private business owner takes responsibility for himself. The goal of the business is to maximize the profit; the manager of state owned business should take care of lots of issues may not related with the business, such as old retirees.
- Western manage style vs. Eastern style
- Components of business economy
 - Usually the costs of business consist of the following three components: Material cost; labor cost and sales cost. While most foreign businesses are seeking for lower labor cost in developing countries, they must notice the sales cost usually are significantly increased due to un-well developed marketing game rules. These game rules may totally different from western ones and build transaction cost considerable high and less control.

Recently, an article points that after 20+ years development in China, sole-venture may be is a more suitable business format for multiple-nation business in China. The eight reasons are listed as the following:

- WTO Opens China for foreign investment
- Chinese partners are not necessary for foreign investors;
- Good for technology protection
- Different management concepts
- Avoid the struggle for power
- Protect foreign well-known brand name
- Adjust its business strategy in China
- Match its global strategy

5. Conclusion

Renewable energy has great global market potential, especially in developing countries, renewable energy technologies are welcome by developing countries. Business practices and strategies are quite different between western countries and developing countries. Fully understanding the local culture, social and economic background is preliminary requirement for doing business there. Sometimes the transition process is time costly and painful. But it is worth to try.