Rural Electrification with PV and Wind Technologies in China

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Background

- China is a developing country with about 70% rural population;
- Rural infrastructure is poor, it needs to be improved with a great efforts;
- In recent years, more than RMB 300 billion (EURO 30 billion) have been invested for rural grid improvement including extensions.
- However, by the end of 2005, there are still about 2.7 million rural households (about 3% of the total population) without reliable power supply.

Efforts from 1970--2000

- small hydropower: 28 GW,
- small wind turbines: about 160,000 sets with a total capacity of 25 MW,
- Solar home systems: about 30,000 sets with a total capacity of 600 kWp have been disseminated,
- The installation was realized through many provincial projects with certain support from the state government.

Brightness Program initiated since 2000

- The “Brightness Program of China ” was drawn up under the leadership of former State Development Planning Commission during 1996 till 1999
- The objective of the plan is to speed up the activity of decentralized electrification of remote rural areas; it is also a positive response to the proposal of the world solar summit in Zimbabwe.
- Pilot Projects
- Under the leadership of SDPC, the pilot projects were lunched in March 2000.
- Applied by provinces, Inner Mongolia, Gansu and Tibet were selected as pilot provinces
- SDPC allocated RMB 20 million grant

Main International Cooperation

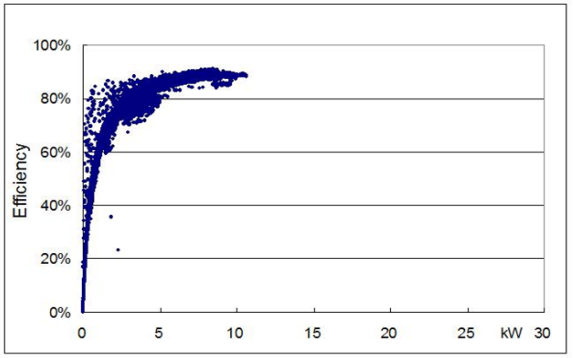
Project	Donor	volume	RMB	Content	Provinces
PV Village	Germany KfW	34 Mio. Euro	340 Mio.	PVH mini-grids	XJ, YN,QH,GS
REDP	World Bank/ GEF	25.5 Mio. USD	210 Mio	SHS	XJ,Tibet,GS,IM, SC,QH
Silk road	Holland	13.79 Mio USD	113 Mio.	SHS	XJ
Rural RE	Germany GTZ	7.3 Mio. Euro	73 Mio.	Policy, Quality, capacity	
PV demo. And Lab.	Japan NEDO	302.2 Mio. JY	38.6 Mio.	PV demo. And test Lab.	12 provinces and Beijing
Solar program	Canada	3.43 Mio. C dollar	23 Mio.	Demo. And training	IM
Capacity building	UNDP	1.43 Mio. USD	11.44 Mio.	Demo. And training	XJ etc.
Total	7		807 Mio		

A PHP and jubilant people in Yunnan

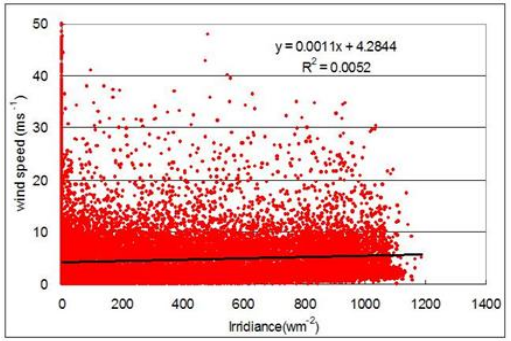
The life in remote villages are improved significantly

Quality Monitoring & Evaluation

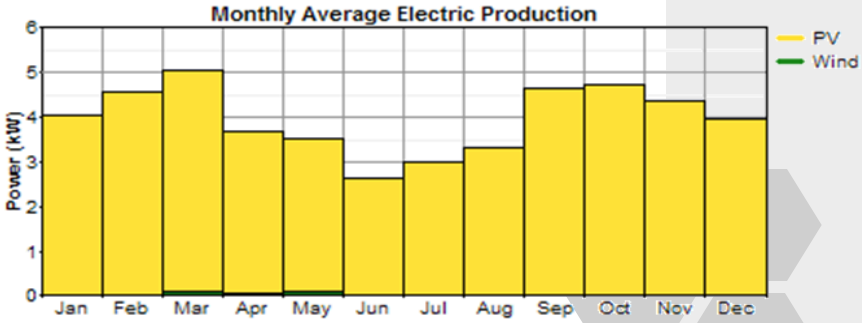
System monitoring and evaluation were implemented in cooperation with NREL and GTZ



Efficiency of the 30kW inverter at Zongjia, 10 min averages from Sep.15, 2006 to Mar.10, 2007.

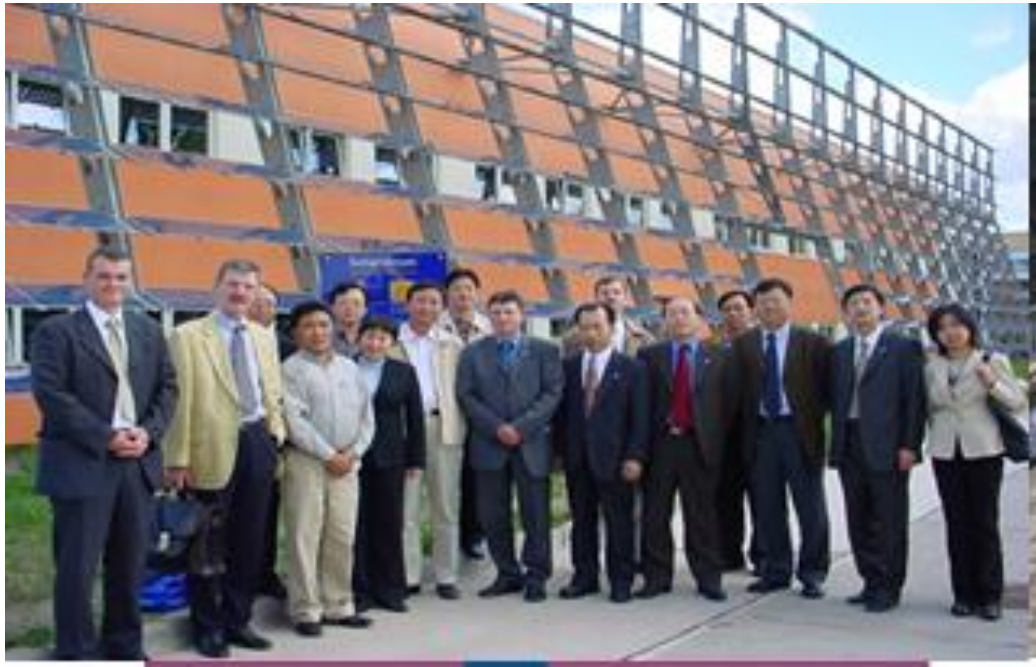


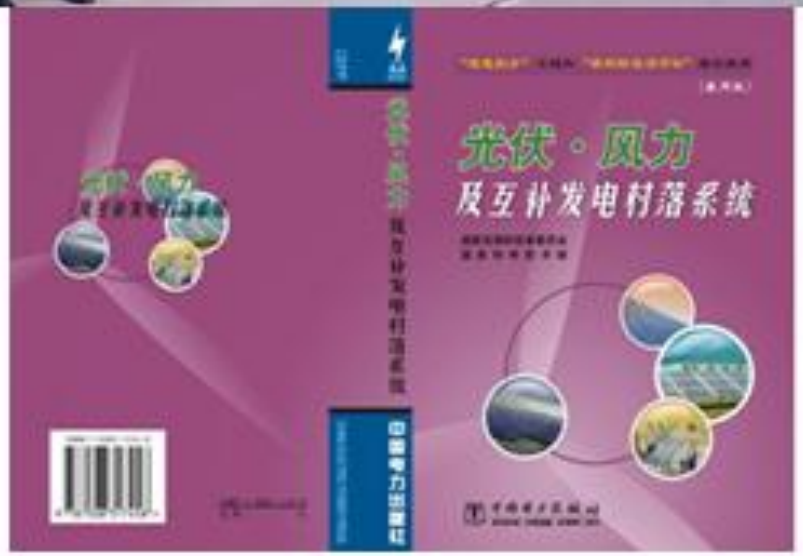
Monthly average wind speed and irradiance, Zongjia (left), Yangkang (right).



Monthly average electric production calculated by HOMER.

Capacity Building





Significance of the Sino-German Cooperation

Projects (KfW & GTZ)

Through implementation of the projects, not only 162 PVP installed for demonstration, the capacity of IEE has been substantially strengthened. The training materials were elaborated , published and used, a training lab. was established and used, 240 local trainers were trained. The strategic agreement with CETTIC was signed which is the concrete base for sustainable RE training facility in China. Many fundamental policy studies contributed to the RE development of China. The achievements in sector of quality control are substantial , the collected data and evaluation reports are valuable for improving system design, policy formulation, management regulations and many other aspects. The positive impacts are being recognized and will be more effective in near future.

Song Dian Sao Xiang Program

- It is the first step towards the large-scale dissemination of renewable energy technologies for decentralized rural electrification launched in 2002 by NDRC.
- The objective of the program is to supply power for the basic needs of the 1,065 not-connected township locations, which are distributed in 12 provinces, by use of small hydropower, PV and PV/wind hybrid systems under consideration of the actual resource-situation of the location.

A 300 kW PV Hybrid System in Gansu Province

A 145 kWp PV Plant in Xinjiang

A 46 kWp PV System in Tibet

Experiences

- It is feasible to electrify remote farmers by RE technologies as the least cost option compared with grid extension and diesel generation.
- Government grant and support are necessary as the costs of RE technologies are still relatively high at present and difficult to be financed by the rural population
- The RE electrification significantly improves living conditions of the local people and provides better opportunity for the social and economical development, although the RE power may only satisfy a limited range of needs such as lighting, communication, and small-scale machinery and equipment.
- The ownership must be cleared from beginning in order to ensure a sustainable operation. However it is still a not-settled issue of the program.
- Capacity building, training and set-up of local service networks are fundamental conditions to guarantee a long term success and sustainable development of the program.

Challenges

- The operating costs of some RE technologies such as PV are still very high on this stage due to the limited lifetime of the batteries, a long term subsidy is actually needed even under the condition of the capital investment being granted. An appropriate cross subsidy scheme with grid power has therefore to be established;
- How to install a commercial approach of a long term O&M system based on necessary subsidy condition?
- How to optimize the function of the RE systems with their limited capacities to deal with increasing requirements of the mini-grid users to achieve good benefits?
- How to extend the lifetime of the battery bank to limit the running costs of PV systems?

Outlook

- Chinese government decides to strengthen the support to rural development. The rural electrification is one of the fundamental elements.
- “Renewable Energy Promotion Law” of China has been issued, the principle of cross-subsidy to rural RE power has been settled.
- PV / wind technologies will continue to play an important role for the electrifying about 1.5 Mio. households in remote areas by 2015
- It is planned to supply 1 Mio. HH during the 11th Five-year Plan (2006-2010)
- Large scale dissemination is going to be initiated.

Significances

- We hope that our experiences are useful for other developing countries to provide electricity to their un-electrified rural population who counts in total for more than 2 billion in the world;
- Our efforts will contribute to the renewable energy development, limitation of emission and sustainable development of human society;
- China offers a huge market for RE industry of the world.

It is really good to have electrical light !

Thanks!

We would express our sincere appreciation to those nations and international organizations that supported us in the field. China welcomes all of you to join us in the next large scale programs!