The Brightness and Township Electrification Program in China

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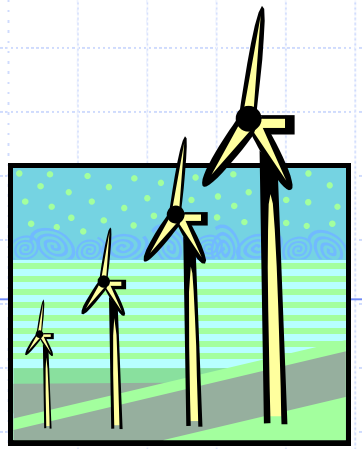


Background

- China is a developing country with about 70% rural population；
- Rural infrastructure is poor, it needs be improved with a great efforts;
- In recent years, more than RMB 280 billion (EURO 28 billion) have been invested for rural grid improvement including extensions.
- However, by the end of 2003, there are still about 29,000 villages with about 7 million rural households (about 3.55% of the total population) which are not connected to the grid.

中华人民共和国地图

黑龙江
黑龙江省
V:13
H:9,100
吉林省
V:4
H:4800
辽宁省
内蒙古自治区
V:2,360
H:249,590
河北省
V:400
H:13,800
北京
北京市
天津
天津市
山西省
V:259
H:112,000
山东省
江苏省
上海市
上海
安徽省
V:50
H:80,500
河南省
V:700
H:577,000
陕西省
V:344
H:289,100
宁夏回族自治区
V:306
H:64,000
甘肃省
V:1,045
H:488,700
新疆维吾尔自治区
塔里木河
V:563
H:316,200
青海省
V:774
H:101,000
西藏自治区
V:5,254
H:289,300
四川省
V:1,499
H:648,300
重庆
重庆市
V:163
H:191,900
湖北省
V:1,050
H:121,500
湖南省
V:518
浙江省
江西省
V:50
H:287,000
福建省
V:350
H:33,000
台湾省
贵州省
V:3,377
H:1,294,000
云南省
V:528
H1,003,000
广西壮族自治区
V:700
H:388,600
广东省
H:50800
香港特别行政区
海南省
V:253
H:160,300
南海诸岛
黄河
长江

Renewable Energy Resources

- Hydropower: about 395 GW,
- Solar energy: about 2400 Bio. Tce /year,
- Wind power: about 1000 GW,
- Biomass: about 840 Mio. Tce /year

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

- The “Brightness Program of China ” was drawn up under the leadership of former State Development Planning Commission during 1996 till 1999
- 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.
- It is planned that 23 million people in remote area shall be electrified by wind and PV technologies till 2010 with an average capacity of 100 W per capita. The total installed capacity will reach 2,300 MW then.

Pilot Projects of the Brightness Program

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 for the projects and installed a executing system

Installations of the Pilot Projects

- About 5500 sets of Wind/PV hybrid home systems, 1 W/D/B village system were installed in Inner Mongolia by end of 2003
- About 10,000 solar home systems and 3 PV mini-grid village systems were installed in Gansu by end of 2002
- 6 PV village systems around 6 kW were installed in Tibet by end of 2001

Program in Ali Prefecture of Tibet

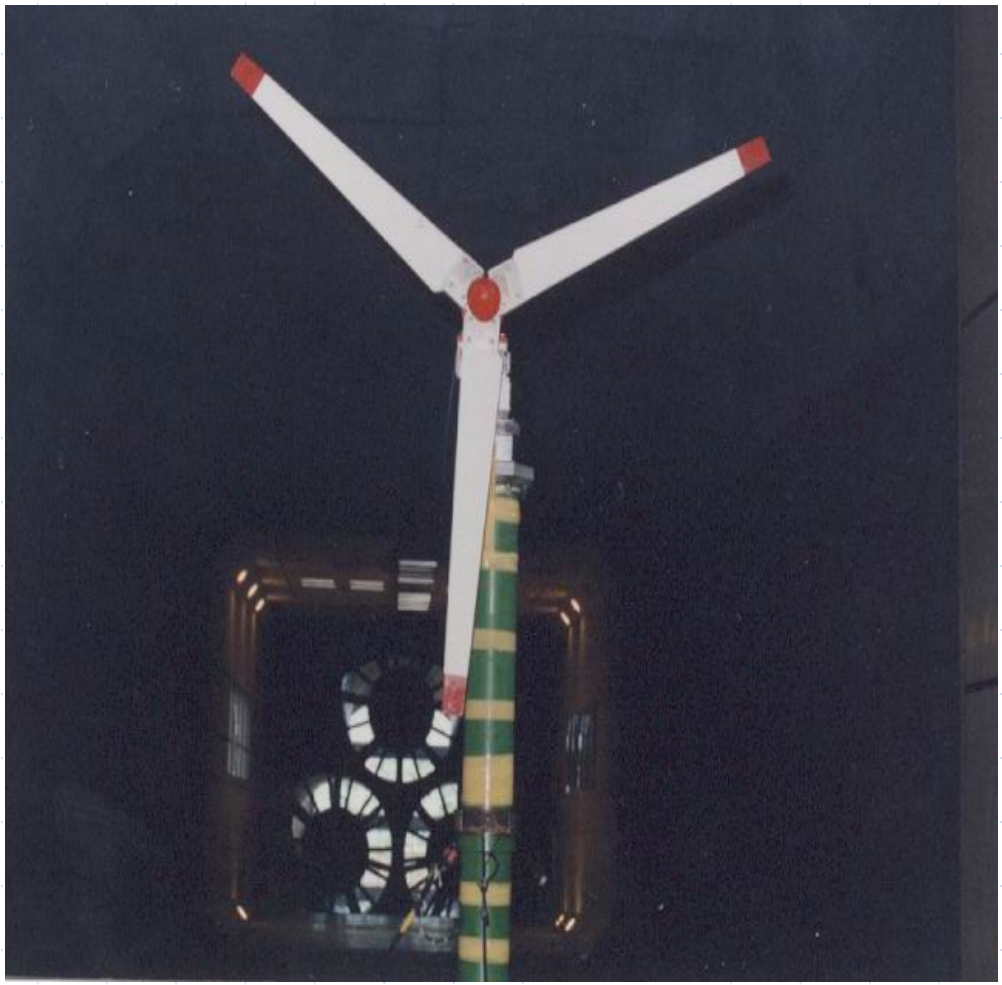
Supported by SDPC, MOST an SP, electrification project of Ali Prefecture, Tibet was implemented in 2001. 688 kW PV were installed. The total investment is about RMB 70 million.

- 11,000 sets of 40W PV home systems
- 30 sets of 5 kW PV village station
- 30 sets of PVP systems
- 10 sets of 400W PV TV antenna receiver

Quality Control

-Wind tunnel test

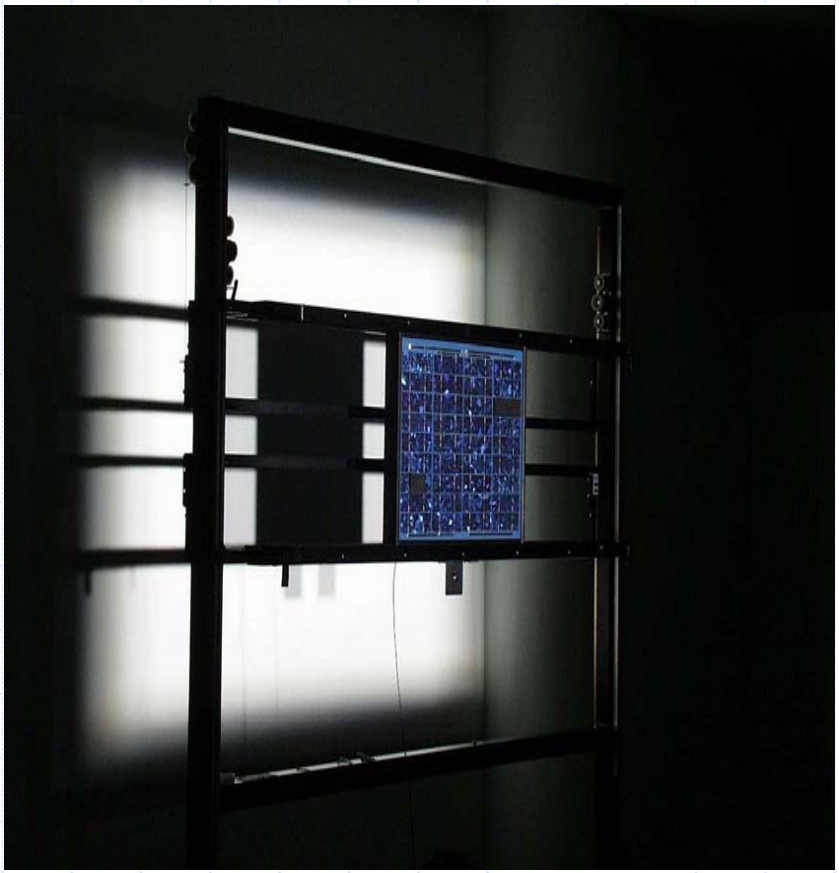
All wind-turbine manufacturer who intents to supply their machine to the Brightness Program has to pass wind tunnel test and certificate.



Field test of wind-turbines

All wind-turbines must be sampled and pass at least 1 year field reliability test

PV test and Certificate



A Wind/PV Hybrid System in IM

A PV village system in Tibet

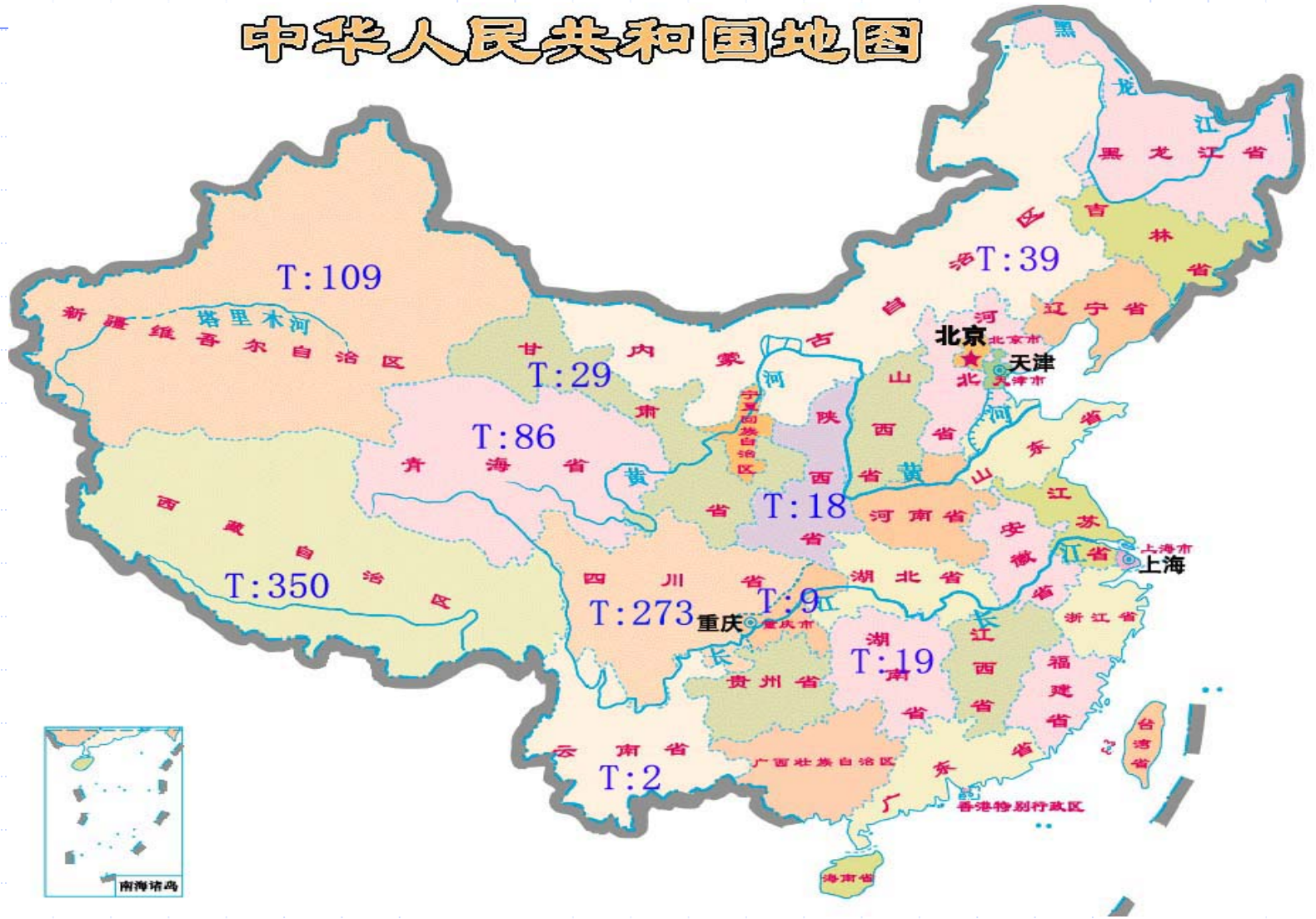
Song Dian Sao Xiang Program (1)

- 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.

Song Dian Dao Xiang (2)

- 688 PV or PV/wind hybrid mini-grid systems with a total capacity of 20 MW will be installed by the end of 2004, most of them have been in operation;
- 377 small hydropower mini-grid systems with a total capacity 264 MW will be installed by the end of 2005;
- The total investment was RMB 4.7 billion;
- All of the townships of China are supplied then;
- More than 1 million people benefits from the program;

Map of the Main Project Provinces



A 300 kW PV Hybrid System in Gansu Province

A 145 kWp PV Plant in Xinjiang

A 46 kWp PV System in Tibet

Support of Germany

- BMFT cooperated with MOST and jointly built up Saihantala Test Field from 1991--1993, advanced measuring systems were donated by Germany, and Chinese engineers were trained. The test field is charring out reliability test of W/PV hybrid systems for the Brightness Program
- GTZ carried out a TA project named “Use of Wind and Solar Energy in Inner Mongolia” in 1990s, 19 W/D/B and PV/D/B village systems were demonstrated.

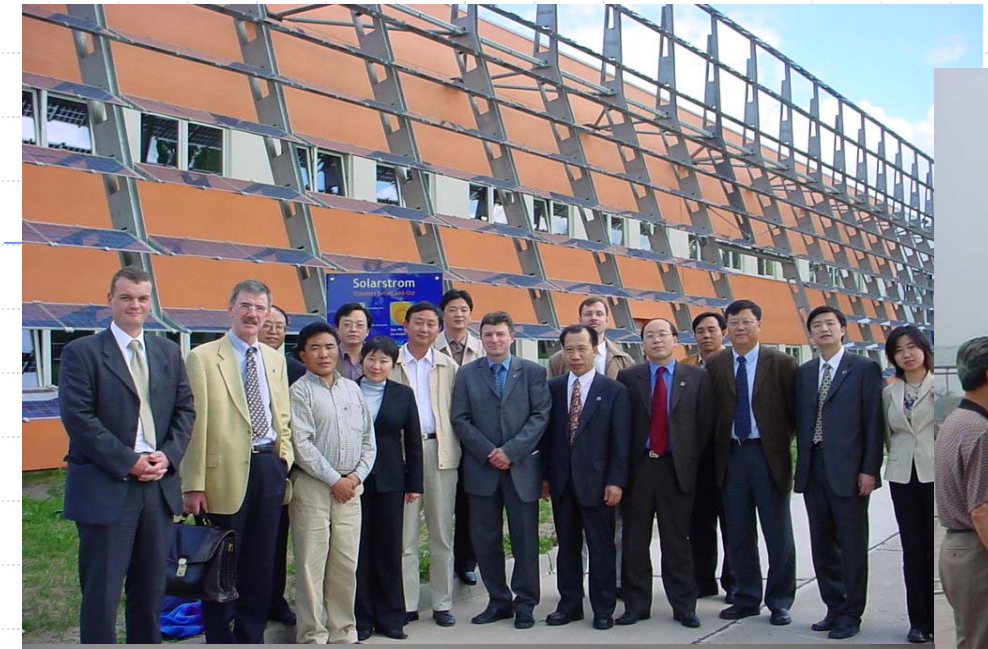
Saihantala Test Field

Supported by BMFT and GTZ, a wind turbine and PV test field was set up in Sainhantala, Inner Mongolia in 1993

Wind/Diesel Power Station--1

New Program of GTZ

- A new program of Improving Development Conditions by use of RE technologies started in 2001, 4 provinces (Qinghai & Yunnan, Gansu, Tibet) were included. Contribution of GTZ is 4.8+1+1.5=7.2 million EURO.
- The main contents are: capacity building, market strategy, quality assurance


Solarstrom

Sino-German Financial Cooperation Program

The representative of German government declared on the “Sino-German Environment 2000 Conference ” that Germany will provide financial support to the Chinese efforts of using RE energies to improve the local energy supply structure in the “West Development Strategic Program”. KfW accepted a proposal of MOF to implement the “ PV Mini-grid Program” in western provinces.

Decided Projects within the Program

Province	No. of Sys	German input (Mio. EURO)	Chinese input (Mio.RMB)	Time	progress
Xinjiang	42	5	24	2002--2005	Installation
Yunnan	53	5	24	2002--2005	Installation
Qinghai	60	8	28	2003--2006	Bidding.
Gansu	60	8	28	2003--2006	sitting
I.M.	80	8	28	2005--2008	proposal

Ceremony of Signature in Qinghai

KfW Appraisal Mission in Gansu

The Workshop Held on April 29th, 2004 in Urmuqi

Experiences

- It is feasible to electrify remote areas 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.
- 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

- “Renewable Energy Promotion Law” is already in the pipeline of the legislation system to establish the legal framework for the further development of renewable energies
- RE technologies will continue to play an important role for the electrification of the remaining 7 Mio. households in remote areas till 2010
- It is planned to install about 1 GWp PV during the 11th Five-year Plan (2006-2010)
- Large scale dissemination is expected.

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 a 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!