

Final Evaluation 2007

**Renewable Energies in Rural Areas,
China**

Brief Report

gtz

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on behalf of: RWI, Essen

This report was compiled by independent external experts. It is solely a reflection of their opinions and assessments.

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Tabular overview

The evaluation mission

Evaluation period	06/2007-11/2007
Evaluating institute/ consulting firm	Rheinisch-Westfälisches Institut für Wirtschaftsfor- schung, Essen
Evaluation team	Andreas Oberheitmann, Ph.D. (RCIEP); Dr. Wang Yan

The project/programme

Title of the project/programme ac- cording to the order	Renewable Energies in Rural Areas, China
Project/programme number	2000.2100.6
Overall term broken down by phases	October 2001 – September 2007
Total costs	EUR 7,101,626 (GTZ), EUR 6,900,000 (IEE, QNERI, HNEC, SERI, CSTC), EUR 31,300,000 (KfW).
Objective of the project/programme	Improve the living and working conditions of the rural population in areas far from the public grid by providing appropriate energy services based upon the environ- mentally sustainable utilization of renewable energy sources.
Lead executing agency	National Development and Reform Commission (NDRC), Ministry of Commerce (MOFCOM)
Implementing organisations	<ol style="list-style-type: none"> 1. GTZ 2. Beijing Corona Science & Technology Co., Ltd. (BCSTC) / Tibet Subsidiary; 3. Gansu Huineng Renewable Energy Technology Development Company Co. Ltd. 4. Qinghai New Energy Research Institution (QNERI) 5. Solar Energy Research Institute of Yunnan Normal University (YSERI) 6. Institute of Electrical Engineering (IEE)
Other participating development organisations	KfW
Target groups	Private small- and medium-sized farm households, nomad ranchers, craftsmen and providers of services such as repair shops, restaurants, tourist hotels or video stores that did not have access to electricity.

The rating

Overall rating	3
Individual rating	Relevance: 1; Effectiveness: 3; Impact: 3; Efficiency: 3; Sustainability: 3

On a scale from 1 (very good, significantly better than expected) to 6 (the project/program is useless, or the situation has deteriorated on balance).

Executive summary

The GTZ-Programme number 2000.2100.6 “Renewable Energies in Rural Areas” (“Programme”) was initiated following requests by NDRC in 1999 for assistance in its efforts to electrify rural off-grid areas using renewable energies. Based on the findings of a workshop in Beijing, which was attended by representatives from Germany and the Chinese provinces of Qinghai and Yunnan in December 2000, a project proposal was submitted to BMZ in March 2001. The total duration of the project was six years, from October 2001 until September 2007. Due to additional financing at the beginning of 2004, the programme was enlarged to Gansu province and the Tibet Autonomous Region (Naqu Prefecture). The funds provided by Germany amounted to EUR 7,101,626, while the Chinese partner contributed about EUR 6,900,000. The programme was launched to support the Chinese Brightness Programme. The national partners are IEE, NDRC and MOFCOM, while the local partners are PDRC and QNERI in Qinghai, DOFCOM and HNEC in Gansu, PDRC and SERI in Yunnan, and DOFCOM and CSTC in Tibet.

The **precursor** of the Programme was the “Brightness Programme,” which the Chinese government initiated in 1996. By the end of 2000, there were about 30 million people distributed across 7 million households in some 29,000 villages without access to electricity in China, 15% of which were located in the lightly populated provinces of Yunnan and Qinghai.. The Brightness Programme aims at providing some 23 million people with electricity from renewable energy sources. These sources are mainly solar PV-stations in decentralized mini-grid village and township systems, and to a lesser extent hybrid-systems (PV/wind) and pico-hydro systems (< 5 kW). Most of the hardware was provided by the Chinese government. As the Brightness Programme had still not reached Yunnan by 2007, KfW installed 154 solar photovoltaic (PV) systems for about 4,600 households or 20,000 people only in Yunnan and Qinghai, and electrified an additional 1400 households (about 6000 people) in Gansu.

The **overall objective** of the GTZ-Programme was to improve the living and working conditions of the rural population in areas far from the public grid by providing appropriate energy services based upon the utilization of renewable energy sources. To assure the sus-

tainability of the investments undertaken by the Brightness- and KfW hardware projects, the GTZ-Programme implemented training and quality assurance measures to support the long-term utilisation of the installations.

The Programme designed three **components** to achieve its objectives: institutional advice, dissemination strategies, and technical quality improvement. GTZ complements hardware projects by supporting the training of about 300 local solar PV operators and the establishment of rural energy service providers in Qinghai, Gansu, Yunnan, and Tibet.

The **conceptual design** of the Programme aimed for consistency with the different development goals of the partner country in addressing the issue of electrification of remote rural areas and poverty reduction. It was **relevant** being consistent with the MDGs and the German Government's development-policy orientation towards poverty reduction, environmental policy and sustainable use of natural resources. The effects of the Programme were measurable and verifiable, as direct input-output relations could be drawn between the training course activities and the stable running of the PV systems. The Programme placed considerable emphasis on impacts: from the beginning, a socio-economic impact monitoring system was set up on target group level. Although the objectives of the Programme were ambitious, they have to be seen in connection with the Brightness- and the KfW-Programme. In this regard, it bears noting that the primary employment effects of the delivery of electricity are mainly due to the indirect effects of the solar PV stations by the Brightness- and KfW-Programme, and not through the direct effects of the training of the operators by GTZ. The World Bank and other donors worked in fields that complemented the programme, such as training and accreditation of a PV laboratory.

The **overall objective** of the Programme to improve the living and working conditions of the rural population has been achieved, as could be evidenced by the fulfilment of objectively verifiable indicators such as:

- at least 80% of the roughly 500 women in the Programme areas state that their working conditions have improved because of better energy services;
- at least 60% of about 1000 school children state that two years after the electrification, their learning conditions at home and at school have improved;
- in the Programme areas about 400-500 new jobs were created through installation and maintenance of the renewable systems and the productive use of electricity.

The **effectiveness** of the Programme can also be measured against the **objectives of the three components** developed in the project design: (a) Component 1 of the Programme aimed at improving the overall political and institutional framework conditions for an efficient promotion of renewable energy technologies. The indicator of Component 1 was fulfilled on the national level in terms of the adoption of the new Renewable Energy Law and the Na-

tional 11th 5-Year-Plan for PV Development, to which the Programme contributed by providing advisory services to policy makers. On the provincial level, government officials gained a better understanding about the management of renewable energy technologies through training and institutional advice. (b) Component 2 aimed at developing markets for renewable energy systems. The Programme reached this objective. In each of the four provinces, about 10,000 households are receiving electricity from renewable energy sources, which has created demand for private RE distributors. With the hardware components being provided by the Brightness- and the KfW-programme, the GTZ-programme successfully promoted market transparency, improved the quality of components, facilitated the acquisition of RE-systems, supported the set-up of local installation and maintenance networks and contributed to public awareness. (c) Component 3 aims at a sustainable quality improvement of the offered techniques for the utilization of renewable energies. The indicated objective was reached, as more than 80% of the energy users were satisfied with the installed devices. In contrast, the experiences with pico-hydro are mostly negative.

The following **direct results** can be verified and are documented in the various impact monitoring reports: (a) Illumination is the biggest benefit of improved energy services on the living conditions of the target groups. Home improvement is also realised by using electrical appliances such as rice cookers. There are also positive results as regards education, as the learning conditions at home and at schools had been improved, e.g. through the utilisation of computers. Based on this, the intention to migrate from the surveyed villages has decreased. (b) Direct Environmental results are also positive: consumption of and expenditures for dry cell batteries decreased from 76% to 25%. (c) Health improvements were realised as the utilisation of eye-hurting resin candles decreased by approximately 90%, from formerly 75% to 7% in 2005. Provided with electricity, health centres now can provide their services throughout the night.

The Programme contributed plausibly to achieving the intended **overarching indirect results**. Poverty has been reduced via the creation of job opportunities, both directly from employment of the operators as well as indirectly by the provision of electricity. The impacts on income however, vary in different areas due to different local conditions. In Kesheng and Duseng of Qinghai Province, for instance, people are relatively well-off and there is a higher demand for electricity in new restaurants and shops. By contrast, in Shangnanyao of Yunnan Province, only 50% of the generated electricity is consumed. The Programme did not differentiate according to ethnic groups, which may have been warranted in Yunnan due to the ethnic mix of the local population. In designing the Programme, men and women were equally considered. Women, who are in most cases responsible for the provision of traditional energy sources, tend to have busier days than men. Electric appliances facilitate tedi-

ous house chores and thus bring about more free time to women. In this sense, women benefited more from the improved energy services than men.

Efficiency is evaluated by looking at the extent to which the resources invested in the programme are appropriate compared to the results achieved, especially regarding cost- and time efficiency: The German approach of sending experts who serve over long durations is cost-efficient, as the establishment of good relationships with the local partners generally assures a smooth implementation of the programme. By teaming up with other donors, the Programme avoided a duplication of efforts and costs on similar activities. Time-use appeared to be very efficient in Qinghai, while weaker in Yunnan. The good performance in Qinghai was mainly due to the following reasons: (i) successful coordination of local GTZ staff; (ii) timely reply of local partners in communication with GTZ; (iii) sufficient allocation of human resources; (iv) active local partners in the private sector; (v) no financial constraints. In Yunnan, these conditions were only partially fulfilled. The fact that SERI is a public university institute with little entrepreneurial capacities hindered a more time-efficient management of the Programme. The communication problems in Yunnan mentioned in the April e-VAL report are, to a large extent, due to deficits in the institutional setting of the project. Specifically, the project was burdened by: i) loose agreement on financial obligations; ii) disputes on cost-sharing issues, which resulted in poor personal relationships between people implementing the project and worsened future communication; iii) lack of human resources within the partner institution; vi) frequent changes of local GTZ staff; and v) budget constraints for local partners.

We observed several issues during our field trip that would endanger the **sustainability** of the rural electrification unless solved: First, it is not clear as to who owns the facility and who should manage the system. Therefore, it remains a pending issue as to who is to cover the future cost for maintenance given that the obligation of three years' free maintenance by SERI and QBEC under the Brightness Programme already expired. Second, it is unclear who should be responsible for the replacement of the batteries after an expected technical life span of 4 to 5 years and for covering the future cost of maintenance. Finally, the tariff in Qinghai is three times higher than the average tariff for thermal power. Some villagers cannot afford this high tariff. Due to low salary and uncertainty of their job, some operators are leaving for other jobs. All these issues, however, are to be solved at the central government level for the Brightness Programme, rather than on a single project level. Hence, the sustainability of the programme largely depends on central political decisions.

The **overall rating** for the Programme is 3, i.e. a "satisfactory rating, falling short of expectations but with positive results dominant". *Relevance* is rated 1, a "very good rating, significantly better than expected," as the Programme is in line with the MDGs and one of the country's most prominent development goals, rural electrification. *Effectiveness* is rated as 3,

as all three components had been implemented successfully, except for the negative result of Pico-hydro activities and some unfulfilled planned activities. *Impact* is rated 3, as the input of the Programme, in combination with the hardware input from KfW and Chinese government, had positive impacts on living conditions, health, education and environment. Impact on income is limited in some places. *Efficiency* is rated 3, as it appears cost-effective in terms of avoiding duplication of efforts and costs on similar activities by teaming up with other donors. It appears time-efficient in Qinghai, Gansu and Tibet but not efficient in Yunnan due to institutional issues. *Sustainability* is rated 3, as it is only partly achieved in terms of established installation and maintenance networks that guarantee the normal functioning of the RE systems over the medium-term. However, long-term issues of financial sustainability issues (ownership and management) have to be solved by the Chinese government far beyond this programme.

The most important recommendations for the remaining time and similar future projects can be summarised as:

- a. Analysis of technical opportunities for the feed-in into the grid as the extension of the grid may become feasible in the future (as it happened in Gansu).
- b. Discussions at central government level towards a solution of the financial sustainability issues (cross-subsidization from urban to rural consumers etc.).
- c. Detailed studies of the hypothesis that electrification reduces migration as a result of improved individual living standards as well as positive macro-economic effects such as better conditions in hospitals and schools.
- d. Feasibility studies based on local conditions before implementation of any activity such as the installation of pico-hydro.