Household-size Wind Turbines, Sri Lanka

Themes

★ Renewable energy
⁂ Innovative technology applications
❖ Financing mechanisms and private sector involvement
❖ Technical capacity development
✷ Poverty alleviation (MDG 1)

PROJECT DATA

Name: Small wind energy systems for villages in Sri Lanka
Grantee: Manawa Sampath Saha Parisara Surakum Sanvidanaya (community group); Intermediate Technology Development Group-South Asia
Location: Hambantota district, southern province of Sri Lanka, with planned clusters in southern, eastern and north-western provinces
SGP Contribution: $10,378 (September 2000);$39,546.00 (September 2002)
Start Date: September 2000

ENERGY OVERVIEW

Energy Resource: wind
Technology: small wind system (single household units)
Application: battery charging, lighting
Sector: residential, public spaces (related to education), and income generation (agro-processing and battery charging)
Size of turbines: 250W
Per unit cost: $550, including a 1-year guarantee
Households Served: 6 (pilot phase)

BACKGROUND

Approximately 80% of Sri Lanka's population lives in rural areas.The population is widely distributed across about 25,000 villages with an average population of 500. Currently, about 55% of Sri Lankan households have access to electricity, mostly in the Western Province. The eight remaining provinces, which are predominantly rural, have much lower rates of electrification. In un-electrified villages, automobile batteries are often the primary source of power for radios and television sets.These must be transported over long distances to charging centers. Kerosene is used for lighting. Although Sri Lanka's annual grid extension rate is relatively high (around 3%), many remote villages will not receive electric power for many years to come. Wind conditions in Sri Lanka are variable, but the Hambantota district on the southwestern coast, where this project is located,offers good conditions for wind power, as do the eastern and north-western provinces. Under the right conditions, wind power offers good power output and quality compared to solar home systems.

PROJECT DESCRIPTION

Overview

This project seeks to demonstrate the potential for small wind systems to provide battery-charging services to rural areas in Sri Lanka, thereby improving local livelihoods. Technical and institutional barriers to the local production of small wind systems, as well as financial barriers to their purchase, are being addressed through this project.

Local manufacturers producing a small wind system, using local materials (Hambantota district,Sri Lanka).

Implementation

The grantee, ITDG-South Asia, has coordinated with other local NGOs, a local manufacturer, an engineering consultant in the United Kingdom, and local government entities. Project activities have included:assessing local wind conditions;studying the potential local market for small wind systems and estimating individual willingness to pay for the systems;and designing a small wind system that meets local needs and conditions and can be constructed using local materials. ITDG has estimated the willingness to pay in this region at Rs. 3000-5000 for an initial investment and Rs. 500 per month thereafter. However, to make the upfront investment villagers would need loans covering approximately 60% of the capital cost. ITDG estimates the size of the market to be over 60,000 households in un-electrified fishing villages.

Technology

The small wind system that has been designed for this potential market in Sri Lanka is approximately 12 meters tall, produces 250W at a rated wind speed of 8 meters per second, costs approximately $550, and should last about 20 years. ITDG hopes to bring the cost down to $400. It is designed to meet the energy needs of an individual household, powering compact fluorescent light bulbs, a radio, and/or a television. At peak wind times there is excess power that can be used to sell battery-charging services to others. This cost is comparable with, and slightly cheaper than, a solar home system in Sri Lanka, and current battery charging costs. A diesel generator-powered micro-grid is still cheaper, but would require community mobilization, whereas the wind power option is designed for individual ownership.

ITDG trained small manufacturers to produce this small wind system using local materials. In September 2002,SGP provided a second grant related to this effort to ITDG,which is working with local manufacturers to produce an additional 18 small-scale turbines. The manufacturers sell the systems to local entrepreneurs, who distribute them in three chosen pilot sites. GIDES, another local NGO, helped choose the pilot sites, and established a revolving credit scheme through several local self-help societies. GIDES serves as a link between local entrepreneurs who purchase the systems and the manufacturers.

Environmental Benefits

Global: Wind power is replacing kerosene use for lighting,which reduces greenhouse gas emissions. So far, 15 households have the wind systems.

Local: Small wind systems reduce air pollution from kerosene use, and do not impose any significant local environmental problems. Although large wind systems generate noise that drives away birds, these household-size wind systems do not generate such noise.

Local Livelihood Benefits

Health: Reduced use of kerosene improves indoor air quality, which greatly reduces the risk of respiratory and eye problems, especially for women and children.

Poverty alleviation: Families that have purchased the wind systems now sell battery-charging services to neighbors. In addition, the previous use of dry cell batteries for torches, necessary at night to avoid attacks from wild animals, has been decreased.These expensive disposable dry cell batteries are no longer necessary, because villagers can now use a rechargeable motorcycle battery attached to the end of the torch. In this way, villagers also save money as a result of the project.

Education: Due to better lighting at night, children can study in the evenings more effectively.

Reduced drudgery: Villagers used to travel over two hours to recharge automobile batteries. Now this is unnecessary, not only for those who have wind systems, but also for those living nearby who can now recharge their batteries locally.

Improved local opportunities: Improved access to energy has led to lifestyle changes in the villages. Now, families without wind turbines visit the homes of those with the turbines to watch television and listen to the radio at night.Thus, the project has improved the villagers'ability to obtain battery charging services and information locally, instead of traveling to the nearest town.

Safety: Elephants often cause damage to houses in rural areas. However, when lights are lit in the outskirts of a village, elephants are reluctant to go nearer to the houses.

National Benefits

New method of expanding electricity access:Sri Lanka now has access to a new way to expand access to electricity to its rural population. Small wind system technology did not previously exist in the country, but it has the potential to meet the needs of many rural villages. There have been discussions with the Renewable Energy Ministry to incorporate small wind systems into the government's rural electrification plan in future years.

Capacity Development

ITDG develops the capacity of four distinct groups that are directly involved with the wind systems.

- Users of the systems learn operation and maintenance.
- Technicians in the localities are also trained to service and repair the systems.
- Manufacturers are taught how to fabricate the wind systems.
- Technology designers learn new technologies and improvements to the existing systems. (These activities are not directly funded by SGP.)
- Training is continuing on a rotating basis. Six manufacturers were trained in 2001, of whom only two are active now. Another training course for manufacturers is planned for February 2004, and a training program for designers is scheduled for December 2003.

Partners

NGOs: ITDG provided the technical expertise for the project, including the participation of an engineer from the United Kingdom.GIDES,a local development NGO, helped make contacts in the villages and established a revolving credit scheme so that villagers can purchase the systems. A presentation about the project was made to a consortium of NGOs in the Hambantota district, which the project leaders hope will be involved in future commercial applications of the wind systems.

Government: The project has made connections with the 3MW wind project implemented by the Ceylon Electricity Board to share experiences.

Industry: The project is closely linked with several manufacturers who have been trained to build the small wind systems. Their participation was essential to ensure the local production of the technology.

Funders: Funding was received from SGP and the United Kingdom's Department for International Development, as well as local sources. Future funding is being sought from the Sri Lankan government.

LESSONS LEARNED

Environmental Management

The research on wind characteristics in Sri Lanka demonstrated the potential applicability of small-scale wind power, and market research has demonstrated the existence of sufficient willingness to pay for the system,if there is adequate access to credit.

Barrier Removal

Technical: The project has successfully reduced barriers to accessing wind power via small-scale systems in Sri Lanka. Key

elements of the project that contributed to this were their study of wind characteristics, which was carried out with the help of the Ceylon Electricity Board, the close study of local energy needs and willingness to pay, and the design of a wind system that is specially adapted to local conditions.The training and involvement of local manufacturers throughout the process was essential,since otherwise the project would not be sustainable or replicable.This training and information exchange process is still on-going. For example, ITDG has planned a workshop for November 2003 for the users of the wind systems to discuss their problems and exchange their experiences. All users of small wind systems, manufacturers, technicians and wind energy experts are to take part.This enables stakeholders to understand on-the-ground realities,and to develop ways to improve the equipment and services.

Financial: The project's use of revolving credit schemes helped reduce financial barriers to the purchase of the wind systems. The key step here was to involve GIDES,a development group with good local contacts in villages. GIDES was able to build credit resources using local institutions - the village self-help societies.

Institutional: A key institutional barrier was the link between manufacturers and the potential market. Again, GIDES played an important role here, finding local individuals who would be good local entrepreneurs to distribute the wind systems after purchasing them from the manufacturers.

Scaling Up

Several elements of ITDG's strategy were key to facilitating the scaling up of the project:

- *Good relationships with government entities:*. ITDG worked with the Ministry of Power and Energy, the Ceylon Electricity Board,and local government entities.As a result,the Ministry of Power and Energy can help integrate the wind systems into the government's rural electrification plans, and the Ceylon Electricity Board could use its resources and technical capacity to study wind characteristics to get a sense of the possible areas in which small scale wind systems would be viable.
- *Training local manufacturers:* This key element of the project enables the expansion of the project through the market. In order to convince manufacturers to be involved, however, studies of potential market size, including willingness to pay, are critical. In addition, links to customers, as provides by GIDES, are often necessary to help establish the market.
- *Publicity:* The government broadcasting service interviewed a local beneficiary of the project,thereby helping to spread the word about small-scale wind systems in the South Province of Sri Lanka. Such publicity efforts go hand-in-hand with efforts to establish local production capacity and increase potential buyers.
- *Demonstration of the units:* The potential for use of small wind systems is not known by all communities. In addition to the awareness creation programs, demonstration units are vital to scaling up. ITDG has taken steps to develop visuals describing the technology and applications of the wind systems suitable for demonstration purposes.In addition, ITDG has developed a manual and poster for the users of wind systems on operation and maintenance aspects.

SOURCES CONSULTED

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