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An Innovative Approach to Overcome Financial Barrier for Meeting Lighting Needs of Rural Markets by Solar Energy

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Abstract

Thousands of rural markets in Bangladesh are deprived of electricity. Rural markets without electricity do not attract merchants and the farmers are to sell their product at comparatively low price. This results in wastage of huge amount of unsold products leading to great loss to the farmers. An alternative option may be connection of rural markets by solar energy for meeting their lighting needs. This paper deals with the experience of CMES (Centre for Mass Education in Science), a national NGO in Bangladesh, on solar energy based lighting in rural markets.

Key Words: *Solar energy, rural markets, financial mechanism, tariff.*

Introduction

Electricity is considered to be one of the essential inputs for quality of life. As a matter of fact, per capita consumption of electricity is taken as an indicator of the standard of living in a country or a community.

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Only 30% of the population get grid electricity in Bangladesh (Ibrahim et al., 2000). There is no possibility of connecting all homes of remote villages and rural markets to the grid system in near future. The power system in Bangladesh mostly depends on fossil fuels, which are depleting fast. At this stage, electrification by solar energy has emerged as a viable technical option for meeting lighting and other small energy needs of millions of people living in isolated areas of Bangladesh. Solar energy can also bring considerable improvement in rural life through income generation and thus alleviating poverty. In addition, it can bring multiple positive results in terms of women's welfare, children's education, employment and income generation. But installation of solar system requires high initial cost which is really a burden for the rural people. So, an alternative financial mechanism is required to make the program successful.

Literature Review

The first Photovoltaic (PV) based rural electrification project in Bangladesh was initiated with the financial support of France, with a total installed capacity of 62 KWp, of which 29.414 KWp was for BCS (Battery Charge Station) and the rest by Solar Home System (SHS) (Dipal et al., 2001).

Hiranvarondon et al. (1999) suggested that the dissemination of PV requires an implementation strategy that should initially identify the type of the system. Government could accelerate the dissemination by removing barriers to market expansion, by removing excessive duties and taxes, and by removing subsidies on products which compete with Solar PV. They also listed the role of key players such as national governments, donor agencies, educational and research institutions and private sectors/ NGOs in the promotion of dissemination of PV systems in developing countries.

Cabraal et al. (2000) noted that successful PV market development for rural electrification requires the removal of financial and institutional barriers. The other major issues to be considered are the high initial costs, establishment of responsiveness and sustainable infrastructure, and ensuring quality products and services. These findings were based on their study on Indonesia, Sri Lanka, the Philippines, and the Dominican Republic.

Nieuwenhout et al. (2000), studying the use of PV systems in households in developing countries, notes that there is no single best organizational model to promote dissemination of SHS. They point out that dissemination depends on institutional, legal, socio-economic and cultural conditions in the country.

These studies illustrate that the factors contributing to the successful promotion of PV based rural electrification are:

- Suitable financing schemes to address the problem of high initial cost.
- Means of providing regular and proper maintenance and availability of spare parts
- Choice of available configurations to suit the consumers' needs and affordability.

Methodology

This paper is based on the experience of CMES on implementation of the solar energy system in rural markets under the project "Renewable Energy Technologies in Asia (RETs in Asia): A Regional Research and Dissemination Program", which is funded by Swedish International Development Cooperation Agency (SIDA) and coordinated by the Asian Institute of Technology (AIT), Thailand. Under this pilot project, CMES has already installed solar systems in eleven different rural markets for meeting their lighting needs (Asian Institute of Technology, 2004). These experiences have been gathered through in-depth interview of CMES personnel.

Secondary data has also been used for this study. Final Research Report of "RETs in Asia Project", Technology Fact Sheets, Monitoring Reports, Barrier Studies, Case Studies etc. prepared by CMES have also been gathered and properly analyzed.

Electrification of Rural Markets by Solar Energy

About 80% of the total population of Bangladesh live in rural areas. One of the main economical activities of rural Bangladesh is based on rural markets called "Haat" or "Bazaar". Farmers from long distance come to the "Haat" with their products to sell to merchants, who usually come from cities or major towns. The trading continues till evening. Kerosene lamps called "Kupi" and "Hurricane" are the major appliances to meet the lighting needs of the shops of a "Haat". Some shops use more expensive mantle lamps called "Hazzak" to obtain brighter light. Diesel generators supply electricity in some rural markets. All of these alternatives are hazardous for environment (Ahammed, 2004).

In the concept of electrification of rural markets by solar energy, a number of solar modules are mounted at one location, preferably in the middle of the load (light, TV etc.) distribution. The client shops are then connected to the system by

keeping the cable as short as possible. A local technician is trained for operation of the system, which is also capable of doing minor trouble shooting while the major ones are taken care of by Engineers and PV Experts of CMES.

The first solar energy based lighting was established in Manikganj Bazaar of Dinajpur district, 400 km. north of Dhaka. There were about 30 shops in the market. Lighting needs of the shops were met by "Kupi". Under the project of "RETs in Asia", CMES explained the concept of Solar Energy based electrification system to the shop owners and the Bazaar Management Committee (BMC). The operation, benefits and maintenance procedure were explained to them. They welcomed the idea. A daily tariff of Tk. 5 with no initial deposit was agreed upon. A contract was then signed with BMC and the shop owners by CMES. After that, solar energy based lighting was initiated on 28 September 1999 in Manikganj Bazaar. Six solar modules of 50 Wp each, divided into two groups, were installed in two suitable locations of the bazaar. The batteries and controllers accompanying each group were placed close to the respective solar panel.

Equipment installed:

- Six solar modules (50 Wp each)
- Six batteries (12V, 100 AH each)
- Six charge controllers
- 24 FL lights as appliances.

The users of the systems were:

- Grocery shop
- Local restaurant
- Tea stall
- Barber shop
- Village doctors' chamber.

Tariff Collection

Electrification of rural markets by solar energy may be a suitable model for implementation in rural areas where there is market for lighting needs. One of the major problems for implementing solar system is its high initial cost, considering the prevailing socio-economic condition of the rural people. But in the concept of CMES Model, the shop owners have to pay only Tk.5 tariff per night for the connection with one light. A technician, locally recruited and trained, is responsible for tariff collection and management. The simple pay back period for total investments including maintenance and spares cost is just 5 years (Ibrahim

et al., 2000). So, after 5 years another solar energy system can easily be installed in another market with the amount of tariff collection in the first 5 years.

Users' Feedback

Feedbacks from users indicate that-

- High user satisfaction with having a local and full time technician.
- The service is good and amount of light is sufficient.
- One tea stall owner noted that his income has significantly increased.
- One grocery shop owner observed that more customers were visiting his shop.
- Solar PV system is free from hazards of smoke.

The attraction of the approach to the users is that they are free from the responsibility of maintaining the system. Involvement of local community in management avoids the risk of damage of the whole system.

Prospect for Rural Electrification by Solar Energy

Solar energy based electrification in Manikganj Bazaar is a model of rural market electrification. Many visitors came to see the system and discussed its benefits to the users. There was interest from many other markets for electrification. In order to fulfill their demand, CMES has already installed solar systems in eleven different rural markets for meeting lighting needs.

Electrification of rural markets by solar energy is not only technically suitable but also financially viable if a soft loan can be available. Simple pay back period of five years may be reasonable enough to attract investors.

Conclusion

Providing electricity for meeting lighting needs of rural markets can bring several positive, impacts, including improvement of quality of life and increasing in income and employment opportunities. So, electrification of rural markets by solar energy is a model of demonstration. This approach could equally be applicable to other developing countries with similar socio-economic condition.

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