

An Innovative Financing Mechanism: Creating Access to Renewable Energy for Rural People of Bangladesh

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Abstract

Bangladesh has shortage of electricity but has abundance of sunshine. The grid electricity could not reach many areas due to remoteness and inaccessibility. In many rural areas energy needs are met by biomass for cooking and kerosene for lighting purpose. Solar PV has to some extent has provided light in rural Bangladesh. The rural energy access which has immense social benefits has sustained due to vibrant financial management and acceptability by rural people. The financing mechanism and the infrastructure which are the two major factors for the sustainability of rural energy access are discussed in this paper. Our hope that the lesson learned from Bangladesh will be helpful to other developing countries specifically African countries. However, the socio economic condition of this continent needs to be studied in-depth to tailor a successful and economically viable model for rural energy access.

1.0 Introduction

Bangladesh, a developing country of south-east Asia with large population, has agricultural economy. The gas is the main fuel for electricity generation which is depleting very quickly. In recent days government has implemented high cost imported liquid fuel based electricity generation as a short time measure. At present the peak power demand [1] in Bangladesh is about 8500 MW and the generation is less than 6300 MW. Bangladesh has area of 147,570 sq. km and about 152 million population i.e. about 28 million house hold. Nearly 75 percent population lives in rural areas and 30 percent has access to electricity. Most of the power is supplied to urban areas. Per capita power consumption is only 292 kWh. Fifteen million household [2] of off-grid areas (total 17 million households) live in rural areas.

The country is situated between 20.30-26.38° north latitude and 88.04 -92.44° east longitude, with average solar radiation between 4 and 5 kWh/m²/day, is ideal location for solar energy harvesting. Solar Home System in many countries with abundant sunshine had not been successful due to various reasons, like bad quality equipments and system, specifically the batteries, and the inability to repay the loan or monthly installment. For example, in some parts of Africa, it is difficult to do SHS maintenance due to remoteness of the area and bad road system. Government policy like the imposition of customs and tax is also a hindrance for the development of SHS [3]. Solar Home System program of Bangladesh with micro financing for rural electrification has gained worldwide recognition. In Bangladesh strong micro financing system and good after sales services and good loan recovery system are some of the reasons for the success and sustainability of rural electrification by solar PV. A Renewable Energy Policy of a government is very important for success of rural energy access. Such policy of Bangladesh [4] allows 0% percent tariff on RE products.

2.0 History of Solar Home System in Bangladesh

The main application of PV technology in rural Bangladesh is the SHS. The use of SHS for rural off-grid electrification has become very popular during the last years. Following the initial experience [5] from a French-funded pilot project in Narsindi implemented by the Rural Electrification Board (REB) in 1997, several initiatives for the large-scale promotion of the SHS technology were launched. Through REB's follow-up projects 'Diffusion of Renewable Energy Technologies' and "Rural Electrification through Solar Energy" about 13,000 SHS were disseminated using the 'fee for service' model.

Encouraged by the success of the REB pilot project in Narsindi, NGOs soon went ahead with their own SHS dissemination programs.

First commercial activities with SHSs were initiated by Grameen Shakti (GS) in 1997 following 'cash sale' and 'credit sale' approaches.

A new phase of SHS promotion started in 2002 with the implementation of the 'Rural Electrification and Renewable Energy Development Project' (REREDP), which is jointly financed by the International Development Association (IDA), Global Environment Facility (GEF), German KfW and GIZ over 2002 to 2009.

Infrastructure Development Company Limited (IDCOL) was established on 1997 by the Government of Bangladesh (GOB). The Company was licensed by Bangladesh Bank as a non-bank financial institution (NBFI) on 1998. Since its inception, IDCOL is playing a major role in bridging the financing gap for developing medium and large-scale infrastructure and renewable energy projects in Bangladesh. The company now stands as the market leader in private sector energy and infrastructure financing in Bangladesh.

IDCOL supports to disseminate SHSs through 47 partner organizations (POs), namely experienced NGOs such as Grameen Shakti or the Bangladesh Rural Advancement Committee (BRAC), Rural Services Foundation (RSF), SolarEn, (together disseminating about 90% of the overall number of SHSs) as well as a number of smaller NGOs and private enterprises.

The POs sell the SHSs to households and small businesses mostly through 'cash sale' and micro credit schemes following to the Grameen Shakti. IDCOL provides refinancing facilities to the POs and channels grants to reduce the cost of the systems therewith making them more affordable to rural customers.

Furthermore, parts of the grants are used to support the institutional development of the POs. Besides giving financial support, IDCOL sets technical specifications for the solar equipment, provides technical, logistic, promotional, and training assistance to the POs and monitors the PO's performance.

IDCOL's initial target was to disseminate 50,000 SHSs by the end of June 2008. However, due to unexpected high SHS sales this target had already been achieved in September 2005, three years ahead of schedule and US\$ 2 million below estimated project costs. As the popularity of SHSs continues, IDCOL had set a new target of 200,000 SHSs to be sold by 2009. With more than 2.3 million SHSs sold by October 2013, the IDCOL program is one of the fastest growing renewable energy programs in the world.

3.0 Different Financial Model for Rural Energy Access

A model [6] that has widely replicated mainly in Latin America and Africa, but with substantially less total outreach than the many Grameen Bank replications is the "**Village Bank model**". The model involves an implementing agency that establishes individual village banks with about thirty to fifty members and provides "external" capital for onward financing to individual members which are repaid at weekly intervals over four months, at which time the village bank returns the principal with interest/profits to the implementing agency. This model has been very successfully implemented in Jabal al-Hoss, Syria. A new experiment by FINCA in Afghanistan also seeks to implement this model.

Another type of MF model is a “**Credit Union (CU)**” model. A CU is based on the concept of mutuality. It is in the nature of non-profit financial cooperative owned and controlled by its members. CUs, mobilize savings, provide loans for productive and provident purposes and have memberships, which are generally based on some common bond. CUs are quite popular in Asia, notably in Sri Lanka.

A third model originating in India is based on “**Self-Help Groups (SHGs)**”. Each SHG is formed with about ten-fifteen members who are relatively homogeneous in terms of income. An SHG essentially pools together its members' savings and uses it for lending. The terms and conditions of loans differ among SHGs, depending on the democratic decisions of members. The SHG model is a good platform for combining microfinance with other developmental activities.

4.0 Grameen Micro Credit Model

Although the operating cost is quite low, a handsome initial investment is required for installation of renewable energy sources like Solar Home System (SHS). Rural Electrification being targeted for mainly the rural and poor people, a pragmatic financial strategy is essential for ensuring penetration of these technologies which must suit their purchasing capacity and the need. For financing any project we need loan. From the bank or financing institution side it will require that the borrower is able to pay back the money given as loan with some interest. To be sure about this, the bank will require guarantee in the form of collateral. That means some kind of ownership of property or valuables have to be transferred in the name of the Bank. In banking language “Poores are not Bankable”, because he is poor, he does not have anything to mortgage. About 22% of the population in Asia Pacific region lives on \$ 1 per day.

So how to overcome the problem of these unbankable poor? Prof. Mohammad Yunus, the 2006 Noble Peace prizewinner thinks in a different way. He thinks we can put word “POOR” to a museum and everybody should be able to live a life with all the basic amenities. His brainchild is the micro credit. Micro-credit gives to people loan without any collateral or any guarantee; only guarantee is the trust and good faith which is the philosophy of Grameen Bank. And he has proved that loan recovery rate is over 99%.

Grameen Shakti, ‘Gram’ means village and ‘Shakti’ means energy in Bangla language so it deals with rural energy. Grameen Shakti (GS), a member of the Grameen family, started its journey in 1996, as a not for profit company has played a pioneering role in successful initiation and implementation of renewable energy programs in Bangladesh. Specially its solar PV program is internationally recognized and won many international prestigious awards. GS has evolved a financial strategy that is appropriate and effective for Bangladesh. GS was started by the Grameen Bank’s (GB) best managers with a clear goal to create a sustainable and profitable business. GB’s experience with micro-credit has contributed to the proper designing [7]-[8] of GS programs. GS is one of the first companies to which have developed successfully a financial mechanism to promote solar home systems in rural areas on commercial basis. GS innovative financial model has made it easier for its clients to pay for the systems and was successful in reducing customer down payments and extending repayment periods over the years.

4.1 Grameen Shakti’s Market Implementation Approach

Grameen Shakti has developed a unique market based approach that forges collaboration with the communities at the grass root level for market penetration, local capacity development, and to become a

positive force for change in social-economic development. The Grameen Shakti's approach includes the following key factors:

- Offer innovative financing to make the Solar Home Systems cost-effective compared to traditional energy alternatives and to create ownership (of the SHS); i.e. through affordable financing, the customer pays approximately the same amount of monthly installments as he/she spends for kerosene and over time the customer becomes the owner of the SHS.
- Focus on customer needs and provide high quality service including customer friendly installation, training on proper use of the system, effective after sales support and maintenance, and strict quality control.
- Use a de-centralized bottom up approach that strongly encourages a culture of listening to the customers. Customers' needs, concerns, and feedback are constantly sought and the Company's approach/policy is fine tuned on an on-going basis based on such feedback.
- Tap into local community leaders (teachers and other such influential people), institutions and local market forces and contribute to the economic diversification of the rural sector through entrepreneur development and job creation.
- Focus on women as an agent of change in socio-economic development.

4.2 Market Penetration Strategy

In each community it serves, Grameen Shakti has a local Branch office, which gives the Company a local presence. The local presence is critical for Company's success and strategy because it allows the Company to become part of the community and thereby understand the needs and issues of the local population. The staff members of the local Branch office interact with the people of the community on a daily basis as they perform their daily functions.

As part of the market penetration strategy, local demonstration meetings are held on a regular basis to show the members of the community that the technology is "real" since many are skeptical at first. Once, through actual demonstration, they see that the technology is "real" and it works, they become interested in understanding how they can afford it. This process is time consuming, yet very effective in winning over the customers.

Also through other various community involvements and activities, Grameen Shakti (through the local Branch Offices) builds rapport, creates awareness about SHS and its economic benefits to the customers themselves and also the employment opportunities it creates within the community.

4.3 Payment Options Available to the End Users

1. The customer has to pay a minimum 15% of the total price as down payment. The remaining 85% of the price is to be repaid within (maximum) 36 months with 12% (flat rate) service charge.
2. For worship places (Mosque, Temple, Church etc) user has to pay 15% as down payment. The remaining price is to be repaid within 12 months with no service charge.
3. 4% discount is allowed on printed price in full (100%) cash payment.

There are three payments options available (as stated above); however, based on Grameen Shakti's experience over 90% of all customers opt for the 36 months installment option (Option #1). There are three major reasons why such vast majority of the customers chooses the 36 months installment period.

The 36 months installment period requires lower down payment which is more financially affordable for most rural people.

Because of the longer payment period (36 vs. 24 months) the resulting monthly installment is lower which again is more affordable for most rural people.

Grameen Shakti offers free repair and maintenance service to its customers during the payment period. Customers feel more at ease with longer term coverage of free repair and maintenance. Once the payment period is over, the customers have the option to enter into a yearly repair and maintenance service contract for an annual cost of BDT 300; however, majority of customers tend not to sign this annual service contract (main reason being that there aren't many servicing needs for Solar Home Systems and many issues can be addressed by the customers themselves after the one day training they receive).

4.4 Grameen Shakti's Extensive Geographic Network and Organizational Structure: Offering Deep Market Penetration

Following the market penetration strategy outlined above, as of right now Grameen Shakti has over 1300 local branch offices throughout Bangladesh serving the local communities. This extensive geographic network and the organizational structure has now become an unrivaled and unparalleled asset of the Company. This geographic network gives Grameen Shakti deep market penetration. The geographic network of the Company also gives Grameen Shakti the flexibility to offer new renewable energy related products/services with relative ease.

4.5 Local Presence permitting continuous feedback

The community based approach of Grameen Shakti and the resulting extensive geographic infrastructure throughout Bangladesh fosters constant contact (almost on a daily basis) with the end-users and that in turn gives the Company feedback from the end-users. Grameen Shakti's organizational structure has been designed to incorporate such constant feedback from the end-users (bottom up feed loop) resulting in continuous improvement of the organization (and thus the business operations) to meet customers' needs. This "listening culture" of the Company is a key success factor of Grameen Shakti.

4.6 All Local Branch Office Staff are Cross Trained

All of Grameen Shakti's Local Branch Office Staff are cross-trained to Conduct Sales, Installations, After-Sales Service and Maintenance, and Payment Collections. This cross-training of functions allows more of the Company's staff to be in direct contact with the end-users. It also allows the Company to operate the Local Branch Office more efficiently with fewer staff. A new Branch office opens with just two staff members and as the business activity grows two more members are hired. Thus, on average, an established Local Branch Office has six staff members, each one performing all of the functions required to successfully operate the office. One of these four members is designated as the Branch Office Manager, and he is typically in direct contact with the Regional office and he is responsible for directing and coordinating all of the local activities.

4.7 Built-In Monitoring and Audit Process

The organizational structure of Grameen Shakti is ingeniously designed to provide bottom-up feed loop, yet allow top down monitoring and audit process to ensure that the quality standards are strictly met and the Company policies and procedures are being properly followed. The organizational structure is such that the Local Branch Offices report to and are in turn monitored by the Regional Offices. Regional Offices report to and are in turn monitored by the Divisional Offices. And the Divisional Offices report to and are in turn monitored by the Head Office. Grameen Shakti's organizational structure allows the information to flow both ways within the organization and offer maximum operational flexibility.

4.7 Financing Method:

An example for 50wp SHS:

When a SHS price is USD 380, an amount of buy down grant USD 38.40 is provided by IDCOL to the POs. PO collects 15% of the price (which is USD 51.24) from the customer as down payment. The remaining price is $(380 - (38.4 + 51.24)) = \text{USD } 290.36$.

On the remaining price of USD 290.36 PO calculates 12% service charge for 3 years, which is USD 104.5. A client has to pay all together $(290.36 + 104.5) = \text{USD } 394.89$ by 36 monthly installment, which comes USD 10.97 per month.

IDCOL refinances to POs 80% of the remaining price USD 290.36 which is USD 232.29.

Kerosene is about BDT 60 BDT per liter, poor rural household burns about quarter liter of Kerosene per night. For one month the cost of Kerosene will be about BDT 450. The monthly installment of 20 Wp SHS system is about BDT 400.

If we consider the Kerosene cost is half a liter per night the monthly Kerosene cost will be BDT 900, which is about the equal of a 50 Wp SHS's monthly installment.

Beside this payback method, Grameen has introduced some schemes that helped to flourish SHSs in remote areas. Micro-utility model, village pay phones, good maintenance of the SHSs are the main schemes that has profound effect on the popularity of SHSs.

The organogram and different SHS packages of GS are shown in Appendix A.

5.0 Conclusions:

In this paper we have discussed the financing mechanism and the infrastructure for the sustainability of rural energy access. This green energy revolution is produced thousands of green jobs in Bangladesh. Our hope is that the lesson learned from Bangladesh will be helpful to other developing countries specifically African countries. However, the socio economic condition of this continent needs to be studied in-depth to tailor a successful and economically viable model for rural energy access.

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Appendix:A



Figure 1: Organogram of Grameen Shakti

Table 1: Different SHS Packages offered by Grameen Shakti



(1 USD=80 BDT)

PACKAGE PRICE OF LED LAMP SOLAR HOME SYSTEM (PRICE IS CHANGEABLE)					
Sl.	System Capacity	Loads can be used	Equipments supplied by Grameen Shakti	Package price in BDT	Package price in USD
1	10	2 x 2.5 watt LED light	A 10 watt panel, 2 x 2.5 watt LED light, a 15AH battery, a charge controller, a frame and cables	7,500	94
2	20	3 x 3 watt LED light	A 20 watt panel, 3 x 3 watt LED light, a 30AH battery, a charge controller, a frame and cables	12,800	160
3	30	3 x 3 watt LED light and a 15" LCD/LED TV or	A 30 watt panel, 3 x 3 watt LED light, a 40AH battery, a charge controller, a frame and cables	17,000	213
4	30	5 x 3 watt LED light	A 30 watt panel, 5 x 3 watt LED light, a 40AH battery, a charge controller, a frame and cables	18,200	228
5	40/42	5 x 3 watt LED light and a 16" LCD/LED TV or	A 40/42 watt panel, 5 x 3 watt LED light, a 55/60AH battery, a charge controller, a frame and cables	25,000	313
6	50	7 x 3 watt LED light and a 16" LCD/LED TV or	A 50 watt panel, 7 x 3 watt LED light, a 80AH battery, a charge controller, a frame and cables	31,500	394
7	60	8 x 3 watt LED light and a 16" LCD/LED TV or	A 60 watt panel, 8 x 3 watt LED light, a 80AH battery, a charge controller, a frame and cables	34,500	431
8	63/65	9 x 3 watt LED light and a 16" LCD/LED TV or	A 63/65 watt panel, 9 x 3 watt LED light, a 100AH battery, a charge controller, a frame and cables	36,500	456
9	80	10 x 3 watt LED light and a 16" LCD/LED TV or	A 80 watt panel, 10 x 3 watt LED light, a 130AH battery, a charge controller, a frame and cables	40,000	500
10	83/85	12 x 3 watt LED light and a 16" LCD/LED TV or	A 83/85 watt panel, 12 x 3 watt LED light, a 130AH battery, a charge controller, a frame and cables	44,500	556

Warranty for different parts of LED Solar Home System:

- Solar Panel: 20 Years
- LED Lamp: 5 Years
- 15 AH Battery: 3 Years
- 30- 130 AH Battery: 5 Years (1 USD=BDT 80)
- Charge Controller: 3 Years