

# **Feasibility of Small Solar Home System (SSHS) (<30 Wp) Rural Electrification and Renewable Energy Development Project (REREDP)**

## **Preamble**

IDCOL promotes solar home systems (SHSs) under REREDP. REREDP is being jointly financed by the IDA, Global Environment Facility (GEF), KfW, GTZ over 2002 to 2009. IDCOL's initial target was to finance 50,000 SHSs with financial assistance from the World Bank and GEF by the end of June 2008. The target has already been achieved in September 2005, 3 years ahead of schedule. Now IDCOL has a target of financing 200,000 SHSs by year 2009 with additional assistance from the World Bank, KfW and GTZ. IDCOL is expected to achieve the target of financing 200,000 SHSs by the year 2009 and over 130,000 SHSs have been installed already till July 2007 through participation of 15 Partner Organizations (POs).

SHS, a standalone system, has become very popular among rural people. The program has changed lives in remote rural areas of Bangladesh through providing access to electricity. So far SHS with capacity  $\geq 30$  Wp are being installed under the program. The performance of these systems was found to be excellent over the years and rural people are now considering solar technology as their reliable source of energy. However, there are certainly demands for lower capacity SHS which is not covered under the program. Therefore, for further dissemination of solar program among the lower income people, IDCOL is now considering to include small SHS (less than 30 Wp) under RERED project.

GTZ, Germany intends to extend their support for promotion small SHS in the existing program. To get views of Technical Standards Committee (TSC), IDCOL in this regard, the matter was taken forward to TSC. TSC has also agreed in principal to include small systems under the current program. To observe the sustainability of small SHS, TSC also recommended for making a field visit on the existing small systems that has been installed by POs and other organizations outside RERED project.

In view of these, IDCOL initiated a field visit comprising Dr. M. Rezwan Khan, Chairman, TSC; Mr. Tazmilur Rahman, Member, TSC and Mr. Hirak Al-Hammad, Member-secretary, TSC. Dr. Khalequzzaman, Senior Advisor, GTZ and Mr. Jubayer, Program Manger, GTZ also accompanied the team on at least two occasions.

The team undertook a 4-day field visit in Gaibandha, Lalmonirhat, Kurigram, Rangpur and Chandpur districts on 12.07.07, 13.07.07, 14.07.07 and 1.08.07. The team inspected small systems installed by BRAC Foundation and Rural Services Foundations (RSF) in Rangpur and Chandpur respectively. The team also inspected different models of small systems installed by LGED in Gaibandha, Lalmonirhat and Kurigram.

## **Objectives and Methodology of the field visit**

The objectives of the field visit which among others, included:

- i. To find the target group of small SHS
- ii. To assess acceptability and affordability of small SHS in the context of socio-economic condition of rural people
- iii. To observe performance and design of small systems and find options for standardizing small SHS under the RERED program

## **Customer survey**

The team visited the households which are brought under small SHS. The team also conducted customer survey that included household's monthly income level, monthly expenses on fuel i.e. kerosene and households demand and use of small SHS.

During the survey it has been found that, indeed there are gaps for meeting demand of lower capacity systems in the existing program. Most of the small systems are sold in the commercial places like small shops, bazaar etc by the POs. However, small systems can be introduced in the households as effective as shops if systems are designed considering their load pattern. Households have been found to use small systems mainly for study, dining and other household activities such as sewing, cooking etc. The small systems developed by POs ranging 7.5 Wp to 21 Wp used combination of LED lamp/Lantern and CFL together. The systems developed by LGED ranging 3 Wp- 10 Wp used different combination of LED lantern. LED lantern has been found to be very useful with small SHS since it is flexible and can be used during transportation and other activities. The systems have been installed for 4-8 months and no major technical failure was identified during inspection. However, the some of the systems installed by POs were found to be oversized especially with the sizing of battery and charge controller.

## **Target Group**

The program aims to further disseminate solar lighting system to the rural people who has affordability as well as low energy demand. Due to low buying capacity of poor people, at present the program may not reach at the grass root level but the program can bring huge socio-economic development targeting lower income group people as user of small SHS. The survey revealed that user who has income of Tk. 3,000 to 4,000 per month can afford to buy a small SHS in credit. Depending on system capacity (10 Wp to 20 Wp), the price of the system varies in the range of Tk. 6,500- 13,000 and monthly installment fee of Tk. 175- 350. Households' average fuel (i.e. kerosene) requirement was found to be 5-6 liter per month and they used to spend Tk. 200-250 on an average in each month as fuel cost. Therefore users of small SSHS are able to provide installment fee in place of

fuel cost i.e. kerosene. Furthermore, proposed buy-down grant of Tk. 1250 and capacity development grant of Tk. 400 for per SSHS can play a key role in keeping the price of small SHS within the limit of low income group people.

### **Options for introducing SSHS**

Both POs and LGED developed several designs for small SHS. The survey revealed that the systems that used LED and CFL lamps together, in those systems LED lamp was found to be underutilized in the presence of CFL. Therefore to ensure optimum usage of lamp, either complete LED based system or complete CFL based system can be adopted.

Both CFL and LED based systems have some advantages over another. CFL has wider illumination angle but overall system price would become higher because of reduced durability of CFL. On the other hand, LED has comparatively lower illumination angle (Viewing angle) but overall system price would become lower due to high longevity of LED. Overall system size would also be reduced using LED. Therefore, for small SHS complete LED based systems can be one of the suitable options.

To design LED based small SHS following standards have to consider:

1. Quality of LED has to be ensured
2. Household uses light for various purposes like study, dining, cooking, sewing, etc. Therefore, proper design of LED lamp/ lantern has to be selected
3. To prevent LED from damage, a proper LED lamp controller circuit has to be designed
4. In case of LED lamp fixed at the roof, height of roof cannot be more than 6 feet from the ground.

### **Conclusions and Recommendations**

- ◆ SHS program can further be extended below 30 Wp capacity
- ◆ To standardize small SHS, technical specifications for LED, CFL, battery, PV modules need to be developed
- ◆ Two separate: CFL based small SHS and LED based small SHS can be adopted
- ◆ In case of LED based small SHS LED, controller circuit need to be developed

### **LED lantern Model : F**

Implemented by : LGED

Specification: SPV module 3Wp, 12 V, 3W LED lantern

Estimated cost : TK 6800.00



**Observation:** This model was found suitable for domestic use. This is very handy and effective for going out at night. Even that student could study at night with this lantern. Furthermore during social festival people collect 5-8 lanterns from the neighbors and observe the festival. There is a regulator for controlling lighting intensity as a result economic utilization of the unit is ensured.

### **LED lantern Model : C**

Implemented by : LGED

Specification: SPV module 6Wp, 12 V, 2 nos of each 1W LED lantern

Estimated cost : TK 4850.00



Observation:

**LED lantern Model : B**

Implemented by : LGED

Specification: SPV module 6Wp, 12 V, 3 nos of each 1W LED lantern

Estimated cost : TK 6650.00



Observation:

**LED lantern Model : D**

Implemented by : LGED

Specification: SPV module 3Wp, 6 V, 1 nos 2.5W LED lantern

Estimated cost : TK 3450.00



This model was supplied at Jamalpur. We did not visit the system

**LED lantern Model : A**

Implemented by : LGED

Specification: SPV module 10Wp, 12 V, 3 nos 1W LED bulb and one LED lantern

Estimated cost : TK 9100.00



This model was implemented at Chapai Nawabgong. We did not visit the system

**RSF model : 01**



This model comprises of 24 leds. Total power consumption is about 2 Watt. It has been found very effective in the field.

**RSF model 02:**



This model was found very ineffective at the field. Light was not suitable for commercial activities.

**RSF model 03:**



3 Watt CFL was found very effective at the shops and commercial places. Light quality was very good.

**Tendency of using extra load:** BRAC model at Pirgacha, Rangpur



This type of unwanted load may shorten effective life of battery

**BRAC model at Pirgacha, Rangpur:**



One 10Watt TFL and one LED was supplied but the consumer did not use LED at all because they found LED producing less light in comparison with TFL.



Knowledge sharing with the beneficiaries at Lalmonirhat Sadar Upazila

RSF model at Matlab, Chandpur:





Bedroom of a day labour at Rajarhat Upazila of Kurigram district. [Quality of life has improved]



Use of SHS at a barber shop



Solar lantern has created enthusiasm among school boys

