

## Output-Based Aid in Bangladesh: Solar Home Systems for Rural Households

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**A** renewable energy program in Bangladesh that brings solar power to rural households is one of the most successful solar home system (SHS) programs in the world. It has demonstrated an inexpensive and reliable way to bring electricity to rural households. Several OBA features have contributed to the success. Notably, the subsidy payment makes the installation of a working solar home system affordable to poorer households, and is combined with longer-term consumer credit. This note explores the distinctive features and results of the program and draws lessons for future projects.

Less than half of Bangladesh's population of 150.6 million has access to grid electricity; in rural areas, where most people live, the percentage is even lower. Even those with access to grid electricity suffer interruptions in supply because of serious power shortages.

The Government of Bangladesh (GoB) is making efforts to increase electricity generation capacity and to improve the efficiency of the supply system. Reliance on grid electricity alone, however, will not allow the government to realize its vision of universal access to electricity by the year 2020. Furthermore, the dispersed nature of rural settlements and the many rivers that crisscross the country make grid electrification in many areas difficult and expensive. In this context, the least-cost solution to providing access to electricity to millions of people in rural Bangladesh is off-grid electrification based on renewable energy such as solar home systems (SHS).

### Donor support for the output-based solar home system scheme

For the past nine years, the World Bank-financed Rural Electrification and Renewable Energy Development (RERED) project has used an output-based approach to increase electricity access in rural Bangladesh. Starting with an initial target of 50,000 systems, the program had installed more than 1.2 million SHS by 2011, making it one of the most successful SHS programs in the world.

The World Bank scaled up its support for the program in 2009 through the International Development



Photo courtesy of GPOBA

Association (IDA), its arm that serves low-income countries like Bangladesh. By early 2011, it had reached its target to support 300,000 systems a year early. Additional IDA financing of \$172 million has been approved recently, and will support the installation of another 630,000 systems by the end of 2012. The program aims to nearly double installations by 2014, for a total of 2.5 million SHS.

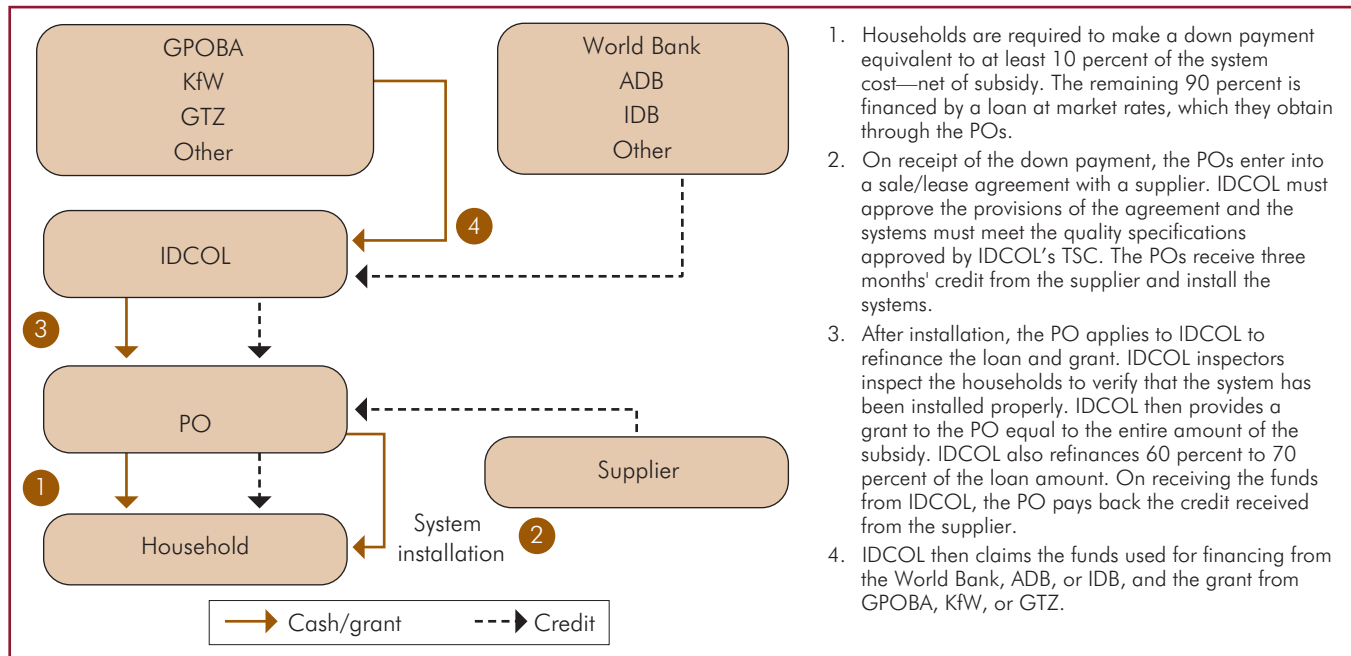
Together with the World Bank, a variety of multilateral financing institutions (MFIs) are supporting the program. The World Bank, Asia Development Bank (ADB), the Islamic Development Bank (IDB), and other partners are providing credit support. Meanwhile, the Global Partnership on Output-Based Aid (GPOBA),<sup>1</sup> the German development institution (GIZ), and the German development bank (KfW) are providing output-based aid (OBA) subsidies to reduce the cost of SHS for consumers.

### Implementation arrangements

The project is implemented by the Infrastructure Development Company Ltd. (IDCOL), which provides loans to private sector companies to support infrastructure projects in Bangladesh. IDCOL is owned by the Ministry of Finance and governed by an independent

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Figure 1. The Output-based SHS Scheme



board of directors drawn from the government and the private sector.

The project uses a dealer credit model. Customers use donor-supported credit to purchase the SHS from Partner Organizations (POs). IDCOL selects POs based on clear eligibility criteria. All POs are private organizations (mostly nongovernmental organizations, NGOs) with a strong base in microfinance, ranging from very small organizations operating in specific locales to well-known renewable energy providers like Grameen Shakti. The POs obtain the SHS from equipment suppliers, in compliance with the technical standards set by an independent Technical Standards Committee (TSC) of IDCOL, which also reviews product credentials and approves/certifies eligible equipment.

The four steps of the model are shown in figure 1.

**Targeting:** The SHS scheme targets poor Bangladeshis living in remote areas where grid electricity is not expected to reach in the foreseeable future. The POs offer a range of product sizes from 10 watts to 135 watts, so poorer customers can choose smaller systems that cost less. The project provides a fixed level of OBA subsidy (currently \$28) for all sizes of SHS. Thus smaller systems, which are typically more affordable to the poorest, receive a higher percentage of subsidies compared to larger systems (see table 1). The subsidy is small compared to the subsidies for grid extensions and the SHS programs in other countries. To encourage a commercially oriented SHS market in the country, the subsidy is being gradually reduced.

**Verification:** IDCOL must verify the claims of POs and make payments within 21 days of the claim. IDCOL has 100 technical inspectors. They check whether the household is in an off-grid area, verify that POs have used certified products, and ascertain whether an installation is consistent with technical requirements and is fully operational. The subsidy and refinancing is not released until the PO fixes any problems. IDCOL maintains a call center to receive customer complaints.

**Financing structure:** The overall financing structure of the SHS scheme is shown in table 1, using a 50Wp SHS for illustration.<sup>2</sup>

## Results

The SHS have greatly improved the quality of life for rural households and productivity and profitability of local businesses (see box 1). SHS installations of 500,000 per year currently far exceed those of grid connections. The rapid growth of this demand-driven program demonstrates the high value that the households place on getting off grid electricity services. Meanwhile, this off-grid option reduces pressure on government budget for grid expansion.

The number of POs involved in the SHS program has grown from 5 to 29, and they compete vigorously to provide attractive credit packages to consumers. The POs conduct their own due diligence to extend loans to households. The implementation mechanism of the IDCOL approach has proved sustainable. POs have an

**Table 1. Financing Structure of Different Sizes of Solar Home Systems (US dollars except where indicated)**

		20Wp	40Wp	50Wp	65Wp
System cost	Cost	175	317	396	486
OBA subsidy	Fixed at \$28	28	28	28	28
System cost net of grant	Cost of system after capital buy-down using GPOBA grant	147	289	368	458
Household down payment	10 percent of system cost net of grant	15	29	37	46
Credit from PO	The remaining system cost is financed by microcredit: 20–30 percent by PO and 60–70 percent by IDCOL	40	78	99	124
IDCOL refinancing	70 percent of microcredit financed by IDCOL is provided by IDA	93	182	232	289
Impact of OBA subsidy	Percentage of system cost reduced by grant	16	9	7	6

average loan collection efficiency of about 96 percent, while fully servicing their debts to IDCOL on time.

## Lessons learned

- *Overcoming the affordability barrier* for households has resulted in widespread adoption of SHS. This is addressed by a combination of the OBA subsidy and longer-term consumer credit from the POs/multilateral financing institutions.
- *Fostering a sense of ownership by consumers* has helped to ensure proper maintenance and upkeep of the SHS systems. Other approaches such as renting/leasing of SHS were tried but proved to be ineffective, as the customers were not dedicated to the upkeep of the SHS. POs provide free training to customers so they can carry out routine maintenance and repairs.
- *Long-term access to finance for POs and households:* The refinancing facility allows the POs to refinance<sup>3</sup> 70 percent of the loans made to consumers from IDCOL at a 6 percent interest rate, with a 10-year repayment period, including a grace period of 2 years (terms are tougher for larger POs). This refinancing mechanism provides POs with long-term access to finance and liquidity. It also allows POs to provide loans with longer repayment terms of up to three years (as opposed to the usual loans of up to six months from micro finance institutions), which reduces consumers' monthly payment for SHS and increases affordability.
- *Sustained technical assistance:* Successful off-grid electrification projects require substantial technical assistance, both for the transaction and supervision. Technical assistance resources from various donors (including GEF and GPOBA) has aided

## Box 1. Three Case Studies: How SHS Has Improved Quality of Life for Project Beneficiaries

**Mujib, a 32 year-old shopkeeper,** has seen his income increased by 1,000 Tk/month and his evening business grow since his system was installed two years ago. Customers enjoy the TV and the music from the CD player powered by the SHS. Previously, he used candles and kerosene for lighting. The price of kerosene kept rising, he suffered from bouts of bronchitis because of the fumes, and suppliers would sometimes adulterate the kerosene with petrol. The SHS eliminated those problems for him.

**Since Hajra, a mother of four,** received the SHS two years ago, she has been able to power five lights, a TV, and a mobile phone charger. Previously, she used kerosene, and still remembers the fumes that filled her house. Now her children can study in the evenings and she can charge her mobile phone to keep in touch with her husband, a laborer in southwest Asia.

**Mustafa, who owns a barber shop,** used to borrow power from his neighbor's side connection. He paid 200Tk/month but had no control over how much power he would receive, for how long, or when. The SHS, installed 13 months ago, has changed his quality of life and his business for the better. His hours are flexible, and he can close the shop as late as 9 pm.

IDCOL's efforts to establish a market for SHS systems and support efforts to manage the quality of the growing program.

- *Leverage POs' existing microfinance network and expertise:* The program taps existing NGO/MFI operators in rural Bangladesh to operate as SHS vendors. These NGO/micro finance institutions already have credibility with the rural population, which increases

customer readiness to try the SHS systems. Further, the institutional set-up of the NGO/micro finance institutions enables them to reach remote customers in a cost-effective and efficient manner. The challenge was to ensure that the NGOs could gain proficiency in the new SHS market. This was addressed by substantial technical assistance from donors to build the capacity of POs with respect to SHS systems, and conduct business with equipment suppliers and customers, particularly after-sales support.

- *Effective implementing agency and client ownership:* The implementing agency, IDCOL, has a strong sense of dedication to and ownership in the program, as well as a professional management with strong oversight by a competent board. IDCOL introduced processes that assure customers of high quality products, provide recourse if they have problems, and make sure problems are fixed quickly.
- *Shifting performance risk to POs and suppliers:* The project design shifts most of the project risks to the POs and suppliers, which increases the sustainability of the project and mitigates some of the governance and corruption risk. When a SHS does not perform properly, households can stop paying their installments until the problem is resolved. IDCOL's TSC certifies the products that can be used and suppliers of SHS equipment are required to provide a warranty to the POs, which extend a similar warranty to customers (20 years for the solar module, five years for the battery, and three years for the charge controller and lamp circuit). During the warranty period, POs and suppliers are responsible for replacing the defective equipment.

## Next steps

For many rural residents, off-grid electrification must be considered the sole option and not merely an interim solution until the grid arrives. It also offers

a way for the government to leverage the capacities of the private sector and NGOs to deliver electricity faster and reduce the huge burden on government resources on grid expansion.

The greatest scale-up constraint remains affordability. Thus POs will need to be creative about how to size and finance the systems. Efforts are underway, and POs are targeting households demanding smaller systems. IDCOL also plans to test the feasibility of introducing low-cost mobile systems (such as solar lanterns) for the poorest segment of the market.

With the rapid growth of the program, demand for verification resources is increasing. Technical assistance funds from GPOBA (including recently approved IDA financing) are being used to increase the inspection, monitoring, and training required to ensure the quality of the growing program. However, the need remains for additional resources to continue with the growth of this successful program.

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<sup>1</sup> GPOBA funding was provided in two tranches: \$7.2 million in August 2010, and \$6.75 million in May 2011.  
<sup>2</sup> At the exchange rate of 72 taka (Tk)/US\$.  
<sup>3</sup> The cost of funds for the POs under the RERED project is comparable with other sources of financing in Bangladesh. Thus, no significant market distortions are created.

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