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Solar power is turning on the lights in Bangladesh



More than half the people in Bangladesh live in areas where there is no mains electricity. Only one third of rural communities have access to electricity. But for nearly 10 years now the lights have been going on in many parts of the countryside thanks to solar home systems (SHS). Previously, people had to rely on kerosene lamps that provide poor light and create a smoky home environment. But now young people can study after school, the family can relax and learn by watching television, people feel safer in and around their homes, and shopkeepers and traders can extend their business hours.

When the World Bank and the Global Environment Facility financed the solar programme in 2003, they were counting on 50,000 systems being installed by 2008. In fact, demand proved so great that this target was achieved by 2005. And demand shows no sign of tailing off – 50,000 systems are now being installed every month! The World Bank has repeatedly reviewed the programme, and has continued financing it. The Government of Bangladesh (GOB) has set a new target of installing 2.5 million SHS by 2014, with 1 million SHS to be installed in 2012 alone.

Since the programme began, other development partners have joined. Financial institutions, including the Islamic Development Bank (IsDB) that joined in 2009, provide loan funds, while other partners support the programme by subsidising the cost of the SHS.



Lights and TV after dark attract customers into Soheli's shop and café at Shapla Bazar, Haluaghat, in northern Bangladesh. Before he started using solar power, Soheli's daily takings were 1200 taka per day, now they are 2000 taka, boosting his daily profit from 250 to 350–400 taka. He says "I used to close my shop at around 7 pm, immediately after sunset. But after I bought the SHS, I now keep my shop open until 11 pm. Now more customers come to my shop during late-night hours for shopping. I now earn better than before and my income has nearly doubled ever since I bought the SHS."

Lofty ambitions

In 2002, the GOB declared that it would provide a reliable electricity service over the entire country by 2020, commercialise the sector and increase private sector participation. In 2008, the government's Renewable Energy Policy laid out the target of meeting 5% of total power demand from renewable energy sources by 2015 and 10% by 2020.

In the near- to medium-term, off-grid renewable energy is the least cost option for millions of people in the remote areas of the country. With support from the international development institutions, the GOB launched a market-based off-grid electrification programme in 2002.

Down to the grassroots

The implementing agency for the programme is the Infrastructure Development Company Limited (IDCOL), a government-owned company established in 1997. IDCOL has played a major role in bridging the finance gap in medium- and large-scale infrastructure and rural energy projects in Bangladesh. It is now the market leader in the country in this sector.

Cover captions: left, Solar panels are appearing on rooftops all over rural Bangladesh. This one is near Haluaghat; right, Study at home no longer stops at sunset.

Support by the Islamic Solidarity Fund for Development (ISFD) of the IsDB group



In 2008, the ISFD agreed to participate in a project to support a phase of the SHS programme in Bangladesh. The total project cost was US\$64 million, of which ISFD provided a soft loan of US\$18 million, 28% of the total project cost. The ADB provided US\$33 million (52%) and IDCOL, US\$13 million (20%), to cover the rest of the project cost. This phase of the programme covers the cost of microfinance for more than 143,000 SHS.

The aim is to support Bangladesh's efforts to raise levels of social development and improve rural household livelihoods by increasing access to electricity and supporting initiatives in rural areas for the productive use of electricity.

The programme is bringing positive changes to the economy of the rural people, as they are now using SHS for their income-generating activities. The ISFD's contribution will improve the livelihoods of hundreds of thousands of rural people in remote areas.

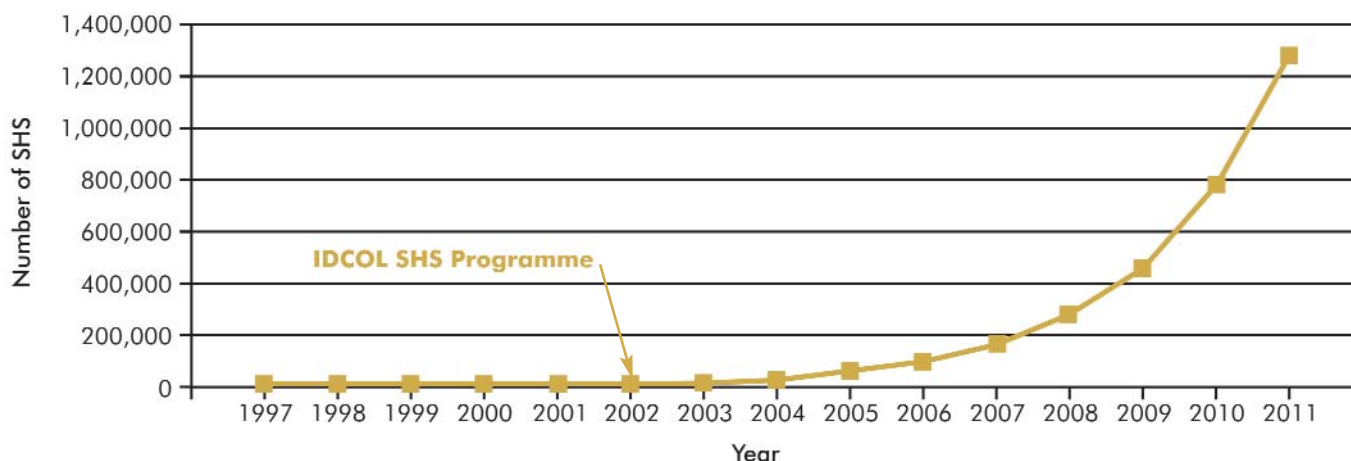
IDCOL's role

IDCOL works through a network of some 30 participating organisations (POs), mainly NGOs – including some of the largest in the country – offering a micro-credit scheme for the installation of SHS. These POs have a grassroots network covering the entire country. In this way, IDCOL has led a very successful programme providing over a million households with basic electricity services from low cost and reliable SHS. Further expansion of services using renewable energy-powered mini-grids has also been initiated, including a 100 kW solar photovoltaic system in the remote southern island of Sandwip.

IDCOL manages the financial aspects of the programme. It provides grants to the POs to subsidise the cost of SHS and soft loans to enable them to purchase and install SHS for consumers. It also provides technical assistance (logistic and promotional support) and capacity building. The collection efficiency of the POs and project implementation are also carefully monitored by IDCOL.



Installations of solar home systems in Bangladesh under the IDCOL programme



IDCOL also organises three important committees:

The PO Selection Committee: Made up of representatives from IDCOL and government ministries and organisations. It selects POs to implement the programme based on their microfinance experience and financial strength;

The Technical Standards Committee: Consists of technical experts from universities, government engineering departments and IDCOL staff. It determines technical standards, reviews dealer credentials and approves appropriate equipment;

The Operations Committee: Made up of project heads of all the POs and representatives of IDCOL. It looks after the operational aspects of the programme.

Collaboration between five partners

The model adopted by IDCOL in implementing the SHS programme involves collaboration with four other partner organisations and professionals:

IDCOL: A GOB-owned financial institution with project finance and project management expertise, sets the policy and provides overall management;

Donor agencies: Bring global experience in renewable energy projects, and financial resources;

NGOs/microfinance institutions: Operate at the grassroots level and bring expertise in microfinance activities;

Manufacturers/suppliers: Provide dynamism in operation and bring technical knowledge;

Professionals: Bring expertise in technology and rural development.

Together these organisations provide the four ingredients necessary for the successful implementation of the programme – policy, finance, institutions and technology.



Saiful Islam has had an SHS for six years in his tailoring shop in Shapla Bazar, near Haluaghat. Before he used a kerosene lamp, but found it very difficult to work with such poor light. He now has more work than ever before. Previously he earned 200 taka, now he can earn 500 taka a day.

What are solar home systems?

SHS are small photovoltaic systems that transform solar energy into electricity, providing a decentralised power supply for individual users – households, small businesses and social institutions. Systems normally

consist of a photovoltaic panel with a peak capacity of 10 to 130 watts, a battery, a charge controller, and some lighting units. In addition to lighting, SHS supply power for small electrical appliances such as radios, cassette players, mobile phone chargers and black and white TVs.

"We have seen so many cases in the remote rural areas where these systems are making a huge impact giving a better quality of life, more time for study, and some business opportunities for people to keep their shops open after dark" Zubair KM Sadeque, Energy Finance Specialist, World Bank, Dhaka

Programme financing and management

IDCOL is responsible for overall management and the POs take care of the marketing, sales, installation and maintenance of the systems. SHS costs in Bangladesh

Ayesha's story



Ayesha is a 21 year-old woman who lives in Haluaghat, Mymensingh District, in northern Bangladesh. She has just finished her secondary schooling and is preparing for an exam that will qualify her as a primary school teacher. She used to study by candlelight before her father installed an SHS. She had frequent headaches and was unable to focus on her studies after dark. However, now that the SHS has been installed at home, she can continue her studies during the evening and no longer gets headaches. She is confident that she will pass the exam and become a primary school teacher in the near future.

(Photo: Dr Shams-ur-Rehman Toor)

Halima's story

Halima is now a student at Dhaka College after completing her secondary schooling at Haluaghat. She says that she owes a great deal of her success to that day back in 2005 when her father installed an SHS, which made it so much easier for her to study in the evenings. Halima wants to become a teacher like her father and aspires to become a professor one day. Without SHS, what would happen to bright students like Halima who are able to break the tough barriers of village life to realise their dreams?



Halima's sisters are making the most of the SHS in their home near Haluaghat. They too are hoping to follow in their sister's footsteps and study in Dhaka when they pass their secondary school exams. (Photo: Dr Shams-ur-Rehman Toor)

are now among the lowest in the world at US\$8-9/Wp (Watt-peak, a measure of the nominal power of a photovoltaic device under laboratory conditions).

Consumers buy the SHS directly from the POs, mostly in conjunction with microcredit hire-purchase agreements. The POs then install the systems in accordance with technical standards set by IDCOL.

After the systems are installed, the POs apply for refinancing from IDCOL (at a lower charge and for a longer repayment period). After technical and other verifications, IDCOL releases the credit and a fixed grant (currently US\$25 per system) to the POs. This refinancing provides the POs with funds to install more systems.

In 2009, the Islamic Solidarity Fund for Development (ISFD), the poverty alleviation arm of the ISDB Group, contributed US\$18 million to the refinancing scheme, joining the World Bank/IDA, the Asian Development

Bank (ADB) and the Kreditanstalt für Wiederaufbau (KfW). Grants to provide the subsidies used in the programme came originally from the GEF and more recently from the UK Department for International Development and the Swedish International Development Cooperation Agency, through the Global Partnership on Output-Based Aid. Grants have also been received from ADB, KfW, GOB, the Deutsche Gesellschaft für Internationale Zusammenarbeit and the Netherlands Development Organisation.

Buying the system

The most popular system for households is the 50 Wp SHS. This will provide power for a black and white TV, a mobile phone charger and five or six lights. The capital cost of this system is less than US\$350. This is reduced by a US\$25 grant. There is a down payment of about 10% to the PO. The balance is covered by a loan provided by IDCOL (80%) and the PO (20%). The PO provides this loan from its own resources and IDCOL receives credit from the financing organisations, such as IsDB. The US\$25 subsidy is fixed for all systems, meaning that poorer households buying smaller systems are benefited more than better off customers buying larger systems. A fixed subsidy is also easier to manage and less open to manipulation.



Having an SHS at home means that you no longer have to pay to charge your phone. You can talk longer to your friends and family and check that you are getting a good deal for your crops from the local middleman.

Success factors

Strategic importance

The government's vision of universal access to electricity by 2020 cannot be achieved by mains electricity alone. Off-grid electrification, based on renewable energy is a viable long-term option available for cost-effective electricity access for millions of people in remote areas and is in line with the government target of meeting 10% of total power demand from renewable energy sources by 2020. The government has created an enabling environment to support these policies, by lifting the import duty on solar panels, for example. The government has also supported the programme and development partners have continued to finance the programme.

Implementing agency

IDCOL is a well-managed government-owned company that has gained an enviable reputation for the efficient management of medium and large infrastructure projects. IDCOL operates on a private-sector model, with less bureaucracy and more efficiency, encouraging competition between its partner organisations and promoting the commercial success of the SHS programme. The government's choice of IDCOL as executing agency has played a key role in making the SHS programme a success.

Planning and management

Institutional, financial and technological models of the programme were carefully designed. IDCOL successfully applied a number of checks and balances (technical, financial and operational) to ensure quality installation and operation of SHS and the effective management of the POs. The business model of the programme, the subsidy provided by IDCOL for POs and households, and the increasingly low cost of SHS have all played key roles in increasing demand.

NGO network and microcredit

Bangladesh has a dense network of NGOs throughout the country that has a good working relationship with rural communities. People are familiar with the concept of microcredit and it is socially acceptable. Capacity building of NGOs and other market players has resulted in more awareness, know-how and technical capacity facilitating relatively easy adaptation of solar technology.

Success factors *continued...*

Partnerships

IsDB and other development partners are working together in the programme. IDCOL works together with its POs, sharing risks, selecting customers, and paying attention to collection efficiencies. POs achieved an average collection efficiency of 94% and are servicing their debts to IDCOL on a timely basis.

Market development

The SHS programme aims to establish a self-sustaining market with a large customer base in relatively densely populated areas. Crucial issues related to sustainable market development have been dealt with in a proactive, efficient and comprehensive manner. POs are free to work where they wish in the country, to select and sell any available equipment, provided it has been passed by the IDCOL Technical Committee, and to compete with one another in attracting consumers. The programme has also provided the incentive for other stakeholders (such as solar panel assemblers) and played an important role in opening up the private sector. The private sector is on the move in solar energy and its dynamism is resulting in technological innovation and intense market competition leading to low cost and greater product quality, user friendliness and customer service. The programme should be commercially viable by 2014.

Ownership

People actually own their SHS. They feel a responsibility for it and care for it properly. Training in basic system maintenance is provided by the POs.

Impact on households and shops

When asked about the most significant improvements in their home since obtaining an SHS, most domestic users mention lighting, study conditions, watching TV and fuel-savings. For most users, the SHS lights replaced kerosene lighting – a potential fire hazard in the home that also produces smoke and fumes.

Lighting enables students to work longer in the evening. This is seen as a big advantage by most people with families. Domestic work can be done over a longer period when the home is adequately lit. The ability to watch TV means that people feel better informed about the world around them and learn more



Wherever you go in the countryside around Haluaghat, houses are sporting solar panels on the roof, even when they are well away from the main road like this one.

about health, agriculture and other important aspects of their day-to-day life. Many people in rural Bangladesh own a mobile phone, but often need to pay shops to charge it. Having a phone charger on the SHS is more reliable and convenient and saves money.

"Based on the success of the SHS programme, ISFD is developing a flagship programme on renewable energy for the poor in the IsDB member countries" Rabih Mattar, Manager Advocacy and Special Programmes, ISFD

People tend to feel more secure with electric light inside and outside their home and they feel safer going out at night to the kitchen or the toilet. A well-lit home is generally more convenient – cooking, household tasks and just moving from room to room are all easier.

Small shops and market stalls are able to remain open after sunset, meaning more customers and more income. In the case of tradesmen like tailors, light also means they can work longer and so earn more. Most people with a small business report earning 200 to 300 taka (about US\$2.5 to 3.5) more a day since installing an SHS.



"SHS have not only brought light to the poorest of the poor, they have changed their lifestyles. To me the greatest benefits of SHS can be seen in the children who can study long hours during the night, watch television at home, and are more educated and more aware just like us. It brings tears to my eyes when I meet families and children who tell me stories about how solar power has helped them study more and grow as individuals. Nearly 1200 SHS are installed every day under our programme. This means that we are changing the lives of nearly 6,000 people every day. That is very fulfilling."

Islam Sharif, CEO, IDCOL

"The SHS have hugely benefited the rural communities. Previously they used kerosene lamps during the night. The smell generated by these lamps caused a number of health problems and was also a heavy burden on household incomes. Now that they have solar power, they avoid the health hazards of kerosene lamps and they can also save money as solar power is free after the one-time investment. Previously women used to finish their cooking before sunset and go to bed soon after dark. Now they can cook in the evening using solar light and spend more time on income generating activities like making handicrafts during the day time"

Ruhul Quddus, Representative of Rural Services Foundation, a partner organisation of IDCOL

Keeping up the momentum

The cost of the SHS includes the cost of the solar panel (30%, falling from 50% at the start of the programme), the battery (55%) and the other components (controller, switches, wiring, 15%). Some panels are assembled locally, but most are imported ready made from China, India and Japan. A total of 550 different types of panels have been approved by the IDCOL Technical



Khairul Islam has an 85 Wp SHS that he uses to run his computer business in Mazrakura village bazar, near Haluaghat. Previously, he was unemployed but was encouraged to move into the computer business by his younger brother who had some computer knowledge. Khairul now has two desktop computers in his shop, a printer, a scanner, a photo printer and a camera. He can print passport size photographs on the spot – before villagers often had to spend a day going to the market in the nearest town to get ID photos. Khairul also browses the Internet through a GPRS connection provided by Grameen Phone and helps villagers send emails. He scans photos and documents, sells DVDs of the latest movies, helps students fill in online forms and uploads music to mobile phones. Khairul's business is only possible because of the SHS installed on the roof of his shop.

Committee. The price of batteries has increased markedly recently, largely due to the increase in the lead price. Batteries are made locally; there are 12 suppliers serving the programme. The other components are largely made and assembled in Bangladesh. Panels are guaranteed for 20 years and batteries for five. Consumer reaction to the need to replace the battery after seven years or so has yet to be judged. Will they be able to afford the expense or will further microcredit facilities be needed?

Initially, the programme allowed for US\$90 subsidy per system – 70% to the consumer and 20% to the PO. This is now reduced to US\$25. It will be further reduced next year as the market matures. The larger NGOs in Bangladesh do not need institutional support. This is unlikely to affect the large middle-class rural community that the programme targets, considering that SHS costs in the country are already very low.

"Bangladesh is really taking the lead in solar home systems. The programme is making a difference in the lives and livelihoods of rural people by alleviating energy-poverty. It has tremendous potential for scaling-up and also



replication in other countries under similar conditions or necessary adaptations". Dr Intizar Hussain, Manager, Compliance and Development Effectiveness Division, IsDB, Jeddah

The initial US\$90 subsidy was based on a comparison of the cost of an SHS compared to equivalent kerosene lighting. In the meantime, system prices have fallen and kerosene prices have risen, meaning that over a five-year period an SHS can prove to be the cheaper option. In any case, the vastly improved lifestyle provided by an SHS – including TV and phones – far outweighs the cost involved for many consumers.

The wide distribution of rural settlements in Bangladesh and the numerous rivers that crisscross the country make grid electrification in many areas difficult and expensive. Renewable energy is popular with both

consumers and the government and its use is increasing rapidly in different ways all over the country. For example, recent government regulations state that all new back-up installations (usually diesel generators) that produce power during load shedding (planned power cuts) in areas supplied by the grid must now include 5–7% solar power. This translates as 1.5 kW for a typical new apartment block. In rural areas, IDCOL will set up 100 pilot solar irrigation sites during 2012, using 6 to 8 kW panels.

Solar energy offers tremendous potential for alleviating energy poverty. The SHS programme provides valuable experiences and lessons for up-scaling and replication in Bangladesh and other IsDB member countries. There is no sign yet of the sun setting on the solar revolution in Bangladesh – in fact it is shining brighter than ever.



Shubal the barber does not have an SHS of his own, but he pays 150 taka each month to use a light on his neighbour's system for four hours a day after sunset. He can now shave 50 to 60 more clients each day during the evening hours.

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Contact for any query

Manager, Compliance and Development Effectiveness (CDE) Division
Operations Policy and Services Department (OPSD)
Islamic Development Bank Group
13th Floor, Main Building
PO Box 5925, Jeddah 21432, Saudi Arabia

Email: ihussain@isdb.org
Tel: (+966 2) 646 6907
Fax: (+966 2) 646 6966
www.isdb.org

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www.scriptoria.co.uk

