

Electricity Beyond the Grid: Innovative Programs in Bangladesh and Sri Lanka

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Extending the national grid to remote rural areas remains a challenge in many developing countries. Complementary offgrid solutions using renewable energy applications can bring the benefits of electricity service to many more low-income rural households. This note examines two successful offgrid electrification projects in Bangladesh and Sri Lanka. Key to their success are design principles that can be applied to any program that aims to deliver rural energy services.

In 2005, only 32 percent of Bangladesh's population had grid electricity, despite the country's successful rural electrification program. By that same year, 66 percent of Sri Lanka's residents had access to the national grid (IEA 2007). Thanks to innovative offgrid projects that include renewable energy applications, 250,000 more low-income rural households in both countries now enjoy the benefits of an electricity connection.

Bangladesh

In Bangladesh, the Rural Electrification and Renewable Energy Development Project has succeeded beyond expectations. Over the past five years, through a loan and grant program supported by the World Bank's International Development Agency (IDA) and Global Environment Facility (GEF), more than 179,000 household photovoltaic (PV) systems, known as solar home systems (SHSs), have been installed, far exceeding the 50,000 expected by 2008 (World Bank 2002a).¹ The delivery of SHSs to new customers has reached an unprecedented rate of more than 7,000 rural households per month. Given that the original target was met three years early at a cost savings of about US\$2 million,² the World Bank has reallocated

¹ Typically, a SHS consists of a PV module (popular capacities range from 30 to 60 peak watts), which generates electricity from sunlight; a rechargeable battery for electricity storage; a charge controller to prevent battery overcharging or deep discharging; and wiring and fixtures. A SHS supplies power to 4–6 compact fluorescent lamps, a black-and-white television set, and possibly a mobile phone charger or DVD player. In Asia, the average cost of a complete system is US\$8–11 per watt (US\$360–480 for a system of 40 peak watts). In Africa, by contrast, the cost is higher, at about US\$16–17 per watt (for example, US\$800 for a 50-watt system in Ghana).

² Planned IDA/GEF program funding was US\$18 million, including US\$2.87 for technical assistance.



Solar lamps permit extended business hours for a village shop in Sri Lanka.

resources to increase its funding for an additional 70,000 systems under this project component.³

Administered by the Infrastructure Development Company Limited (IDCOL), a nonbanking financial institution, the project offers participating organizations (POs)—microfinance institutions and other nongovernmental organizations and private-sector institutions that meet program eligibility criteria—both credit and GEF grants with which to purchase SHSs. The POs sign an agreement with the IDCOL that provides for refinancing up to 80 percent of the loans, which the POs have passed on to customers (Asaduzzaman, Barnes, and Khandker 2008). The IDCOL offers the POs soft loans with a 10-year maturity and 2-year grace period at an annual interest rate of 6 percent. Households make down payments covering at least 10 percent of system costs. On receipt of the down payment, the POs enter into a sale/lease agreement and install the system. They extend households credit on various terms and conditions, with tenors of 1 to 5 years at annual interest rates of 8 to 15 percent using a declining balance method.

While the initial project phase focused mainly on SHSs, the IDCOL recently expanded its funding scope to include biomass electrification, biogas cooking fuel, and other rural energy services. The GEF-financed grants for SHSs are provided on a declining scale—from

³ The German Agency for Technical Cooperation and the German Agency for Financial Cooperation have also come forward with funding to meet the new target of 200,000 by 2010.



Billboard raises public awareness about the benefits of solar home systems in Bangladesh.

US\$90 per system initially to US\$50 today—which encourages commercial market development. The POs use a small portion of the grant—from US\$20 initially to US\$10 today—for institutional development, while the rest is directed toward capital cost buy-down. The investment program is complemented by a strong cost-shared technical assistance program that features awareness-building training for PO staff members and consumers.⁴ The IDCOL covers 80 percent of training costs, while the POs contribute the remaining 20 percent. In addition, the IDCOL provides logistical support and implements a media campaign to promote SHS use throughout the country.⁵

Many more SHS customers have been reached as a result of using service delivery channels put in place by the project’s key POs, including Grameen Shakti and the Bangladesh Rural Advancement Committee. Having already gained the confidence of rural residents, such institutions can function as trusted sources of SHS delivery; those trained as SHS vendors can function even more efficiently. In addition, their collection history has been strong enough to develop a credit line. The main challenge—overcome via investing in initial technical assistance—has been to ensure that the POs gained sufficient training in SHS technology, supplier selection, and after-sales service (box 1).

Sri Lanka

In Sri Lanka, the Renewable Energy for Rural Economic Development Project and its predecessor Energy

⁴ Issues range from SHS configuration and positioning, installation, and maintenance to guidelines for system monitoring and inspection and microcredit marketing methods.

⁵ For details, visit www.idcol.org.

Box 1. Working Together for Quality Standards

To ensure quality standards under Bangladesh’s Rural Electrification and Renewable Energy Development Project, POs purchase PV panels, batteries, and other components approved by the Technical Standards Committee. Vendors submit required documents, warranties, and product-testing certificates to the Committee for its examination and approval. Once products are approved, the POs can buy them directly from the vendor and set up their own terms of purchase and payment. Eager to cooperate with the POs, most vendors offer delayed payment terms to facilitate higher sales volume. The POs arrange for user training in operation and maintenance, regular after-sales service, and the timely handling of customer complaints. The IDCOL routinely inspects the installed systems and shares its findings with the POs, who agree to correct any problems. Representatives from all POs—16 currently—participate in monthly operations committee meetings, where they share progress and resolve problems. Technical audits conducted by the IDCOL and Committee verify whether vendor-supplied equipment meets stated standards.

Services Delivery Project,⁶ a private sector-led effort supported by the World Bank, GEF, and local financial institutions, complement grid-based extension by the Ceylon Electricity Board, the country’s vertically-integrated national utility (World Bank 2002b, 2003). Over the past decade, the project has installed more than 100,000 SHSs, helping thousands of rural households to switch from poor-quality kerosene lamps to more efficient electric lighting.

The project’s centerpiece is a market-based credit program available to participating credit institutions (PCIs)—commercial banks, microfinance institutions, and leasing companies that meet eligibility criteria. Currently, the program comprises 11 PCIs: five commercial banks, two licensed specialized banks, two leasing companies, one finance company, and one microfinance institution. The PCIs can refinance up to 80 percent of their loan amounts. They access credit at the average weighted deposit rate,⁷ repayable in 15 years with a maximum 5-year grace period. In turn, they offer households, community-based organizations, and private developers subloans with which to finance SHS, village hydropower systems, and mini-hydropower projects, respectively. The subloans have a maximum maturity of 10 years with a 2-year grace period, not

⁶ The Energy Services Delivery Project was implemented during 1997–2002.

⁷ Defined as the weighted average of the interest rates paid to depositors by all commercial banks on interest-bearing term deposits, as issued weekly by the Central Bank of Sri Lanka.

exceeding the useful economic life of the equipment financed. The PCIs assume the credit risk on the refinanced subloans and must repay them according to an agreed-on amortization schedule, regardless of whether their borrowers repay (box 2).⁸ Since 1997, the offgrid component of the credit program has received about US\$38 million in IDA/GEF support, including some US\$3 million in technical assistance.

The Administrative Unit (AU) of the Development Finance Corporation of Ceylon Bank manages the credit program. The AU monitors suppliers' compliance with global technical specifications and service standards for SHSs and solar lanterns—thus providing the basis for consumer education and protection—and investigates unresolved consumer complaints.⁹ The AU also approves loans contingent on evidence of installation (for SHS) or design approval by a chartered engineer (for village hydropower systems). Beyond its quality-assurance role, the AU facilitates stakeholder discussions to solve implementation problems. Quarterly stakeholder meetings are organized to welcome new members, discuss innovative approaches and procedures, and review ongoing assignments and project performance.¹⁰ To resolve sector-specific issues, the AU conducts special meetings with the Village Hydro Working Group and the Solar Industries Association.

In addition to SHSs, the project finances village hydropower systems. Typically, the lending PCI is a

⁸ For details on program operating guidelines and PCI eligibility criteria, visit www.energyservices.lk.

⁹ Suppliers are granted free market entry, provided that the systems they sell meet project specifications and honor warranty and service requirements.

¹⁰ Minutes of these meetings are posted on the project website (www.energyservices.lk).

Box 2. Financing Solar Home Systems

The most popular SHS financing model under Sri Lanka's Renewable Energy for Rural Economic Development Project is consumer credit through the microfinance institutions that work closely with solar companies. Via their dealer networks, the solar companies sell SHSs and offer operation and maintenance services. The business model is structured through a memorandum of understanding between the microfinance institution and the solar company, key features of which are a buyback scheme and identification of the consumer-service responsibilities of the two parties. Following this model, the Sarvodaya Economic Enterprises Development Services (SEEDS)—the project's key PCI in SHS financing and a recognized leader in offgrid energy services delivery in remote rural areas—financed more than 60,000 systems during 2002–06.



Typical village hydropower system in Sri Lanka

commercial or development bank. Community-based organizations, known as Electricity Consumer Societies, initiate the process with the help of nongovernmental organizations, consultants, and the private sector. Community participation and cash contributions promote the development of local capacity and skills, strengthen community relations, and aid in cost recovery. Following the Sri Lankan concept of *shramadana*,¹¹ village families assist in constructing civil works and erecting distribution lines. Some 5,000 additional families could gain electricity access via the more than 80 village hydropower projects implemented under the program.

The project also offers output-based, co-financed grants, which are disbursed only after pre-defined results are achieved; such grants are transparent and do not cover operation and maintenance costs. To encourage development of a commercial offgrid market, the grants are offered on a declining scale. To ensure technical quality, they are passed on to suppliers rather than final beneficiaries. In the case of SHS grants, the solar company decides what proportion should be used as a price break for customers and what should be spent on market development activities, such as building infrastructure for operation and maintenance.¹²

What Have We Learned?

Success of the offgrid projects in Bangladesh and Sri Lanka can be attributed, in part, to a flexible project

¹¹ Voluntary work in exchange for payment.

¹² The Uva provincial government recently adopted this output-based, co-financing approach, recognizing that it could support at least three times as many households by doing so.

design responsive to the needs of implementing organizations, suppliers, and beneficiaries. Such flexibility, in turn, reflects a shared set of project design principles:

- **Improved access to capital.** The projects' output-focused approach offered private companies and nongovernmental organizations incentives to enter new markets and deliver pre-defined products, while grants increased product affordability and covered a portion of the incremental costs of introducing environmentally-friendly products.
- **Reliable after-sales service.** Both projects had effective, after-sales maintenance networks in place, particularly for systems financed by the microfinance institutions, which were trained in basic technical-repair skills.
- **Overlay of project on existing outreach networks.** Rural customers were reached via service delivery channels already put in place, primarily by the microfinance institutions.¹³ Solar companies, in particular, worked in close partnership with these networks.
- **Regular stakeholder consultation.** In Bangladesh and Sri Lanka, the IDCOL and AU, respectively, played lead roles in facilitating discussion among committed stakeholders—from the financial to the public sector and from field organizations to civil society and industry—to jointly resolve issues.
- **Investment in market development.** Setting the stage for new offgrid markets requires teaching key stakeholders about the technologies and how to properly implement and monitor projects; it also requires effective media campaigns to develop consumer confidence. In Bangladesh, the IDCOL led initial training for the POs and used grant resources to launch media campaigns at

¹³ Two key project microfinance institutions—Grameen Shakti in Bangladesh and SEEDs in Sri Lanka—were 2006 winners of the Ashden Awards, an international competition that recognizes organizations that implement innovative, yet practical, schemes demonstrating sustainable energy in action (www.ashdenawards.org).

critical project stages.¹⁴ In Sri Lanka, the AU provided the PCIs and developers technical training and support and launched an extensive media campaign in association with the PCIs and offgrid developers.

Conclusion

The success stories in Bangladesh and Sri Lanka demonstrate that it is possible to implement offgrid programs in association with the private sector and microfinance institutions that operate in rural areas. Improved access to capital, reliable after-sales service, and investment of time and resources in market development and regular stakeholder involvement proved instrumental for project scale-up. While these project experiences are based mainly on SHS delivery, the design principles key to their success are not limited by technology. In fact, both projects have begun to experiment with providing other offgrid and rural energy services.

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¹⁴ The Bangladesh project benefited from the media outreach expertise that Grameen Shakti gained via support from the U.S. Agency for International Development and the International Finance Corporation.

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