

# IFC's Lessons of Experience

Through the implementation of the projects discussed in this report, IFC has learned a great deal about the solar PV market in developing countries, the type of financing required to support solar PV market growth in those countries, and what it takes to develop a successful solar PV company. Perhaps one of the most significant lessons that IFC has learned is that the solar PV market is far more complex than first envisioned.

This complexity is rooted in the fact that, despite the apparent social and environmental benefits, solar PV remains unaffordable to the majority of the unelectrified population in most developing countries. The mere fact that it is more economically affordable for a government to provide electricity through solar PV than through grid expansion does not, in itself, make solar PV financially affordable to the end user. It is important to explore the different segments of a potential market, develop products that are suitable for different consumers, and respond to a range of needs and income levels, as well as identify opportunities where solar PV is the least-cost alternative.

### LESSONS ABOUT THE SOLAR PV MARKET IN GENERAL

While solar PV technology is a well-established technology, and technical advances have been significant during the last several decades, the emergence of a consumer market for solar PV is relatively recent in most developing countries. When IFC first became involved in the solar PV market, there was a great deal of excitement regarding the potential for growth in the market. As IFC quickly came to realize, however, these projections were overly opti-

mistic and not supported by changes in market fundamentals. Affordability remains a key issue today; government support is still needed, but often lacking; and, overall, unsubsidized solar PV programs are difficult to implement, particularly in light of the degree of subsidization and political support for alternatives, such as grid extensions.

### Expectations Were Overly Optimistic

It has now become apparent that early solar PV programs, designed by IFC and others, suffered from overly optimistic outlooks on the solar PV market's growth opportunities. With 400 million unelectrified households, the potential market seemed vast, but it rapidly became apparent that the actual potential demand did not equal the entire unelectrified population. While extensive market studies were carried out prior to the implementation of any of IFC's solar PV programs, these studies focused more on identifying businesses than on evaluating end-user demand. Furthermore, upon implementation, it became apparent that many of the opportunities that had been identified by the market studies during the planning stage were not appropriate. In the case of SDC, for example, not one of the over 100 opportunities identified in the feasibility study received SDC support. The initial market assessment had overestimated the maturity of the market; it simply was not yet ripe for the type of equity investment SDC was seeking to provide.

### Solar PV Is Not the Only Answer to Rural Electrification

Most of IFC's financing programs had a dedicated focus on solar PV, an optimistic and too restrictive "tunnel-vision" reflection of the general belief that

solar PV was the best solution in areas not connected to the electrical grid. Small-scale solar PV systems do not offer the constant supply of electricity that most people want, and without focused financing programs, it continues to be unaffordable to the vast majority of the unelectrified population. In the absence of a grid connection market, consumers have continued to find other, more affordable ways (diesel generators, disposable batteries, kerosene lamps) to meet their electricity needs.

### **The Hard-to-Define and Very Segmented Solar PV Market**

The market for solar PV in developing countries was initially defined to be the total number of unelectrified households, some 1.6 billion people. In reality, the market for solar PV is much smaller and significantly more complex to define; smaller largely due to the issues of financial affordability and perceived value, and complex in the need to recognize the different market segments, which are rooted in income level, lifestyle, and numerous regional and geographic differences.

### **Financial Affordability and Perceived Value**

The biggest barrier to widespread adoption of solar PV technologies is affordability. At the time each of the IFC initiatives was structured, it was widely believed that the price for solar PV modules would continue to decrease significantly as mass produc-

tion scaled up, thus making solar PV electricity more competitive. However, as indicated previously, the anticipated decrease in solar PV prices did not materialize; the price actually increased in 2004/2005.

The issue of affordability has been a key driver of the business models employed by solar PV companies. In order to keep the upfront cost of SHS affordable, companies have generally followed one of two approaches: they have provided SHS on a fee-for-service, or rental model, charging a monthly fee for the service provided, or they have arranged for financing to allow the consumer to pay the balance of the SHS in monthly installments (lease/hire purchase model). Many businesses also engage in cash sales. Through Soluz Honduras, experience has shown that the fee-for-service, or rental, model has ultimately proved unsustainable, since unexpected grid expansion tends to jeopardize the customer base before the high upfront costs of acquiring and installing the solar PV systems can be recovered by the solar utility.

The continued high price of solar PV modules is further offset by the issue of perceived value. Experience by IFC and others has shown that affordability is not exclusively linked to price or the availability of financing. Affordability is also linked to the perceived value and opportunity cost of solar PV purchase. In many rural settings, the purchase of a solar PV system represents a very significant expense; in Vietnam, for example, the systems provided by

## **LESSON LEARNED: GOVERNMENT SUPPORT CAN MAKE A DIFFERENCE**

### **SOLAR PV PLANT CONSTRUCTION IN THE CZECH REPUBLIC**

The IFC/GEF CEEF program\* has issued a \$1.08 million project guarantee for a 1.2MW solar power plant, the largest solar PV power plant installed to date in Central and Eastern Europe. The solar PV power plant became operational on January 29, 2007. This installation, in Busanovice, southern Bohemia (Czech Republic), will decrease the country's CO<sub>2</sub> emissions by 743 tonnes annually, and will produce 620Mwh/year.

Electricity from solar PV, as well as other renewable sources, has the support of Czech national renewable energy legislation, which guarantees feed-in electricity tariffs for 15 years from project commissioning and off-take obligation for the grid operator. For solar PV power, the feed-in tariff is 13.62 Czech crowns/kWh (\$0.62/kWh).

The plant has already been connected to the distribution network and started commercial operation on February 1, 2007. The 2,660 silicon-based solar PV modules, which are spread across 6,170 m<sup>2</sup>, can ensure electricity supply for 172 households. The maximum planned capacity of the power plant is 693 kW. A solar PV panel with an area of 1 m<sup>2</sup> produces as much electricity in a year as 250 kg of coal and saves a total of 750 tonnes annually of CO<sub>2</sub> that would otherwise be discharged into the atmosphere by the operation of a coal-fired power station. By the end of 2007, the plant capacity will be ramped up to 1.2 MW.

\* IFC/GEF-CEEF, the Commercializing Energy Efficiency Finance Facility, operates in Eastern Europe with both GEF and IFC financing. The facility provides a partial guarantee for loans made by local financial intermediaries for EE/RE projects, as well as technical assistance.



Selco Vietnam were sold for roughly a year's income. As a result, the decision to buy even a small solar PV system often meant sacrificing a larger item. There is a trade-off, however: with their limited electricity supply capacity, solar PV systems often do not come out on top, when compared to possible alternative purchases.

#### **Economies of Scale**

Solar PV technology is well suited to rural, highly dispersed, sparsely populated areas, but it is precisely in these areas that solar PV programs are most difficult to implement. A certain scale is required in order to become profitable, but if the company sees a need to reach too far out of the central community to increase the scale, it can become too expensive to service the consumers, and the economies of scale are then lost. Solar PV companies are more likely to experience success when able to operate in markets with critical masses of potential consumers that were geographically concentrated. It is only when operating in a relatively dense market that

companies are able to take advantage of economies of scale. Part of Grameen Shakti's success, for example, is attributed to its servicing densely populated areas; economies of scale were not an issue. While there are examples of solar PV businesses that have operated successfully in more sparsely populated areas, it is certainly a more difficult venture.

#### **Government Support and Enabling Environment**

A supportive legal environment is essential and should include as many of the following elements as possible: no import duties or tariffs on SHS components; incentives for solar PV energy or absence of competing subsidized electricity; publicly disclosed long-term government electrification plans; and a legal basis for enforcing loan collection. For example, the SME Program's investment in Soluz Honduras had significant issues surrounding unexpected grid expansion, forcing Soluz Honduras to remove newly installed systems at a considerable loss. In contrast, PVMTI's investment with Sunlight Power Maroc benefited from an agreement with the

national utility to provide SHS under a subsidized fee-for-service scheme within an exclusive geographic concession.

### Subsidies

Unsubsidized solar PV programs have proved particularly difficult to implement. Rural electrification is heavily subsidized throughout the developing world, as are solar PV and other RE technologies in developed countries, such as Germany, Japan, and the United States. All programs examined in this report received some form of subsidization, be it in the form of financing, using GEF funds provided through IFC at terms unavailable in the market, or through local government, as in the case of Sunlight Power Maroc, which has benefited from an extensive government program, subsidizing fee-for-service solar PV systems. The CEPALCO project received a grant equivalent to 70 percent of the overall construction cost of the plant. While the plant makes a strong technological case for the reliability of utility-scale solar PV power plants, from a financial standpoint the plant would not have been feasible without some form of subsidy. It is widely acknowledged that given most current market conditions, some form of subsidy is necessary to maintain solar PV businesses in the developing world.<sup>19</sup> IFC has found that there is a particular need for continued technical assistance funding as part of its financing programs. The question that remains to be answered, however, is whether technical assistance grants will provide enough of a subsidy, or if more substantial subsidies are needed and, if so, in what form?

### LESSONS ABOUT IFC'S FINANCING PROGRAMS

With GEF funding, IFC has been able to implement a number of different solar PV financing programs. Despite the enthusiasm, with which the inception of the different financing programs was based, IFC learned very early in the implementation of its solar PV programs that the market reality was not what had been envisioned. There was need for greater flexibility and patience. Despite the risk-sharing tools offered by IFC, in large part through GEF support, financial institutions (FIs) continued to perceive solar PV to be risky, due to their inexperience with the technology, the nature of SMEs, and the economics of the solar PV market. In the end, it was found that many of IFC's financing programs required tailoring to the specific needs of individual

countries and, therefore, the experience offered limited replicability at a general level. Most profitable opportunities in the solar PV market also lay further upstream in the value chain.

### Need for Flexibility in Program Design

The solar PV market is very much a developing market and, as such, it requires substantial flexibility in project design, as shown by the following examples. IFC's experience in solar PV has demonstrated the need to adapt initial project designs to a number of areas: from the length of repayment schedules to interest rates to the business plan and, particularly, with respect to the financial instrument used.

**RESTRUCTURING.** In the face of continued difficulties in placing funds, particularly in Kenya, PVMTI's approach to the market was restructured. The restructuring, allowing for more technical assistance funding and longer repayment periods to be provided to Kenyan clients, had a significant effect on PVMTI's ability to place funds. The different experiences of SDF and SDC also highlight the importance of being open to revising the original program design. SDF, with its more flexible funding options (providing working capital loans with minimal security, guarantees, and grants), was able to successfully meet its financing targets, while SDC, with its focus on larger projects, greater return expectations, and exclusive focus on equity investments, had a great deal of difficulty placing its available funds. Had SDC been designed differently from the outset, or if it had been able to reach consensus amongst its shareholders concerning its attempted restructuring, it is possible that the overall experience of SDG would have been much more positive.

**VOLATILE MARKET CONDITIONS.** Lower income rural populations are particularly susceptible to the macroeconomic situation of their country (economic shocks, currency changes, changes in the price of crops), as well as natural disasters. They are also subject to cash flow issues, as monthly incomes fluctuate according to seasonal harvests and sporadic income-generation activity. These issues had a strong effect on the ability to make payments both at the consumer and project level, and IFC programs had to introduce some flexibility into the repayment plans to accommodate these issues. Grameen Shakti saw a full 90 percent of its operating area flooded in 1998, when the worst flood in over a century hit Bangladesh. People were focused on the essentials (food and shelter) and, as a result, sales were non-

<sup>19</sup> Solar PV businesses are able to operate sustainably without subsidies when they are the lowest cost source of power for a market segment.

existent and the default rate on collections was extremely high. The SME Program loan to Grameen Shakti had been structured with a two-year grace period, with payments to be made on an annual basis and, as a result, Grameen Shakti did not have issues in servicing the SME Program loan, even though collections from Grameen Shakti's clients had to be delayed as a result of the flood. Selco Honduras also suffered a major setback following the devastation brought by Hurricane Mitch in 1998.

**SIMPLIFIED TRANSACTION PROCESS.** In many instances, IFC's lengthy and cumbersome deal approval process proved too stringent for small solar PV companies. The SME Program, which had been specifically designed for small and medium companies, adopted a less burdensome deal approval process that was more in line with the characteristics of solar PV companies. Lacking an extensive focus on SMEs, both SDC and PVMTI had cumbersome

#### GRAMEEN BANK

Grameen Bank was established by Professor Muhammad Yunus in 1971 as a research project. By December 31, 1995, the bank had equity of \$100 million. Not regulated by the Bangladesh Superintendent of Banking or any similar regulatory body, Grameen Bank is notionally owned by its 2 million members, each of whom owns one share. The majority of the bank's clients are poor and landless and live in rural areas, with 94 percent being women. The members elect 9 of the 13 members of the Board of Directors.

In 2006, Muhammad Yunus and Grameen Bank were awarded the Nobel Peace Prize for their work on economic and social development among the poor.

documentation processes, resulting in deals being canceled due to the fact that the time from approval to disbursement was too long, as well as high operational costs in relation to portfolio size.

#### Need for Flexibility in Investment Offerings

In addition to flexibility in program design, flexibility in investment offerings is necessary. Investment offering needs vary significantly, based on market segment, specific country, or regional needs. Many of IFC's programs offered one particular type of financing—SDC provided private equity, and the SME Program provided concessional loans through intermediaries—and, as a result, it was found difficult to place their funds. SDC was eventually disbanded due to its inability to disburse funds, as the market was generally not ready for private equity investments. The SME Program, with its concessional loan offerings, proved more flexible, and placed the

majority of its solar PV-related funds directly, without the help of intermediaries.

#### Private Equity Is Not the Answer

IFC attempted to attract private equity to the solar PV market through SDC. It found, however, that private equity funds, as a financial instrument, are not well-adapted to the needs of the solar PV market in the developing world<sup>20</sup> and the demanding requirements of a private equity fund. The private equity model is premised on the concept of high risk/high return. The solar PV market in the developing world has certainly proved itself to be high risk; however, financial returns have generally been disappointing. In addition to poor returns, SDC found it difficult to make equity investments, due to the small deal sizes, limited management skills, lack of financial accounting standards, inadequate exit strategies, and the time-consuming and costly administrative monitoring required for equity investments.

Yet, solar PV companies are in need of capital. Launching a successful SHS distribution company requires a significant upfront investment in order to purchase equipment, establish distribution channels, and raise consumer awareness. IFC experience has shown that it generally takes several years to recoup this investment. Renewable energy and energy efficiency projects often attract similar types of investors; however, it is important to keep in mind that the payback periods for renewable energy projects, in particular solar PV projects, are much longer than those for energy efficiency projects. To compare, energy efficiency projects often have payback periods of less than two years, while renewable energy projects are almost always over three years. In the case of solar PV projects, payback periods can be in excess of 10 years. Patient capital and long-term loan commitments with modest financial return expectations are what is needed. For small rural businesses, simple loan instruments with modest security provisions are most appropriate.

#### Financial Institutions Still Find Solar PV to Be Too Risky

IFC underestimated the conservativeness of local financial institutions as far as providing financing to smaller solar PV companies. IFC believes that in order to leverage local financial resources, it should not only raise awareness and provide technical assistance, but also engage the local financial institutions more directly by devising risk-sharing products that can be deployed to finance renewable energy pro-

<sup>20</sup> This experience is somewhat unique to the developing world. Many private equity and venture capital companies are involved in solar PV manufacturing projects looking to sell solar PV in developed countries, where bigger systems are being sold, prices are higher, distribution problems less daunting, and needed economies of scale are easier to come by.

jects. Unfortunately, solar PV proved to be too risky for most FIS. Solar PV is deemed risky for two reasons: (1) most solar PV companies are SMEs, and FIS have generally been wary of financing SMEs, and (2) the economics of the solar PV market means that there are high risks and uncertain returns. Grameen Bank's support of Grameen Shakti (see Grameen Shakti case study, page 32) was a notable exception to the reluctance of FIS to support solar PV projects and provides a successful example of how financial intermediaries can support the solar PV market. However, this is more representative of the uniqueness of Grameen Bank (see box, page 20) than it is indicative of the possible interest of most local FIS to engage in solar PV.

The SME Program, in particular, sought to work through financial intermediaries. However, while the program was able to work through intermediaries for a number of the projects implemented through it, when it came to solar PV investments, this proved to be a significant challenge. In Vietnam, for example, the SME Program had initially hoped to provide financing to the Vietnam Women's Union (VWU), which had taken on the sales and collections role for Selco Vietnam. However, the VWU viewed the risks of providing end-user financing as too high, and was unwilling to take on the responsibility for the financing. In the end, the SME Program provided the loan directly to Selco Vietnam. In fact, E+Co and Environmental Enterprises Assistance Fund (EEAF), both nonprofit nongovernmental organizations (NGOs) and financing institutions with environmental missions, were the only intermediaries supported by the SME Program that agreed to commit concessional loan financing to solar PV projects.

#### **Need for a Broader Technological Focus**

In the IFC experience, investment facilities that were exclusively focused on solar PV (SDC and PVMTI) had more difficulty placing funds than the programs that had the flexibility to also invest in other sectors and technologies (SME Program). Furthermore, those types of programs were able to offset some of the risks associated with solar PV.

#### **Need for a Broader Operational Focus**

It is important to note that SDF, with its exclusive focus on solar PV, was largely successful. However, this success can be linked to its pre-agreed scope of operation; unlike other projects, SDF was a nonprofit entity that provided a range of business development assistance and seed financing to establish new

### **LESSON LEARNED: THE NEED FOR A MIX OF TECHNOLOGIES**

#### **THE PORTFOLIO APPROACH TO DISTRIBUTED GENERATION OPPORTUNITY (PADGO) PROJECT**

The ultimate goal of the PADGO project is to reduce CO<sub>2</sub> emissions by displacing central fossil-fuel-based generation in favor of a portfolio of renewable and clean fossil-based distributed energy (DE) generation technologies with waste heat recovery (also known as combined heat and power). In order to achieve this goal, the project has been divided into two phases.

Phase 1 of the project will focus on Sri Lanka, and will have three specific goals. First, it will develop a performance framework that would enable risk sharing between IFC and the local banks on their existing portfolio of mini-hydro investments. Second, PADGO will focus on introducing new technologies to the DE mix by promoting complementary DE technologies (for example, reciprocating engines, biomass, PV, wind). IFC will work with established private sector players to do one or more pilot projects with a technology that has not been extensively implemented in Sri Lanka. Third, it will identify the key problems that the electricity grid may face with large-scale DE generation, and will develop key guidelines on how DE generation can be assimilated into an integrated resource planning effort at Ceylon Electricity Board.

During Phase 2, IFC will incorporate into the risk-sharing framework the lessons learned from the introduction of the new technology-based pilot project initiated in Phase 1. The framework will thus be made more robust and applicable to a larger set of technologies. The financing process will move closer to an asset-backed securities approach, as larger volumes of transactions are targeted. Significant progress is also expected during Phase 2 on the integration of DE technologies into a mini-grid structure that allows for dispatch capability and value for capacity.

solar PV ventures and support existing early-stage businesses. The type of flexible support SDF provided was greatly needed and in high demand in the solar PV market and, as a result, SDF was largely able to meet its goals. By contrast, both SDC and PVMTI were faced with having to undergo major restructuring, since their narrow initial investment terms were out of touch with the market reality. SDC was eventually disbanded when management was unable to identify a large enough number of investments to provide the type of returns investors sought. PVMTI was restructured to allow for longer repayment periods and increased funding for technical assistance. PVMTI also relied only on GEF funding, while SDC had private capital, which was more demanding.

#### **Limited Replicability**

The experience of PVMTI, in particular, demonstrates how the same model can lead to different results in different countries because of specific country conditions. PVMTI operates in India, Kenya, and Morocco, three countries selected for their supportive policy environments and the presence of a

vibrant emerging solar PV market. PVMTI experienced considerably more success in India, where the market for solar PV was widely established and enjoyed considerable government support, and there were a large number of established solar PV companies and relatively widespread knowledge about solar PV technology. In Kenya, PVMTI found that there was considerably more need for technical assistance funding. A large number of solar PV systems had been sold in Kenya on a pure cash basis by very small local companies, but there were no performance standards, and the quality of many systems had been called into question, undermining the initial progress that had been made in the market. In Morocco, a stepped-up fee-for-service program, subsidized by the government, reduced the need for consumer financing, while increased availability of black market solar PV modules put increased pressure on module prices.

#### **There Are Profitable Opportunities in the Solar PV Market, But They Lie Further Upstream in the Value Chain**

An important finding that emerged from IFC's solar PV experience is that there are more viable opportunities further upstream (module manufacturing) in the value chain than downstream (SHS distributors). IFC's investments lay primarily further downstream in the value chain. One reason for this is that manufacturing companies are often able to obtain local commercial financing more readily, because it is backed with assets, unlike the cash-flow-backed financing provided to SHS distributors, and IFC aims to provide financing only when it is not available through local sources. A second reason is that the vast majority of manufacturing activity in the solar PV industry is focused on export to subsidized west-

ern markets (primarily Europe), and it was not appropriate for IFC to use GEF funds when it could not ensure that they would be used to support renewable energy in the developing country.

#### **Need for Technical Assistance Funds**

Technical assistance grants are still needed in order to help move the solar PV market forward. In order for commercial solar PV enterprises to be successful, technicians need to be trained, industry standards need to be developed, and local governments need to be lobbied for support. PVMTI found that TA was particularly needed in Kenya. In the 2004 restructuring, the initiative approved additional TA grant funding to support the training of solar PV technicians, create quality awareness in the market, support the Kenya Renewable Energy Association (KREA), and establish a quality assurance program for SHS in the Kenyan market.

#### **Shareholder Diversity**

The more diverse a shareholder group is, the more difficult it is to manage expectations. The immaturity of the solar PV market means that financing programs have to be flexible in order to respond to the changing market realities. With a diverse shareholder group, this flexibility often does not exist. Both PVMTI and SDC found very early on in the implementation stage that original targets should be restructured and reevaluated. PVMTI, with its simple shareholder base, was able to complete these changes; however, SDC, with its very diverse shareholder base, found it impossible to reach consensus on changes, which forced its dissolution, rather than allowing for more flexible restructuring. The shareholder diversity that had been much applauded during the initial structuring of SDC proved, in the end, to be one of SDC's greatest constraints.

#### **LESSON LEARNED: MOVING UP THE VALUE CHAIN**

##### **MOSER BAER IN INDIA**

Moser Baer India Ltd. (MBIL) is the third-largest manufacturer of recordable optical storage media products (CDs and DVDs) in the world. MBIL is also an existing IFC client. Currently, MBIL is undertaking a two-year diversification program that involves setting up an export-oriented solar PV cell and module manufacturing facility with an installed annual production capacity of 80MW in Greater Noida, India.

IFC has recently approved a \$22.5 million long-term loan to the company to support this \$92 million project. This project, which has the potential to avoid 80,000 tonnes of CO<sub>2</sub> emissions annually, will also lead to the creation of about 600 additional jobs.

#### **LESSONS ABOUT WHAT MAKES A SUCCESSFUL SOLAR PV COMPANY**

While there are some notable successes among some of the solar PV companies IFC provided financing for, the majority of them did not live up to their original expectations. Although IFC has not been able to identify a fully viable sustainable business model for solar PV distribution companies in developing countries to replicate, its decade-long experience working in the solar PV market has highlighted a number of key areas that companies should focus on and resources that need to be in

place in order to help ensure the successful operation of such businesses.

### Product Offering and Market Segmentation

In order to ensure that they are providing the right products, solar PV companies should acknowledge the different market segments that exist. Low-income consumers are often looking for a solar PV system that will support a single light source, while higher income consumers might well be grid-connected and be looking to purchase larger solar PV systems that recharge back-up batteries to help ensure an uninterrupted power supply in the event of power outages. The needs of each of these different customers vary greatly, and solar PV companies should adjust both their product offering and their marketing strategies in order to satisfy different consumer market segments.

In addition to income level, consumption priorities and lifestyle have proven to be key segmentation issues. These issues also vary from country to country. In Vietnam, for example, having a television was seen as more important than having a light; therefore, people were more interested in larger solar PV systems. Additionally, there was no debt or consumer credit culture in Vietnam; i.e., there was little market for smaller systems, and consumers tended to be from higher income groups, who could afford to purchase systems outright (so-called “early adopters”).

### Provision of Consumer Financing

Consumer financing has often been seen as the key element to developing the solar PV market. Without financing, the large initial price tag of acquiring a solar PV system is simply unaffordable to the vast majority of the population without electricity. IFC’s experience has shown that investors and banks do not like to finance solar PV purchases, as they perceive them to be too risky. Also identified was that solar PV companies are generally more skilled at the manufacturing and commercial distribution of solar PV, and are not concerned with the risks associated with provision of consumer financing. Successful solar PV companies are those that have a way of engaging skilled providers of consumer financing, thus allowing them to remain focused on their core solar PV business. Grameen Shakti, an SHS provider in Bangladesh that received financing from the SME Program, was well positioned to provide consumer financing because of its parent company, the well-established and respected Grameen Bank. This rela-

## LESSON LEARNED: AFFORDABLE PRODUCT OFFERING TAILORED TO TARGET MARKET SEGMENT

### LIGHTING THE BOTTOM OF THE PYRAMID

The Lighting the Bottom of the Pyramid program will leverage IFC’s global network, industry expertise, and regional experience, as well as donor funds to catalyze local and international lighting-related companies to offer the unelectrified population in Kenya and Ghana greater access to modern and affordable off-grid lighting products and displace fuel-based lighting products (kerosene lamps, candles).

Current consumption of fuel-based lighting represents a large global market, mostly served by oil and gas companies, but largely untapped by lighting companies. Independent estimates indicate that worldwide spending on fuel-based lighting in developing countries is \$38 billion per year. In Kenya and Ghana alone, IFC estimates the total spending on fuel-based, off-grid lighting to be \$1.4 billion per year. Hence, IFC believes there is an opportunity to attract lighting companies to enter and compete in the fuel-based, off-grid lighting market with modern and affordable off-grid lighting products, harnessing the private sector profit-seeking motivation to increase access to modern lighting services and reduce poverty.

In order to seize this opportunity, IFC will facilitate the entry of local and foreign lighting companies to this market by helping firms (i) understand the market, including consumer behavior and preferences concerning lighting, acceptable pricing points, and distribution channels, and (ii) understand and mitigate the perceived risks of entering into a new market in a region that, for most private companies, is very challenging. The entry of several modern lighting companies in this market and their competition for market share will bring unelectrified citizens in Kenya and Ghana a variety of modern off-grid lighting products that will be better and more affordable than fuel-based lighting. Their lower power requirements will also enable more cost-effective use of solar PV as a power source (e.g., solar PV lanterns).

As of January 2007, 135 private companies and 63 stakeholders from 35 countries had expressed interest in participating in this initiative. The project target end-results for Kenya and Ghana are (1) to provide greater access to off-grid lighting products that are more modern and affordable than fuel-based lighting; (2) to reach 316,000 (low-end scenario) to 1,500,000 (high-end scenario) end users with modern, off-grid lighting products by 2015; and (3) to reduce CO<sub>2</sub> emissions from fuel-based lighting from 782,000 tonnes (low-end scenario) to 3,909,000 tonnes (high-end scenario) by 2015.

For more information, please visit [www.ifc.org/led](http://www.ifc.org/led).

tionship was a major contributing factor to the success of Grameen Shakti.

### Management and Staffing

A consistent theme that emerged from IFC’s solar PV experience is that the entrepreneur is absolutely critical to the success of the project. Given that solar PV players tend to be small and operate in complex markets, it is documented that hands-on managers who possess strong management skills are crucial.

Managers should be flexible in order to respond quickly to changing market realities. Establishing a local presence through appropriately trained local staff is mandatory for any company looking to be a player in the solar PV market. As the solar PV market in each country differs, the social and cultural knowledge of local staff is essential to the development of a solid understanding of consumer needs.

As mentioned above, Grameen Shakti benefited significantly from its relationships with Grameen Bank, as the bank's presence in approximately 36,000 villages provided significant local knowledge that it was able to share with Grameen Shakti. Furthermore, Grameen Bank's general manager dedicated 20 percent of his time to the direction of Grameen Shakti.

The experience of CEPALCO in the Philippines highlights the need for a strong and experienced management team and staff who understand the local environment. Although it was only a small, 1 MW RE project, local staff had to obtain over 50 permit approvals before construction on the CEPALCO solar PV plant could begin, a feat that would likely have been impossible without adequately knowledgeable local staff. Furthermore, the permitting process delayed construction and, as a result, strong management was required for the project to be completed on schedule.

#### **Local Partnerships and Government Relations**

The importance of strong government relations, particularly in terms of understanding planned grid expansions, cannot be overstated. The Soluz Honduras experience showed the significance for strong government relations to be backed by legally binding concession agreements. Soluz was operating in Honduras without any formal government concessions and, as a result, found itself unprepared for competition from unexpected grid expansions. Grid expansions are a political tool in many developing countries, and are often unpredictable in terms of funding and timing. Operating without some sort of binding legal agreement from the government puts companies at increased risk of customer loss.

In addition to supportive government relations and, in some instances, due to inadequate government relations, the development of local partnerships is pivotal to the success of a solar PV company. When Grameen Shakti first began operations in Bangladesh, for example, local government support was lacking, and the company sought to partner

with local educational institutions to ensure that it remained on the cutting edge of technology. When Selco entered the Vietnamese market, it formed a partnership with the Vietnam Women's Union (VWU) to support the financing of sales of SHS in rural communities. The VWU had representatives in every village in the country, and while the partnership was eventually dissolved, it was of great benefit to Selco Vietnam, as they began to gain a foothold in the country.

#### **Sales versus Rental**

There are two primary models currently being employed in the solar PV market: sales (on a hire-purchase basis) and fee-for-service rentals. According to IFC's experience, the sales model is much more sustainable, especially given current market conditions. Soluz Honduras began operations as a fee-for-service company, supplying SHS to consumers on a rental basis. It became apparent after several years of implementation, however, that the rental model was not financially sustainable. While a rental model made it easier for the end user to ac-



quire the systems, the equipment cost accumulated with the company and, as a result, it was not financially sustainable for an SME start-up. The initial large outlays for capital equipment could not be offset by small monthly rental fees. Soluz Honduras eventually adopted a sales model.

### Marketing

Even when a company has matched the right products to the right market segment, a strong marketing effort is crucial. There is still substantial misinformation and lack of understanding as to what services a solar PV system can reliably provide and at what cost. Furthermore, the presence of poor quality systems in some markets has resulted in solar PV being perceived as unreliable and even undesirable. Solid marketing strategies that include demonstration projects should be in place in order to educate the general population. Grameen Shakti initially provided SHS free of charge to key people in a village, promoting a type of demand associated with “keeping up with the neighbors”. Selco Vietnam engaged the VWU to help sell their systems, as the VWU

had presence and influence in just about every village in the country. These unique marketing strategies contributed significantly to overall sales.

### Entrepreneurial Spirit

In some countries, notably India and Bangladesh, there was a considerable entrepreneurial spirit to be found among end users. This entrepreneurial spirit appeared to have some influence on the success of the solar PV company itself. In Bangladesh, one end user used solar PV panels to charge cellular phones, which he then rented out to people in his village. His business was so successful that he was able to purchase a larger solar PV system while also providing a better education opportunity for his children. Where this type of entrepreneurial spirit existed, there was greater demand for solar PV systems, and consumers had a greater ability to make their payments. It also demonstrated how the provision of solar PV can lead to increased income-generating activities.

