CHAPTER 2

IFC's Experience in the Solar PV Market

IFC has learned many lessons from its experience in the solar PV market. These lessons are summarized in the following chapter. By far the most important lesson that IFC has drawn from its experience is that there is not simply one target market for solar PV in developing countries, namely the entire unelectrified market, but many different target market segments. To be successful, solar PV ventures should be structured with a narrow, well-defined target market. The investment offering can then adequately address a relatively homogenous set of needs. This was a relatively difficult lesson for IFC as, from the outset, the goal of many of our solar PV initiatives was simply to provide services to the unelectrified. As a result, the experiences outlined below led to varying degrees of success, both in their effectiveness and in their implementation.

IFC approved its first GEF-financed investment to a

TABLE 2. IFC/GEF SOLAR PV INITIATIVES

PROGRAM	DATE OPERATIONS BEGAN	GOAL	TOTAL INVESTMENT AMOUNT	GEF SHARE OF TOTAL FUNDING	CURRENT STATUS
SME Program	1995	Increase access to finance, build capacity, and increase growth of markets for SMEs active in the areas of climate change mitigation and biodiversity conservation.	$20 million* ($2.7 million used for five solar PV-related businesses)	100%	The SME program was absorbed into the Environmental Business Finance program in 2004. Some of the solar PV investments have been closed; others are ongoing and operating successfully.
PVMTI	1998	Accelerate the sustainable commercialization and financial viability of energy services, based on solar PV electricity.	$30 million	100%	Ongoing
SDG	2000	Deliver SHS to rural households in developing countries.	$41 million (SDF $12 million, SDC $28.7 million)†	25%	Dissolved in 2004
CEPALCO	2002	Demonstrate solar PV effectiveness in supplying energy during peak usage periods, thus avoiding new plant construction.	$5.775 million	70% (CEPALCO provided $1.775 million in financing)	Operating successfully

* The SME Program received a total of $20 million in funding from the GEF in two stages; a portion of this funding was earmarked to finance solar PV-related projects.

† For details on additional shareholders, see the SDG case study on page 49.

solar PV company in 1998 through the IFC/GEF Small and Medium Scale Enterprise (SME) Program. That same year, IFC's first solar PV-focused financing facility, the IFC/GEF Photovoltaic Market Transformation Initiative (PVMTI), also became operational. Over the next five years, IFC supported three additional solar PV-related initiatives, all financed by GEF, including the Solar Development Group (SDG), which included the Solar Development Foundation (SDF), Solar Development Capital (SDC), and the CEPALCO Solar Photovoltaic Demonstration Project.[16] Table 2 outlines IFC's GEF-funded solar PV initiatives.

The programs and projects implemented by IFC have resulted in significant overall social and environmental benefits. Examined for nonfinancial returns, such as the number of households electrified, the displacement of indoor air pollution, gender empowerment, education, health, and increased income-generation opportunities for the end user, the IFC solar PV portfolio has performed well, with over 84,000 SHS installed. However, from a financial standpoint, performance has proved below expectations, as it has generally not met the initial projections of investee companies.

THE IFC/GEF SMALL AND MEDIUM SCALE ENTERPRISE PROGRAM

The IFC/GEF SME Program was established in 1995 as a $20 million initiative, financed entirely by GEF. It sought to increase access to finance, build capacity, and increase markets for SMEs active in the areas of climate change mitigation (energy efficiency and renewable energy) and biodiversity conservation through the provision of concessional loan financing. The SME Program was the first GEF-funded, nongrant, SME financing program targeting the private sector. While the SME Program did not specifically target solar PV companies, it became operational at a time when there was considerable interest in the solar PV market. (See the IFC/GEF SME Program case studies, page 30.)

Over its lifetime, the SME Program approved investments in five solar PV-related businesses (see Table 3 for details). The SME Program's experience in the solar PV sector was mixed, with one successful project (Grameen Shakti in Bangladesh) and other projects with more limited success. In 2004, the operations of the SME Program were absorbed by the Environmental Business Finance Program (EBFP), a $20 million IFC/GEF initiative that was designed as a successor to, and based on, the experiences of the SME Program.

TABLE 3. IFC/GEF SME PROGRAMS'S SOLAR PV PROJECTS PORTFOLIO

COMPANY	COUNTRY	COMMITMENT (IN MILLIONS)
Grameen Shakti	Bangladesh	$ 0.750
Environmental Enterprise Assistance Fund (EEAF) Soluz Dominicana*	Dominican Republic	0.075
Soluz Honduras**	Honduras	0.500
E + Co Rex Investment†	Tanzania	0.150
Cogener	Tunisia	0.500
Selco Vietnam	Vietnam	0.750

* The SME Program lent to EEAF, which on-lent to Soluz Dominicana S.A., an SHS distributor.

** Soluz Honduras S.A. de C.V. received a $400,000 loan, as well as a $100,000 equity investment.

† The SME Program lent to E+Co fund, which on-lent to Rex Investment Ltd., a leading Tanzanian solar PV distributor.

Perhaps one of the most important lessons IFC learned from the SME Program's experience with the solar PV market was that it was possible to offset some of the risks associated with solar PV by investing in a number of different markets and sectors.

Contrasting the experience of Grameen Shakti, which operated in densely populated Bangladesh, with those of Selco Vietnam and Soluz Honduras showed that economies of scale are harder to come by in sparsely populated and remote rural areas. Economies of scale are vital to the success of solar PV companies, since they reduce the financial cost of monthly rental fee or payment collection, as well as an ongoing system service and maintenance. Without a sizable service population, a private solar PV company simply cannot financially sustain the cost of a service technician or collection agent, and ultimately this leads to collection issues and difficulties in maintaining systems (as was the case with both Selco Vietnam and Soluz Honduras).

The SME Program experience highlights the importance of local ownership and government support. Grameen Shakti's ties to Grameen Bank and, through it, the local community proved to be invaluable and a major driver of Grameen Shakti's success. Soluz Honduras found that the lack of a defined exclusive government concession to defend geographic service territories was problematic when it was faced with unexpected grid expansions that eliminated large numbers of established customers. (See case studies on Grameen Shakti, Soluz Honduras, and Selco Vietnam in Part 2.)

PHOTOVOLTAIC MARKET TRANSFORMATION INITIATIVE

The IFC/GEF PVMTI is a $30 million GEF-funded initiative designed to accelerate the sustainable com-

[16] This review does not discuss the experience of the Renewable Energy and Energy Efficiency Fund (REEF), due to an agreement among participating investors restricting disclosure.

mercialization and financial viability of energy services based on solar PV technology in India, Kenya, and Morocco. Launched in 1998, PVMTI is expected to continue to the end of its extended mandate in December 2009 and, by the beginning of 2007, had committed over $18 million to 12 projects. (See PVMTI case study, page 40.)

PVMTI initially found it difficult to structure deals as the extensive documentation required, small investment size, and long negotiation periods proved too burdensome for many small and thinly capitalized solar PV companies. It quickly became apparent that companies would not be able to absorb and repay committed funds by the original end date of December 2007. The extensive documentation process and small investment size also resulted in high operational costs for PVMTI in relation to its portfolio. In 2004, PVMTI underwent a significant restructuring that extended its operational mandate by two years and has resulted in an increase in the proportion of disbursements to commitments to roughly 80 percent.

As PVMTI is still an operational project, it is difficult to evaluate its overall performance (see Table 4 for a summary of the PVMTI portfolio). To date, PVMTI financing has resulted in the installation of over 60,000 SHS units in previously unelectrified households. The Mid-Term Program Review, which was completed in July 2006, noted that PVMTI will be responsible for the displacement of an estimated 109,466 tonnes of CO_2 emissions over the lifetime of the installed SHSs.

The PVMTI experience highlights the need for flexibility in program design. The initial $500,000 minimum investment proved to be too large for most SMEs to absorb, and the extensive business plans and other documentation proved too daunting for the small businesses active in the solar PV sector, particularly those in the lower density rural areas where solar PV was most needed. PVMTI was, indeed, flexible, and IFC was able to restructure the program to better suit the needs of the market.

PVMTI's experience in Kenya highlighted the need for technical assistance funding. While the Kenyan solar PV market was well-established, with many players and a true entrepreneurial culture, there was no real structure to the market and no standards. It quickly became apparent that there was a need for funding to help strengthen the overall market through the creation of performance standards and by securing government support. (See case studies on SREI, Muramati Tea Growers SACCO and Sunlight Power Maroc S.A. in Part 2.)

TABLE 4. PVMTI'S ACTIVE SOLAR PV PROJECT PORTFOLIO

COMPANY	COUNTRY	COMMITMENT (IN MILLIONS)
Selco India	India	$ 1.10
Eskom-Shell Solar Home Systems	India	3.90
Shri Shakti	India	2.23
SREI Infrastructure Finance, Ltd.	India	3.50
Barclays Bank, Kenya	Kenya	2.00
Equity Building Society (EBS)	Kenya	2.10
Muramati District Tea Growers SACCO	Kenya	0.60
Salafin S.A.	Morocco	1.00
Sunlight Power Maroc S.A.	Morocco	1.075

SOLAR DEVELOPMENT GROUP

The Solar Development Group (SDG) was a $41 million initiative which became operational in 2000. The goal was to deliver SHS to rural households in developing countries. SDG was comprised of two separate entities: (1) Solar Development Capital (SDC), a $28.7 million for-profit private equity fund that provided growth capital for private solar PV and solar PV-related businesses; and (2) Solar Development Foundation (SDF), a $12 million nonprofit entity that provided business development assistance and seed financing to support the establishment of new solar PV businesses. (See SDG case study, page 49.)

SDC experienced problems very early in implementation. There simply were no viable opportunities in the solar PV market that would provide the returns that private equity investors were seeking. Despite revisions of return expectations, SDC managed to approve only six investments, totaling $3.9 million (of the approved projects, only $650,000 was disbursed to three investments), before being liquidated in 2004. In contrast, SDF, with its focus on the provision of early-stage working capital loans, guarantees, and technical assistance grants, was largely able to meet its targets, making commitments totaling over $3.5 million to 54 companies in 23 countries. With SDC's liquidation, however, SDF transferred its operations to the Triodos Renewable Energy for Development (TRED) Fund and SDG ceased to exist in April 2004.

IFC learned a great deal from the SDG experience relating to the type of financing programs required for solar PV. A key lesson was that a diverse shareholder group can be problematic. With over 15 different investors from a wide range of institutions (nongovernmental, bilateral, and multilateral financing organizations, socially responsible investment funds, and private companies), as well as private individuals, it was very difficult to satisfy the shareholders' different objectives and expectations. When it became obvious that SDC required restructuring, reaching consensus on a new structure proved impossible and SDC was eventually disbanded.

The SDG experience also highlighted the necessity of focusing mainly on market development and capacity building. Overall, SDG had only focused on developing individual businesses, rather than on the market as a whole.

The SDG experience, more than any other IFC solar PV initiative, demonstrates IFC's optimistic outlook on the market. During the initial planning stages for SDG, over 100 investment opportunities were identified for SDC. Ultimately, none of the opportunities identified in the feasibility study received SDC support, as the market was not prepared for equity-type investments, companies were not in a position to absorb so much capital, and the return expectations by most of the candidate businesses were not met.

CAGAYAN ELECTRIC POWER AND LIGHT COMPANY

CEPALCO is a private electricity distribution company on the island of Mindanao in the Philippines. In December 2002, CEPALCO received $4 million in GEF funding (loan convertible to grant) from IFC to build a 1 MW distributed generation power plant, which was integrated into the 80 MW distribution network of CEPALCO and operated in conjunction with an existing 7 MW run-of-the-river hydroelectric plant. The purpose of the project was to demonstrate the effectiveness of solar PV in addressing distribution system capacity issues, thereby delaying the need to construct a new hydroelectric plant. The solar PV plant operated through a conjunctive use application, whereby hydropower and solar PV resources were used jointly, for the first time, to increase the capacity of the hydropower unit and convert the solar PV plant's power output to firm dispatchable power, rather than an intermittent resource.[17] (See CEPALCO case study, page 54.)

Fully operational since 2004, the CEPALCO plant has operated successfully and without incident since its inauguration, making a strong technical case for the reliability of utility-scale solar PV power plants and resulting in a significant reduction in greenhouse gas emissions. It is important to note that the GEF grant, which was provided through IFC, effectively subsidized 70 percent of the construction and start-up costs of the CEPALCO solar PV plant. Thus, the intended potential for replication is currently somewhat limited, since global solar PV prices remain too high.[18]

The CEPALCO experience highlights the importance of a strong local presence and knowledge of the local market and its regulations. Although the CEPALCO plant was a small plant, the Philippine Government did not make a distinction between it and the more conventional electrical plants. CEPALCO was still required to comply with the permit process required for much larger fossil-based plants. As a result, over 50 permits and licenses would have been required, many of which were inappropriate for a small, clean RE plant. Without the staff knowledgeable of local government processes, this would have been a very daunting process, potentially crippling the project's implementation.

The CEPALCO project also highlights the necessity of capital cost reductions for larger-scale grid applications. Without the GEF grant, the CEPALCO plant would not have been financially viable, as the price of solar PV modules was simply too high to be competitive with the capital cost of a 1 MW diesel generator. Perhaps most important, the CEPALCO project demonstrated the potential for conjunctive use applications of solar PV.

[17] World Bank Group, *Renewable Energy for Development—The Role of the World Bank Group*, 2004.

[18] Other large-scale solar PV power plants are now being constructed in Europe and North America, due to generous subsidy programs, financial incentives (e.g., tax credits), and the existence of renewable energy portfolio standards, some of which require a certain percentage of solar capacity. Plans for a 40MW solar PV plant were recently announced in Europe (see box relating to Moser Baer, page 22).