

# EXECUTIVE SUMMARY

Rural electrification has been a long-time focus for the World Bank Group (WBG) overall, and IFC, the World Bank's private sector investment arm. The contribution of electrification to quality of life, through improved livelihoods and health, and increased education and productivity, is well documented. With approximately one-third of the world's population living without access to electricity—mostly in rural areas of developing countries—rural electrification is a key means of achieving the Millennium Development Goals (MDGs)<sup>1</sup> and reducing poverty.

Concern about the global environment in recent years has led to an increased focus on renewable energy (RE) technologies. The Global Environment Facility (GEF) was initiated as a pilot project in 1991 and then formally established in its current form in 1994 with a mandate to address climate change and develop a strategy to support RE investments. The World Bank Group became interested in exploring the solar photovoltaic (PV) market as a means to providing clean energy service in rural areas that had no access to the grid. IFC recognized an opportunity to use GEF funds to test various options for the commercialization of solar PV in emerging markets.

This publication documents IFC's solar PV experience. In total, IFC managed five GEF-funded solar PV initiatives, of which four are discussed in this publication: the IFC/GEF Small and Medium Scale Enterprise Program (SME Program), the Photovoltaic Market Transformation Initiative (PVMTI), the Solar Development Group (SDG), and the grid-tied solar power plant of the Cagayan Electric Power and Light Company (CEPALCO).<sup>2</sup> While IFC programs have been responsible for the installation of over 84,000 solar home systems (SHS), these programs have been less successful from a financial standpoint, IFC having been unable to significantly transform markets and create sustainable businesses as originally anticipated.

In some of the initiatives that were implemented, we have found the main challenge to lie, not in the technology of solar PV, but in accurately judging market reality and trends. IFC's solar PV portfolio has been significantly impacted by well-documented market trends. These included a failed prediction that the price of solar PV panels would come down, the decrease in supply of smaller modules, and a number of economic shocks. Hindsight shows that the initial beliefs of IFC and many market players about the solar PV market were overly optimistic. Through the implementation of its solar PV initiatives, IFC has learned a great deal, not only about the solar PV market in general, but also about the type of financing required to support solar PV market growth and what it takes to develop a successful solar PV company. Perhaps one of the most important lessons that IFC has learned is that supporting the growth of the solar PV market is far more complex than first envisioned, particularly due to the level of market segmentation that exists.

IFC remains committed to addressing the issue of rural electrification in developing countries and is cautiously optimistic that a self-sustaining solar PV market will develop there. However, in light of the lessons, we are moving away from focusing narrowly on solar PV as a way of addressing rural electrification. Instead, we are moving toward a broader approach, such as supporting a variety of technologies, the commercialization of low-power lighting devices, and distributed power generation.

<sup>1</sup> A set of eight international development goals for 2015, adopted by the international community in the UN Millennium Declaration in September 2000, and endorsed by the International Monetary Fund (IMF), the World Bank, and Organization for Economic Co-operation and Development (OECD).

<sup>2</sup> 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.

## KEY LESSONS FROM IFC'S EXPERIENCES IN SOLAR PV

### ■ **The issue of affordability cannot be addressed without segmenting the market.**

The rural unelectrified market in developing countries is large. To reach it, proper segmentation along income lines, needs, and lifestyle are necessary. It was initially felt that if solar PV module prices could be brought down to a certain level, or if business models could be structured to maintain low monthly payments, solar PV would become financially affordable to the consumer and competitive with alternative energy sources. Experience has shown that the definition of affordability varies among market segments (relative income levels, market applications, etc.), and it remains a challenge for PV companies to identify the niche market segments where solar PV is the least-cost energy alternative for the consumer.

### ■ **While solar PV is a viable technical solution, it is not the only solution. Without some level of subsidization similar to that provided for grid-connected electricity, it often remains too expensive for the average rural consumer.**

Experience has also demonstrated that people are looking for a constant supply of electricity provided by grid connection. It is important to note that, while solar PV is cheaper for governments than costly grid expansion in dispersed rural populations, grid connection has emerged as a key political tool in many developing countries, and the grid has almost always been heavily subsidized. In addition, solar PV simply cannot provide equivalent services to the grid, and it is also not the only technology available for addressing rural electrification demand. The high initial cost of acquiring a solar PV system makes solar PV considerably less affordable to the rural poor than alternatives, such as car batteries and kerosene.

### ■ **Private equity is not the most appropriate financial mechanism for financing solar PV activities in developing countries.**

An important lesson for IFC was that, while private equity and venture capital firms are heavily involved in the manufacturing of solar PV for developed country markets, the risks and economics of solar PV in the developing world mean that the returns that such off-grid investors typically look for are nonexistent. Profitable opportunities for solar PV utilization in the developing world lie further up the value chain, primarily in the manufacture of solar PV modules for export to subsidized, developed world markets.

### ■ **Good government relations and support are a strong success factor.**

While there are examples of companies able to establish successful ventures without express government support, those companies fortunate enough to operate with a government concession for exclusive territorial rights to distribute solar PV systems (or with some form of subsidy or favorable pricing agreement) tended to be more successful than companies operating without explicit government support.