

## IFC's Approach in the Early 1990s

### THE EMERGENCE OF SOLAR PV

In the early 1990s, when IFC was in the process of structuring its first solar PV market initiative, there was a great deal of anticipation about the future of solar PV in emerging markets. Overall industry growth had accelerated steadily since the early 1980s.<sup>9</sup> In emerging markets, it was felt that there was an opportunity for small-scale solar PV applications, such as SHS, to replace diesel generation and to provide supplementary power to grid-connected systems.<sup>10</sup>

The first renewable energy initiatives that were implemented in emerging markets were largely donor-led and focused on demonstrating the func-

tionality of the technology. Little to no attention was paid to commercializing the market to support wider dissemination of the technology. Given that the majority of early initiatives were grant-based programs, many of them ended when funding was exhausted, as the programs had not been designed with financial sustainability or replication as key considerations.

By the mid-1990s, large capital flows were streaming into solar PV businesses. Large players, such as BP, Shell, and Total Energie, were entering this market, manufacturing solar PV panels, and selling solar PV systems to rural electricity consumers in developing countries. Anyone with the means and interest in electricity in emerging markets experimented with solar PV in what appeared to be a major emerging business opportunity.

### SIZABLE MARKET AND DEMAND

The potential market was considered very attractive. An estimated 1.6 billion people were without electricity (roughly 400 million households), all of which could be electrified with SHS. The thought was that if solar PV was made available to a community, demand would be similar to that experienced with the arrival of grid-connected electricity. While the initial start-up cost of acquiring solar PV was considerably more expensive than the alternatives, such as batteries or diesel generators, it was assumed that a significant segment of the unelectrified population would opt for the superior quality of solar PV, could financially afford it, and would purchase systems if credit were available. The opportunity to bring about a substantial increase in the market size was present; in fact, some were predicting a similar



growth pattern to that experienced with personal computers and mobile phones.

### PRICES WOULD FALL AND SOLAR PV COULD BECOME MORE FINANCIALLY AFFORDABLE

It was widely perceived that the main barrier to scaling up the industry was rooted not in the technology, but in the financial affordability of solar PV. Solar PV had proved to be unaffordable for three key reasons: (1) the overall price of solar PV modules was not considered competitive against alternative electricity sources, such as diesel generators; (2) there was no financing available to help solar PV consumers with the large initial cost of acquiring and installing a solar PV system; and (3) subsidies for other forms of energy, such as grid-tied electricity, were distorting the market. The appropriateness of solar PV technology itself was not called into

question, as it was largely believed to be the best technological solution to rural electrification, given its scalability and fit for dispersed populations.

At the time IFC was structuring the solar PV initiatives discussed in this report, it was widely thought that the prices of solar PV modules would continue to decline. The price of solar PV modules had decreased by a factor of over 50 since the early 1970s, and it was expected that further price reductions would continue to occur as a result of technical progress in materials, cell design, and manufacturing methods, as well as economies of scale in manufacturing.<sup>11</sup> It was expected that solar PV module prices would decline sufficiently to allow solar PV to become a cost-effective replacement for diesel fuel or kerosene. With cost expected to decrease, the lack of consumer access to financing was seen as the major constraint. IFC considered that it could structure solar PV initiatives to address this constraint.

#### SIGNIFICANT SOLAR PV MARKET TRENDS

During the period in which IFC's solar PV projects were implemented, there were a number of well-documented market trends that emerged in the global solar PV market that had a significant impact on solar PV markets in the developing world. These were the discontinuation of the expected downward trend in solar PV module prices, the increased demand for large solar PV systems in the industrialized world, and the global economic shocks that occurred in the late 1990s and early 2000s (the Asian and Russian financial crises of 1997 and 1998, respectively, the Argentine economic crisis of 1999, and the 9/11 attacks). While these market trends were not on their own responsible for the limited success of IFC's portfolio, they did serve to further exacerbate existing obstacles.

Prices did not decrease as expected and, in recent years, the exact opposite has occurred. According to the United States Department of Energy's Energy Information Administration (EIA), the average price for silicon contracts increased by approximately 25 percent between 2004 and 2006.<sup>12</sup> As silicon is a key component in the construction of solar PV panels, this has had a serious impact on the overall price of solar PV systems. The main reasons for this increase were the continued tight supply of high-grade silicon, as well as the increased demand for solar PV, fueled by subsidized programs in the industrialized world.

It is currently estimated that as much as 50 percent of the cost of solar PV electricity is paid for through transitional subsidies. Most of this is for grid-connected systems, which currently represent well over three quarters<sup>13</sup> of the total solar PV market. In Germany, for example, the electric utilities are now paying customers a significant premium for any surplus solar PV power they sell back to the grid. This huge premium has resulted in a sizable increase in the global demand for solar PV systems.

The increase in demand for solar PV in the industrialized world has affected solar PV markets in the developing world, not only through increased prices, but also by shifting production away from the smaller modules. Load requirements in industrialized countries are significantly higher than those in developing countries, and manufacturers have chosen to move away from the manufacture of smaller modules in favor of the increased profitability and steady cash flow associated with catering to the industrialized country market. The lack of supply of smaller modules has led to increased working capital requirements for smaller integrators,<sup>14</sup> as well as increased pressure on prices for smaller modules. In the period between mid-2005 and the end of 2006, the price of 40-watt panels has increased by 50 percent (36 percent for 20-watt panels).<sup>15</sup>

<sup>9</sup> Jackson, 1999, p. 376.

<sup>10</sup> Ahmed, 1994, p.7.

<sup>11</sup> This review does not discuss the experience of the Renewable Energy and Energy Efficiency Fund (REEEF), due to an agreement among participating investors restricting disclosure.

<sup>12</sup> <http://www.solarbuzz.com>.

<sup>13</sup> Some estimates place grid-connected systems at over 90 percent of the total solar PV market.

<sup>14</sup> Hande, 2006.

<sup>15</sup> Hande, 2007.