

## Shared Solar Panels for Indoor Lighting, Côte d'Ivoire

### Themes

- ★ Renewable Energy
- \* Innovative technology applications
- ❖ Technical capacity development
- ❖ Institutional capacity development
- \* Poverty Alleviation (MDG 1)
- \* Education (MDG 2)
- \* Health (MDGs 4-6)

### PROJECT DATA

**Name:** The "Minimum Comfort" Solar Electricity Program of the Côte d'Ivoire

**Implementing Organizations:** Opportunities Industrialization Center (OIC), St. Ignatius Loyola Organization for Economic and Social Study, Center for Training and Research in Rural Development, and the Program for Community Health and Development (NGOs)

**Location:** 15 villages in five regions of Côte d'Ivoire

**SGP Contribution:** \$225,519.00 (5 separate grants)

**Start Date:** August 2001

### ENERGY OVERVIEW

**Energy Resource:** solar

**Technology:** communal PV systems

**Application:** indoor lighting

**Sector:** residential, public buildings (schools, health clinics, and community centers)

**Households Served:** 2000 people, 31 public buildings

**Cost per inhabitant:** \$52 per inhabitant for an installation lasting 25-30 years

**Total power provided:** 7.1 kW (129 solar panels of 55Wp)

### BACKGROUND

Approximately 7 million people living in Côte d'Ivoire's 8,500 villages still have no access to electricity. Through conventional methods of electrification, they cannot hope to have access for another 50 years. In the meantime, they rely on kerosene and wood for lighting, which provide poor quality light and create indoor air pollution.

### PROJECT DESCRIPTION

#### Overview

This project sought to test communal solar photovoltaic systems as a low-cost method of electrification for households and public buildings such as health clinics, schools and community centers. The program involved four NGOs operating in about 15 villages in five districts of the country. These villages are not included in the country's electrification plans for the next ten years. The NGOs, local populations, and certain elected officials together agreed upon the locations for project activities. In one set of villages, household lighting was the focus. Villages chosen as sites had at most 60 households, with hous-



Photovoltaic panel for a primary school (Côte d'Ivoire).

es constructed of durable material, totaling approximately 500 inhabitants. These villages were situated along the major roads in the country in order to provide visibility for the project activities. In the second set of villages, public lighting was promoted, and villages chosen as sites had to have adequate public infrastructure. All villages in the project had to have existing social welfare committees in order to assure that equipment would be maintained in the future. Those sites involving household lighting also had to have sufficient income-generating potential to pay for extensions of the photovoltaic lighting system. Beginning in 2002, each community is expected to cover 1/3 of the cost of these installations.

The communal photovoltaic system for households was organized as follows: each village was subdivided into groups of no more than 10 households; each subdivision received four 55Wp panels, totaling 220Wp per subdivision; and each household received two energy-efficient light bulbs and a plug for audio-visual equipment.

#### Environmental Benefits:

**Global:** The homes of about 2000 people, plus 31 public buildings, benefited from the lighting programs. The reduced use of wood and kerosene in these villages due to solar lighting reduces emissions contributing to climate change.

**Local:** Any reduction in the use of wood for lighting purposes reduces pressure on local forests and other ecosystems. However, reductions in wood use are not recorded.

#### Local livelihood benefits:

**Health:** The reduced use of kerosene and/or firewood for lighting improves air quality in the home, leading to reduced incidences of respiratory and eye problems. In addition, the lighting in health clinics improves the capacity for health care, both through improved lighting and the possibility of refrigerating medicines.

**Poverty alleviation:** An improved ability to work at night has made it possible for villagers to engage in more income-generating activities, such as spinning cotton and making other products from locally grown crops.

## Africa: Côte d'Ivoire-2

**Education:** Lighting has helped promote education in a variety of ways. First, better lighting in the schools provides a better environment for learning. Second, the existence of lighting in the schools attracted more teachers to the schools. For example, one school with six classrooms had been operating with only four teachers. The lighting attracted two additional teachers to the school. Finally, lighting in community centers has helped to enable greater adult education opportunities.

Improved local opportunities: All of the above benefits, plus greater access to news and information through television and radio, improve conditions in small rural villages, and may reduce somewhat the migration of young people to the cities.

### National Benefits

This project has stimulated the interest of the national government in using solar panels for electricity access.

### Capacity Development

Although detailed information is not available about capacity building activities undertaken by the NGOs, they helped to set up local committees for managing the systems in each village, and this involved some training on maintenance of the photovoltaic systems. However, it was reported that greater follow-up on the part of the NGOs to strengthen these management committees would have been desirable.

**Beneficiaries:** The main beneficiaries of the program are the inhabitants of the 15 villages that were chosen to participate in the project.

**Partners:** The major partners in this project were SGP, which provided a significant proportion of the funding for the project, the four NGOs that carried out the project, and the village community groups that were involved in the project. Government entities were also stakeholders, since some elected officials were involved in deciding which communities should take part.

## LESSONS LEARNED

### Environmental Management

This project was testing the feasibility of communal photovoltaic systems. While overall the results were positive, some problems were encountered. First, some of the panels were stolen. In addition, users of the electricity tended to increase their demand without taking into account the capacity of the panels. Finally, some villages had trouble locating spare parts due to the lack of private sector suppliers. These problems suggest a few key lessons regarding photovoltaic systems, particularly communal ones:

Property rights to the solar panels must be very clearly defined and enforced. It is not clear from the information available how the ownership of the panels was organized. The panels shared by the subdivisions of households may have been construed to be jointly owned by the 10 households, or by the community group that was in charge of managing and maintaining them.

Limits on the use of electricity must be clear and enforced. The use of excess electricity from communal panels is related to the

issue of property rights. In this scheme, each household is not charged according to how much electricity it uses. Without strong communal sanctions for overuse, or without a technical means of limiting electricity use, each person has little incentive to remain within the agreed-upon electricity use limits. As a result, some households will use more than their share and others will get less.

Attention must be paid to the development of a market for solar panels. Without such private sector involvement, spare parts are likely to be hard to find, and expansion of existing systems will require the intervention of an NGO. This is true for both individual and communal solar panel systems. The experience of other SGP projects that focused on developing markets for certain products suggests that private companies do not emerge on their own, especially domestically where technical capacity to produce the products may not exist.

### Barrier Removal

**Financial barriers:** The communal photovoltaic scheme was being tested as a lower cost method of electrification than individual systems. The cost is low, at approximately \$52 per inhabitant for a system that should last 25-30 years. However, this figure includes only installation costs. While in general the maintenance costs of solar panels are small, the possibility of the theft of panels and the lack of replacement parts, as described above, add to the per-inhabitant cost over time. In addition, if the committees responsible for maintaining the systems are not fully engaged or do not collect sufficient funds from villagers for this purpose, the systems may not last as long as anticipated. The report on the project indicates that problems did occur with the village committees responsible for maintenance.

Two lessons mentioned in the report regarding the removal of financial barriers are:

*When possible communities should contribute financially to obtain the solar systems* The report suggests that communities whose agricultural activities bring in sufficient income should pay, while other less prosperous villages should receive full support for system installation.

*Solar panel installation should be linked with income-generating activities* The report indicates that efforts should be made to encourage income-generating activities at the village level that depend upon electricity.

**Institutional barriers:** This project highlighted the importance of addressing institutional barriers, particularly if communal energy systems are being proposed. The project report indicates that greater efforts should have been made by the NGOs to strengthen local village committees. If more capacity building had been undertaken, perhaps some of the problems with the theft of panels or managing the use of electricity might not have been so severe.

### Scaling Up

Additional testing is required before this project can be scaled up. One proposed setting for a larger scale program is villages around which "satellite settlements" are located. In these places,

## Africa: Côte d'Ivoire-2

village electricity cooperatives could be organized using this model, with the cooperative charging tariffs for electricity use to recover costs. More recently, the government has expressed interest in scaling up the project to 300 villages.

Programme d'Electricite Solaire en Côte d'Ivoire." December 2002.  
Kouassi Cyriaque N'Goran,national coordinator; GEF Small Grants Programme Côte d'Ivoire, email communication,October 2003.

### SOURCES CONSULTED

SGP Project Records,SGP Database, <http://www.undp.org/sgp>  
Kouassi Cyriaque N'Goran,national coordinator; GEF Small Grants Programme Côte d'Ivoire. "Note de Synthese sur le

---