



USAID
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Renewable Energy for Development

Title: Increased Access to Modern Energy Services
Program Area: Rural Energy
Implementer: Sandia National Laboratories
Geographic Focus: Central American, South America (Brazil), and South Asia
Country: Brazil, Guatemala, Honduras, Mexico, Pakistan, India, Nepal, and Bangladesh
Duration: 1999 - 2004



Students enjoy their first distance education class with a newly installed photovoltaic system that powers their school.

This joint program is carried out primarily in Latin America, and strives to provide energy as a tool to enhance development objectives in economic growth, agriculture, health, education and environment. The context of the program is providing renewable energy technologies to serve development needs. The program relies on leveraging between multiple agencies and partners to accumulate sufficient capital resources to carry out projects.

Development Objectives

The program seeks to overcome market and institutional barriers to encourage widespread adoption and use of renewable energy systems to meet development needs. The program seeks to:

- Foster implementation of policy or regulatory changes that clarify or establish rights and incentives for the cost-effective utilization of renewable energy resources and technologies;
- Mobilize business entities to pursue and leverage financial commitments to energy projects;

USAID and the Department of Energy's Sandia National Laboratory (Sandia) have collaborated on energy programs and projects for over 10 years. Most of this collaboration is through an Interagency Agreement that allows USAID to access Sandia's technical expertise in renewable and rural energy technologies and their application.

- Catalyze the establishment or strengthening of host-country, non-profit institutions for the explicit purpose of promoting renewables, and expanding access to energy;
- Support national security through energy independence for the US, economic development and regional stability in developing nations;
- Maintain a strong US renewable energy industry in the global market;

The program has activities in three regions: Central American, South America (Brazil), and South Asia.

Project Partners

Implementation partners include:

- New Mexico State University/South West Technology Development Institute
- Winrock International
- Enersol Associates (Honduras)
- Fundación Solar and FUNRURAL (Guatemala)
- National Rural Electrical Cooperative Association (NRECA)
- SOLUZ (Honduras and Dominican Republic)

Collaborative partners include:

- The World Bank
- Inter-American Development Bank
- Organization of American States
- UN Food and Agriculture Organization
- UN International Telecommunications Union
- UN Development Programme
- Ministries of Education, Energy, Environment and Agriculture
- National Aeronautics and Space Administration
- Department of Commerce,
- Environmental Protection Agency



Solar powered water pumping system supports irrigation needs of farmers in rural Mexico.



Project Activities

USAID and Sandia activities include conducting training programs, establishing pilot projects, providing guidance and technical oversight to major rural electrification efforts and the formation of new renewable energy strategies.

Mexico

- In Mexico, USAID and Sandia assisted with the installation of more than 400 pilot renewable energy systems, representing over 265 kWp, to provide energy for more than 28,000 rural Mexicans in 14 states.
- Successful pilot projects have formed the basis for replication on a large scale, with increasing support and involvement from government and industry.
- Initiated work on developing a governance model that will help ensure the sustainability of rural energy systems managed by a community.

Honduras

- PV training for rural water pumping applications has led to technical assistance requests from three international development organizations doing their own projects.
- World Bank, IDB, Organization of American States, Honduran Government are collaborating on several pilot PV-powered rural telecenters with USAID and Sandia's technical input.
- Established multiple-use telecenters (e-mail, internet, distance education) for a pilot for the Inter-American Development

Bank US\$8.5 million Distance Education Project, in the Village of Montaña Grande.

- UN/FAO Pico-hydro Project: Hydroelectric turbine and mini-grid installed in the Village of Los Suncuyos, Lempira. Combined forest protection and energy generation project.

Guatemala

- Workshop given with emphasis on Codes and Standards, which improves reliability and performance and builds markets for US products. This training helped support multiple rural electrification projects.
- Support for the Global Village Energy Partnership to improve access to clean and appropriate energy. This is part of the US Clean Energy Initiative, implemented by USAID, USDOE and USEPA, and many national governments and NGO's.
- FUNRURAL Project: Rural electrification and improved education for coffee co-operative villages.
- The Nature Conservancy Project: Combined Forestation/Energy project in the Sierra de las Minas. This project combined watershed protection/carbon sequestration with productive uses of electricity produced from renewable energy.
- Fundación Solar Renewable Energy Projects: As part of USAID/Guatemala's support for the Peace Program in Quiché, Sandia assisted in the design

and implementation of four community development projects powered by renewable energy sources.

nuclear risk reduction by enhancing regional stability and reduce risks through projects requiring conventional and military cooperation.



A solar powered community center in rural Guatemala.

- Nonproliferation Transparency and Cooperation through the Center for Nuclear Monitoring and Transparency in Bangladesh.
- Environmental confidence building measures through assessment of trans-boundary water quality throughout South Asia and promote watershed management and cooperation.

Brazil

- Established two Rural Community Centers with Greenstar Foundation that consisted of PV powered connectivity technologies to support community efforts in small business development, education, health and water.
- Remote Educational Platforms for Conservation Professionals: A Web-based portal will support a USAID's forestry program in Brazil, by improving communication and information exchange between USAID's cooperators.

South Asia

Sandia manages the Cooperative Monitoring Center, South Asia Cooperative Monitoring Project. This project supports trans-boundary monitoring of natural resources to increase trust and cooperation between bordering nations in the region of Pakistan – India, Nepal – India and Bangladesh – India. The goal is improved stability and

Project Results

Results from the Mexico program, which has been active since 1994, demonstrate the potential for renewable energy to support economic growth. Additionally, this project has served to catalyze large Mexican government and World Bank replication programs that are expected to achieve over 10,000 system installations by 2005.

Of the 400 pilot systems installed, 206 of these installations are water pumping systems for domestic, livestock and agricultural uses, 107 are electrification systems for rural communities, and 68 projects were implemented within protected areas for electrification, water pumping and communication purposes. While the majority of these projects have utilized PV systems, the program is demonstrating that wind energy systems are also suitable.

Approximately 45 U.S. and Mexican companies participated in program



activities promoting the development of the renewable energy technology market in Mexico. Program activities resulted in more suppliers providing better systems at generally lower prices than before the program. In total, more than 30 local system suppliers throughout Mexico have participated in the program. Increased competition and the improvement in system quality caused price reductions of PV systems.

Guatemala: Technical assistance has led to installation of 850 PV home lighting systems.

Lessons Learned

The USAID-Sandia effort over the past 10 years has proven that renewable energy technologies can be sustainable at the community level and can provide benefits that extend far beyond simple household lighting. Some key lessons learned are:

Develop Solid Partnerships

The success of a program depends on working with in-country organizations and with industry. For strong partnerships, high levels of language skills and cultural knowledge are necessary.

Use a grass-roots development approach

An integrated and grass-roots development approach provides a strong base for dissemination and replication. A local and capable champion greatly facilitates local renewable energy development. If a program is going to succeed and have any lasting effects, the work has to be done from a development perspective first.

Create Sustainable Markets

The cost share of pilot projects greatly facilitates renewable energy technology acceptance and creates a sense of local ownership. As project volume increases, system costs are reduced due to increased competition. Renewable energy must be cost accessible to rural people, either through cost-sharing or financing. End-user financing at an affordable level, similar to what conventional energy costs are, lowers out-of-pocket initial capital expenditures and expands renewable energy markets. Pilot projects should be used as a tool, not an end. Pilot projects should be installed to establish growing and sustainable markets, not to point to the number of installations accomplished during the project. Their primary value is as tools for training and building the capacity of implementing organizations, businesses, and the user community.

Focus on Capacity Building

In-depth training is critical for developing the interest and knowledge required to understand and successfully apply renewable energy technologies. Technical assistance and training are a continuous process best done in an incremental fashion over time. It is important not only to train project developers, but also local industry (supply side). Success depends largely on the technical capacity of local technicians and administrators who continue development efforts and must assure the overall quality of future systems long after the outside “experts” leave.



Evaluate results

Monitoring and follow-up are necessary to understand the true results for any renewable energy development program.

Measuring replication and impacts requires a concerted effort and significant resources.

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