

Sustainable Rural Energy Development in Brazil

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Sustainable Rural Energy Development in Brazil

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ABSTRACT

Under the Luz Para Todos (“Lights for All”) Program, the Government of Brazil (GOB) seeks to provide basic electricity services to all its citizens by 2008. An estimated 2.5 million rural households (over 12 million Brazilians) currently lack electric service, with approximately 80% of them located in rural areas. Since many of these households are too geographically isolated to be connected to the national grid, they will receive distributed energy systems, and the government hopes to maximize the use of local renewable resources to service them.

The National Renewable Energy Laboratory (NREL) is working with the GOB and a variety of local partners to identify and implement sustainable off-grid solutions to meet Brazil’s rural energy needs. Focused in the Amazon region, these collaborative activities are, on one hand, using field-based activities to build local technical capacity and design replicable models for rural energy development, while on the other hand helping to develop the institutional structures that will be necessary to sustain distributed renewable energy development on a large-scale in Brazil.

1. Objectives

NREL’s rural energy activities in Brazil seek to develop long-term sustainable markets for distributed renewable energy systems and to create market opportunities for U.S. suppliers of renewable energy products and services. This work in Brazil is based on a foundation of strategic partnerships designed to institutionalize local capacity, build long-term support for renewable energy deployment, and facilitate information dissemination and replication of effective deployment strategies throughout the country. Successful implementation of these activities should result in substantially increased business opportunities for US companies in Brazil, where the near-term market for off-grid distributed power systems is conservatively estimated at approximately US\$720 million (30% of the current \$2.4 billion in *Luz Para Todos* funding).

2. Technical Approach

NREL’s field based activities in the state of Amazonas are using the Vila Campinas hybrid system--installed in 1997 in cooperation with the Brazilian government’s Centro da Pesquisas de Energia Elétrica (CEPEL) and Companhia Energética do Amazonas (CEAM), the host utility--as a foundation for capacity building and market development activities. NREL is integrating necessary

system refurbishment work with broader options analysis training that will enable CEAM to evaluate methods and costs of supplying energy to other remote communities. Efforts to replicate the system will help local partners apply options analysis and integrated resource assessment tools and techniques on a regional basis with the goal of catalyzing sustainable markets for renewable energy systems, while helping CEAM’s develop an implementation plan for its off-grid *Luz Para Todos* activities.

NREL is also working to help build the institutional structures necessary to sustain distributed renewable energy development on a large-scale. A key element of this entails supporting the capacity development and training needs to underwrite effective renewable energy deployment. Toward this end, NREL is working with in-country partners to organize targeted training sessions for government planners and the technicians who will be responsible for identifying technology options for distributed generation in their service territories.

NREL’s partnerships with CEAM and UFAM will help to institutionalize new technical capacity in the state of Amazonas, while collaborative activities with Eletronorte, the federal entity responsible for rural electrification throughout the Amazon region, provides a mechanism to transfer expertise to other Brazilian states.

3. Results and Accomplishments

In May 2004, NREL received a grant from USAID’s educational travel fund to bring three local partners from the state of Amazonas to the U.S. for two week’s of training in rural energy options analysis. With support from the Solar Energy Technologies Program (SETP), NREL expanded these training activities to include three representatives from Brazil’s federal government and a utility representative from the state of Minas Gerais and expanded the curriculum to include rural energy planning and program design. The training was conducted along two tracks to accommodate different programmatic responsibilities, with significant overlap between the two groups to allow for information sharing and enhance the participants’ understanding and appreciation of the various roles and responsibilities in the rural energy development process.

Participants in the track on *Rural Energy Planning & Program Design* focused on *Luz Para Todos* program development, activities under the Global Village Energy Partnership (GVEP), and identification of specific areas

where outside technical assistance could support Brazil's rural development goals. After preparing a central timeline for implementation of off-grid activities, this group quickly identified that its key challenge will be preparing electric concessionaires to develop Phase 2 implementation plans and effective strategies to serve isolated communities that will not be connected to the national grid. This implementation timeline is now the basis for Phase 2 off-grid planning activities for *Luz Para Todos* and includes two NREL training sessions in Brazil, which will be funded by USAID.

Participants in the track on *Rural Energy Options Analysis* received training in the use of NREL's options analysis computer models, with an emphasis on the HOMER and Hybrid2 models and an introduction to ViPOR, a distribution design tool. The participants used Hybrid 2, a detailed engineering model, to conduct preliminary analysis of refurbishment options for the Vila Campinas hybrid system, and developed an action plan detailing the steps for full system refurbishment. The Brazilian Government has taken a strong interest in the Vila Campinas hybrid system; it plans to have the system fully refurbished by the end of 2004 and subsequently to use it to showcase solar-diesel hybrid technology as an effective option for serving isolated communities under *Luz Para Todos*.

With support from SETP, NREL also initiated work with the *Institute for Sustainable Power* to help develop a framework for renewable energy training and certification standards that will help insure that there are sufficient qualified personnel to implement *Luz Para Todos* over the long run. This work will include certification of two Brazilian institutions and training for local auditors. SETP support also enabled NREL to hire a local subcontractor to provide in-country technical support. This subcontract provides NREL invaluable on-the-ground support to carry out its activities, while helping to build human capacity in the Amazon region where lack of qualified technical personnel is a major barrier to sustainable energy development.

With funding from USAID, NREL will conduct targeted training sessions for LPT technicians in January 2005, and will support CEAM in the development of a replication plan for the Vila Campinas hybrid system.

As a result of these activities, the Brazil Government now views NREL as a valuable technical partner in the implementation of *Luz Para Todos* program.

4. Conclusions

NREL's activities in Brazil are supporting a \$2.4 billion rural electrification program that will provide service to over 12 million people and create near-term market opportunities for distributed renewable-based power systems that are conservatively estimated at approximately US\$720 million. This work is co-funded and implemented in partnership with the U.S. Department of Energy, the U.S. Agency for International Development, the Government of Brazil, and several local partners. This collaborative approach helps maximize programmatic benefits to all institutions while leveraging their unique technical and institutional strengths for the benefit of Brazil.

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