

## Demonstrating Wind and Solar Energy on Lake Victoria, Uganda

### Themes

- ★ Renewable energy
- \* Linkages with other environmental goals
- ❖ Technical capacity development
- ❖ Institutional capacity development
- ❖ Awareness, culture and practices
- \* Poverty alleviation (MDG 1)
- \* Education (MDG 2)

### PROJECT DATA

**Name:** Bufumira Islands Alternative Energy Demonstration Project

**Implementing Organization:** Bufumira Islands Development Association (CBO)

**Location:** Lake Victoria, Uganda

**SGP contribution:** \$2,000 planning grant, \$41,290 full grant

**Start Date:** November 2000 (planning grant); July 2001 (full grant)

### ENERGY OVERVIEW

**Energy Resource:** solar, wind

**Technology:** battery charging station

**Application:** battery charging for household use, solar panels

**Sector:** domestic, commercial (battery charging), public (primary and secondary schools, BIDA headquarters)

**Capacity:** 3 wind generators of 400W each, combined with 6 photovoltaic panels (Musoni site); 2 photovoltaic panels (Bufumira site); photovoltaic panels in school and 11 homes (Bukasa site)

**Number Served:** demonstration projects in 3 communities

### BACKGROUND

The Bufumira Islands are located in the Kalangala district of Uganda, along the western shore of Lake Victoria. This is the second-largest freshwater lake in the world and feeds into the Nile River and the Mediterranean Sea. The Kalangala district includes 84 islands, 70 of which are inhabited, and the main activity in this area is fishing. Before the project started, most energy needs were met through single-use dry cell batteries, kerosene, paraffin and firewood. Many batteries were not disposed of properly, which resulted in soil and water contamination. Women and children used to have to go to far-away areas in search of clean water, away from the contaminated sources of water. In addition to such problems, it used to be very expensive for schools, as well as for children and parents, to pay for paraffin hurricane lamps in order to work at night, for example when students needed to study for exams. Limited energy options hindered communities' possibilities for improving their livelihoods. These challenges led communities to seek assistance in finding solutions.



Solar photovoltaic panels outside a secondary school at the Bukasa demonstration site (Lake Victoria, Uganda).

### PROJECT DESCRIPTION

#### Overview

This project demonstrates the use of wind and solar energy sources to recharge batteries and meet lighting and other power needs within homes. A hybrid wind/solar power station has been built, and public awareness campaigns about proper battery maintenance and disposal have been conducted.

#### Implementation

The project is led by a community organization, called the Bufumira Islands Development Association (BIDA). This community group has partnered with the East African Energy Technology Development Network (EAETDN), based in Kampala, Uganda. EAETDN-Uganda has provided technical expertise, while BIDA offers local knowledge, through artisans and local technicians, and strong ties within the community. In Musoni, BIDA has formed a community committee to manage the wind/solar hybrid power station. This station is mainly used to recharge batteries, which are used to meet household energy needs and also the needs of fishermen working at night. The community members managing the power station have established a system by which people can pay to have their batteries recharged there. The cost for charging a battery is approximately \$1. A receipt is given for each payment, and the funds are distributed as follows: 30% to the technician, 50% to the bank, and 20% for maintenance and office costs. Those customers who do not own batteries can purchase them from the charging station on credit. While the stations serve approximately 100 people, there is a much greater need than this for battery charging services.

In addition to establishing the power station, the project has allowed some homes to make use of solar panels to meet their energy needs. To overcome the significant financial barriers involved in accessing solar panels, BIDA is creating a small credit fund to help people purchase the panels. Eleven homes have already received solar panels, which were paid for by BIDA, but users are paying back the cost of the equipment over time,

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thereby improving ownership and responsibility among the users.

### Technology

**Musoni Site:** A hybrid wind/solar power station has been built at Musoni. This system consists of 3 wind generators of 400kW each, combined with six solar panels. This power station is used to charge batteries. So far, the wind generators have not performed as well as expected due to insufficient wind, and during the rainy season the solar panels provide diminished charging capacity.

**Bufumira:** The BIDA office and the local primary school now receive power through installations at this site, and battery charging services are available to the community. Seven solar panels, one inverter, 3 power regulators, and 2 100AH solar batteries are now installed and used here. The office has been fitted with 7 energy-efficient light bulbs. The primary school also has a solar battery and energy-efficient light bulbs.

**Bukasa:** The secondary school receives light, and battery charging services are available to the community. This site involves 8 solar panels, 3 regulators, and 1 inverter. The secondary school has two 100AH solar batteries and 10 energy-efficient light bulbs.

### Environmental Benefits

**Global:** Reduced use of firewood, kerosene and paraffin reduces greenhouse gas emissions. Additionally, Lake Victoria feeds into the Nile and borders on several countries, so any improvements in local water quality, described below, may also be considered to bring global benefits.

**Local:** The project has initiated the use of rechargeable batteries, and has begun to educate users about proper battery maintenance and disposal. This means that water pollution problems related to improper dry cell battery disposal may be reduced.

### Livelihood Benefits

**Income generation:** At least 12 community members in Musoni now supplement their incomes by recharging batteries for other households at the wind/solar hybrid power station. Better access to battery power can also help support fishing activities. In Bufumira, increased use of BIDA's newly-lit lodge is also increasing income to BIDA.

**Health:** Reduced use of firewood and kerosene may bring health improvements. In addition, households are using less paraffin for lighting, which has led to a reduced number of accidents involving paraffin.

**Education:** The Bukasa secondary school and the Bufumira primary school have received power as a result of the project, resulting in better conditions for education. Improved lighting access in homes can also enable children to study in the evenings.

**Increased stability:** Users of batteries have responded to surveys conducted by BIDA and said that access to the battery

charging systems has helped encourage them to settle permanently in the area.

### Capacity Development

BIDA has significantly improved its operational capacity both through training of its staff members and through the improvement of its office conditions and equipment. For example, the project will soon receive a donated computer since the office now has access to power.

Community members are receiving training in technical issues provided by EAETDN-Uganda, as mentioned above. Those involved in managing the power generator are improving their skills in project management. Finally, community members are receiving training in proper battery maintenance, which will increase the lifetime of batteries and improve their access to energy services.

### Partners

The partnership between BIDA and the East Africa Energy Technology Development Network (EAETDN-Uganda) has been critical for the success of this project. EAETDN-Uganda is an established NGO with technical expertise and contacts across East Africa, while BIDA is a local community organization. EAETDN-Uganda is able to provide technical assistance and conduct assessments for alternative energy use in the Kalangala District around Lake Victoria, which will in turn benefit their work in similar projects in the region. BIDA, on the other hand, benefits from the expertise of this partner organization in terms of skills in renewable energy.

## LESSONS LEARNED

### Environmental Management

This project sought to demonstrate how renewable energy can improve local livelihoods while relieving environmental pressures. More information is needed on how many people are now using rechargeable batteries, and on the effect of this on water contamination, in order to assess the long-term impacts of the project.

### Barrier Removal

**Technical:** By implementing the first demonstration of a wind/solar hybrid power station in this area, the project should reduce technical barriers and provide information for assessing the feasibility of more large scale implementation of this type of energy source. EAETDN-Uganda's involvement should be very helpful in this regard.

**Information/Knowledge:** The project has promoted awareness among battery users about the impacts of improper battery disposal, along with the benefits of using rechargeable batteries. However, the project's final evaluation indicates that there is a much greater need for battery charging in the area than can be met by the current power stations. In addition, the surveys of users indicated that there is still some lack of understanding

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about these power systems. For example, some do not appear to understand why during the rainy season there is less battery charging capacity, and some think that the technology is poor. The final evaluation indicates that communities would like wind generators for every power station. This is because they had heard good things about wind power from another community, where wind speeds were quite high. However, the low wind speeds in this area decrease the performance of the wind generator. There is therefore still need to sensitize and train communities to better understand technical issues that guide the choice of energy technology appropriate to their needs. Projects involving the transfer of technical skills to communities require continuous interventions over a period of time.

### Scaling Up

There is a great need to scale up these efforts, since there are many islands in this region to which it will be very difficult to

extend the grid in the near future. Thus, a successful demonstration of renewable energy sources could be of great help to this region if scaled up to meet more peoples' energy needs. However, additional work seems necessary to decide upon the best way to scale up the project.

### SOURCES CONSULTED

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