

NEED | ISSUE 5 2008



FOCUS | A BRIGHTER FUTURE

Solar power enriches lives across the developing world.



NATIVES OF BENIN'S KALALÉ DISTRICT, ZACHARIE SERO TAMOU (FRONT), A CIVIL ENGINEER, AND BANI GUETIDO MOUSSA GUINNIN (BACK), AN AGRICULTURAL TECHNICIAN, WORK WITH SOLAR ELECTRIC LIGHT FUND TO POWER THEIR VILLAGES. PHOTO | COURTESY OF MARSHALL BURKE

Electronics dominate our world today. From cell phones and computers to subways and air traffic control systems, our dependence on energy is increasing. Without these technologies our world would come to a standstill. Despite the fact that more than 1.6 billion people live without electricity, the importance of energy in the developing world is no different. Energy is fundamental to many of our needs such as illuminating a room, operating a medical facility and staying safe at night.

Yet development discussions often neglect the importance of energy. Of the eight United Nations Millennium Development Goals set in 2000, including improved education, gender equality, better health care, environmental stability and poverty eradication, energy is not mentioned. Without energy, advancement in these areas is difficult, if not impossible.

An abundant, renewable solution is emerging: solar energy. This simple answer illuminates the lives of people across the developing world. The following four organizations create solutions to the energy crisis, refusing to allow nearly a quarter of the world's population to live in a perpetual blackout.

FOCUS | A BRIGHTER FUTURE

WRITER: MEGHAN GARRITY

Nearly a quarter of the world's population lives in a perpetual blackout.



PRIOR TO SELF'S IMPLEMENTATION OF AN IRRIGATION SYSTEM IN BESSASSI, THE LAND COULD NOT SUSTAIN CROPS DURING THE DRY SEASON. PHOTO | COURTESY OF JENNIFER BURNEY



IN DECEMBER 2007, SIX MONTHS AFTER SELF IMPLEMENTED THE IRRIGATION SYSTEM, YAROU GANNI, THE PRESIDENT OF A BESSASSI WOMEN'S GROUP, RECEIVED AN AWARD FOR THE BEST-MAINTAINED PERSONAL PLOT. PHOTO | COURTESY OF MARSHALL BURKE

SOLAR ELECTRIC LIGHT FUND

Benin's rural Kalalé District is located in the 65 percent of Africa whose tropical savannah climate has a pronounced dry period of three to seven months per year. In Benin these conditions last from November to April, which inhibits the growth of crops and stunts the local economy. This is disastrous for an agricultural community where 95 percent of the population depends on subsistence farming. In June 2007, the Washington, D.C.-based Solar Electric Light Fund (SELF) embarked on a two-year pilot project to build solar-powered drip irrigation systems in Kalalé's Bessassi and Dunkassa villages. The project aims to increase agricultural productivity and incomes while improving health.

Drip irrigation systems and solar power are well-known technologies, but they have rarely been used in tandem. This project uses stand-alone photovoltaic systems that convert sunlight into electricity to power submersible pumps in wells and surface pumps that draw water from small streams. These pumps channel water into reservoirs located near fields, and by simply turning a valve, farmers can water their crops. The intensity of the sun largely determines the amount of water crops need to grow; when it is sunnier, plants need more water and solar panels convert more electricity.

Since November 2007, in conjunction with local women's groups, SELF has installed three irrigation systems — two in Bessassi and one in Dunkassa. Each system benefits 100 families, and based on the average family size of 7.5, the total number of people directly affected is estimated at 750.



A WOMAN FROM BESSASSI SELLS HER SURPLUS PRODUCE IN THE MAIN MARKET OF KALALÉ. PHOTO | COURTESY OF MARSHALL BURKE

Already, success stories abound. Villagers from Bessassi sent a woman with their week's entire harvest to the closest market, 25 miles away. "The woman didn't even make it to the market because everything had sold out by halfway. She came back over the moon about it," describes Jennifer Burney, SELF's project coordinator. The surrounding villages in the district are also affected by the dry season, and members from these communities were eager to purchase fruits and vegetables grown in Bessassi and Dunkassa.

While the system costs between \$20,000 and \$25,000 USD, "over the first few months of operation women

have increased their incomes by 50 percent or more; their families have consumed one to two kilograms of fresh and previously unavailable produce each week [which is] 15 percent of their total production, and over one ton of produce has entered local markets each week," says Burney. "Currently, the 'payback time' of the gardens is between two and three years."

Communities will continue to reap the benefits of the system long after their initial investment: Solar panels last 20 to 30 years, pumps approximately 10 years and drip irrigation equipment five to 10 years. Community members are trained to operate and maintain the systems, which increases the project's sustainability.

Drip irrigation is only the first phase in SELF's two-year pilot project. SELF plans to provide the Bessassi and Dunkassa villages with more solar technologies including solar-powered homes, schools, medical clinics, microenterprise centers, water pumps and a Wi-Fi network. Upon completion of this second phase, SELF anticipates expanding the project to the other 42 villages in the district.

SELF also works in South Africa to electrify rural schools and teams up with other organizations, such as Partners in Health, to power rural health centers in Rwanda, Lesotho and other parts of Africa. "Energy is fundamental," says Robert Freling, the executive director of SELF. "Access to clean modern energy should be a human right. It has been overlooked by far too long by far too many people in the development sector. ... We are demonstrating that solar is a solution."

CAMEL KIT

A collaborative effort between three organizations is revolutionizing the availability and effectiveness of medicine in the developing world. After meeting through a mutual donor, Mpala Community Trust (MCT), located in central Kenya, partnered with the Designmatters initiative at Art Center College of Design in Pasadena, California, to create a ground-breaking solar solution.

As a small, community-based organization in Kenya's Laikipia District, MCT provides reproductive health care, health education, HIV/AIDS care and immunization services through a mobile clinic. Traveling by truck,



A CAMEL SADDLE PROTOTYPE WAS TESTED AND FITTED AT THE BRONX ZOO IN SPRING 2008. PHOTO | COURTESY OF ART CENTER

camel and bicycle, MCT treats an average of 70,000 patients from remote villages and nomadic herding communities across the desolate area northwest of Mount Kenya each year. The extreme heat and the long distances traveled create problems for clinic workers carrying perishable vaccines. Some vaccines are especially sensitive to temperature, and without refrigeration they become ineffective within a few hours.

"Many organizations focus on developing immunizations but few organizations focus on how to reach people. Our concern was transportation," says Molly Fay, a 2006 Princeton civil engineering graduate who works with MCT. In remote regions of Kenya, camels are a popular means of transportation because they are practical and cheap. Working together, MCT and Art Center developed the Camel Kit, a solar-powered refrigeration system that fits a camel like a backpack.



A MORANI MAN HAS HIS BLOOD PRESSURE TAKEN BY A MCT STAFF MEMBER. PHOTO | COURTESY OF MOLLY FAY



A SAMBURU WOMAN AND HER CHILD ARE TREATED AT A MOBILE CLINIC. AS MCT NURSES SET UP, PEOPLE WHO HAD WALKED IN ANTICIPATION OF THEIR ARRIVAL PATIENTLY WAITED TO BE SEEN. PHOTO | COURTESY OF MOLLY FAY

Art Center encountered some unforeseen difficulties in developing its design. “One of the challenges was working on the camels because camels have their own temperament,” says Patrick Kiruki, a Kenyan alumnus of Art Center and the lead designer of the Camel Kit. “Camels are very sensitive animals. ... If they get tired or choose not to move on, a camel will sit down and roll over on its back and destroy equipment. Or a camel will walk by a tree and feel the urge to scratch, and he will just lean on the tree and rub and rub and destroy all the equipment on his back.”

After identifying these problems, Art Center refined its design and submitted it jointly with MCT to the 2007 World Bank Development Marketplace Competition. Being selected as a finalist helped garner the support

needed to move to the next phase. With the help of professor Winston O. Soboyejo and Niyi Olubiyi from the Princeton Institute for the Science & Technology of Materials, Art Center built a first-generation prototype.

While the Camel Kit is still in the prototype phase, Kiruki anticipates that “the impact in Africa is going to be huge; the communities are extremely excited.” The next phase involves observing the effectiveness of the kits, making any needed revisions to the design, more testing and finally production. By testing and fitting camels at the Bronx Zoo, the team gained key insights in spring and summer 2008. The prototype is now undergoing final states of refinement for ease of assembly, stability and durability.

This collaboration promises to empower communities that MCT serves with new access to critical medicine. The design's versatility suggests endless opportunities. "We hope we can readapt this design and throw it on a donkey in South America," says Fay. With the help of solar technology, distances traveled will no longer impede the delivery of vaccines.

SUNENERGY POWER INTERNATIONAL

It is hard to imagine hospitals operating without electricity, yet this is the case in many countries. Kalu Shwe Oo, a Thai medic, succinctly describes the challenge: "It is difficult to perform amputations by flashlight." Providing solar technology to these medical facilities has an extraordinary impact on the health and well-being of thousands of people.

SunEnergy Power International (SEPI), based in Oregon, brings solar power to clinics and hospitals across the world. In December 2007, SEPI electrified 35 clinics and two refugee hospitals in Thailand.

SEPI supplied building equipment, medical resources and training to the Thai medics who were responsible for the installation. "Medics get the solar training and install the systems; we do not do any of the solar installation work because they need to be able to do it themselves," says Walt Ratterman, the chief executive officer and director of SEPI.

The two solar-powered hospitals serve approximately 150,000 people. "A little bit of electricity changes the whole complexion of a medical facility," says Ratterman. "The lighting allows nurses to walk around at night



THAI MEDICS MOUNT ALUMINUM PANEL SUPPORTS ON A WOOD RACK IN ORDER TO INSTALL SOLAR PANELS AT A REFUGEE HOSPITAL.
PHOTO | COURTESY OF WALT RATTERMAN



THE COMPLETED EQUIPMENT RACK OUTSIDE OF THE REFUGEE HOSPITAL PROVIDES SOLAR ENERGY TO POWER OUTLETS FOR MINOR SURGERY, LABORATORY MICROSCOPES, COMPUTERS, VACCINE REFRIGERATORS AND LIGHTS. PHOTO | COURTESY OF WALT RATTERMAN

without kicking the IVs out and makes it safe for people to get up at night and find their way outside to the bathroom. We also provide charging systems for AA and AAA batteries, which might not sound like much but a lot of things run on these.”

A local optometrist is now able to perform cataract surgeries in the solar-powered operating room. Many people in Thailand develop cataracts in their early 30s as a result of long-term exposure to ultraviolet light while fishing. The doctor can complete this simple surgery in 30 minutes.

SEPI plans to double the hospital facilities and training centers in 2009. Financial support for the nonprofit SEPI comes primarily through individual donors and partners. Its for-profit sister organization, SunEnergy Power Corporation, which develops commercial-scale solar electric projects in the US, supplements that funding. Proceeds from renewable energy sales in the developed world are enabling hospitals in the developing world to carry out their life-saving work more effectively, treating hundreds of additional patients with the simplest of tools: light.

SUNNIGHT SOLAR

When the power goes out, most of us reach for a flashlight. This small tool provides enough light to move around safely in the darkness. Mark Bent, the founder of SunNight Solar, based in Texas, devised a solar-powered flashlight that is distributed in Africa. Having left a lucrative career in the oil industry to pursue something that no one has ever done before, Bent transforms the night for thousands of people.

“Lighting empowers people,” Bent says. Light improves literacy by allowing people to read and study after dark. It increases incomes by extending the workday for entrepreneurs and it provides safety at night. A flashlight also eliminates the need for kerosene lamps, which produce dangerous fumes. It is estimated that people who rely on kerosene lamps inhale the equivalent of two packs of cigarettes per day.

The name of SunNight Solar’s BoGo flashlight stands for “buy one, give one.” For every flashlight purchased for \$25 USD, SunNight Solar donates a second flashlight to one of more than 50 organizations including Africare, Feed the Children and UNHCR. This water- and shock-resistant flashlight charges in the sun, weighs one pound and can be hung by its hook to illuminate a wider area.

The idea behind BoGo was “to let Americans know that they could buy a flashlight and someone in Africa gets one; to know where their money is going rather than just donating to a nonprofit,” says Bent. SunNight



THIS BOGO FLASHLIGHT HANGS OUTSIDE ON A CLOTHESLINE DURING THE DAY TO CHARGE IN THE SUN. THE FLASHLIGHT PROVIDES USERS WITH SIX TO EIGHT HOURS OF LIGHT WHEN FULLY CHARGED. PHOTO | COURTESY OF SVEN WIEDERHOLT

Solar has distributed more than 60,000 flashlights in various African countries since 2006.

BoGo flashlights have been distributed in refugee camps, changing the lives of women and children. Women and children in the camps are extremely vulnerable; at night this risk is magnified. “Men will do things in darkness they won’t do in light,” Bent claims. The flashlights allow women to walk at night with confidence. They are able to identify their surroundings, and others can see them as they travel.



PATHS OF NATIVE AFRICA, A NONPROFIT BASED IN CALIFORNIA, BROUGHT BOGO FLASHLIGHTS TO STUDENTS IN IKOT USEN, NIGERIA. PHOTO | COURTESY OF SVEN WIEDERHOLT

A setback occurred in the camps when some men began stealing the orange flashlights distributed to women. In order to prevent this, SunNight Solar color coded the flashlights orange and pink. Theft greatly diminished because men would not carry things that were considered to be women's products.

SunNight Solar recently developed SL-2, or SuperBoGo, in response to the Department of Energy and World Bank field study of its lights' use in Africa. The study found that while Africans loved the BoGo flashlight, it did not illuminate an entire room as fully as their kerosene lanterns did. With this information in mind,

SunNight Solar created the SL-2 light with two distinct modes. One mode lights a small area and the other illuminates an entire room.

While 1.6 billion people live without electricity, one answer to this daunting problem abundantly shines down. From flashlights to irrigation systems, solar power can transform the developing world by improving education, gender equality, health, environmental stability and poverty eradication. Expanding this technology may someday allow everyone's lights to turn on with the flick of a switch. N-ED



STUDENTS ARE ENCOURAGED TO USE THEIR FLASHLIGHTS TO STUDY AND TRAVEL AT NIGHT. PHOTO | COURTESY OF SVEN WIEDERHOLT

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