

ELECTRIFYING LIVES



Designs for Hope Brings Free Electricity to Remote Villages

"People always say, 'Become an engineer so you can make lots of money.' I say become an engineer and you can change the world."

— Chris Bond, Designs for Hope

In Niger, recipients install a bike generator that harnesses energy created while traveling. Its battery can power lights, radios and cell phones at night.

Worldwide, 1.3 billion people lack electricity, according to the International Energy Agency. More than an inconvenience, this means working and learning all but stop when the sun goes down. Reading, washing and sewing require burning expensive fuel for light. News that could travel via radio, phone or Internet never reaches these regions. In sub-Saharan Africa, the least electrified part of the world, 70 percent of people live in the dark. Other unwired regions include parts of rural Asia, Latin America and the Middle East.

In these same regions, where infrastructure is sparse, one form of transportation stands out as efficient, simple and cheap: the bicycle. Bikes are popular in developing countries, and anywhere bike wheels are turning — from farm to village, from home to school and back — they're creating rotational energy.

That fact made gears turn in the mind of mechanical engineer and high school teacher Chris Bond. Why not harvest this rotational energy, just like those 1950s bike generators that let cyclists power their own bike lights?

Bond acted, founding Designs for Hope, a nonprofit of three engineers (Bond plus an electrical engineer and a civil engineer). The group set out to design an inexpensive, durable device that would hold a generator on a bike, harvest its power and condition the electricity to feed a battery. They began making prototypes on a Dimension 3D Printer.

To succeed, the bike generator needs the same qualities that make the bike itself so popular: affordability, simplicity and durability. "There are no parts around the corner for a battery holder in Uganda. So we have to be prepared to produce something extremely durable," Bond says. "That is the life of an engineer. Reducing cost and maintaining quality."

The initial design had some flaws. "As we were printing out our first idea, holding it and putting it next to a bicycle, I thought, 'Um, this isn't going to work!'" Bond said. Tweak after tweak in Bond's basement, the team kept improving the generator and testing it on a bike. The design now stabilized in its fifth iteration, Designs for Hope has worked with missionary networks to place eight 3D-printed test units in the field.



One recipient is a Uganda orphanage whose only power comes from a small solar-panel system. Orphanage workers commute seven to ten kilometers daily by bike. Once at work, they charge their cell phones from the solar panels, gobbling up limited power. Bond hopes his device alleviates this problem.

“The beautiful thing is, they’re using their bikes anyway,” he says. “It’s a free energy.”

Beyond cell phones, which are in high demand in developing countries, Bond says the device’s battery can power many small electronics that don’t require high resistance. As he rattles off the possibilities, he reveals his genuine desire to use his engineering skills to improve lives. Kids can do their chores by electric light at night, freeing daytime hours to attend school. Radios can carry vital news to politically unstable regions. Entrepreneurialism could spring up on a micro scale as energy becomes available for hair clippers and evening handiwork. Firewood can be reserved for heat, no longer burned for light. This in turn means cleaner, safer indoor environments and reduced strain on natural resources.

Bond wants to bring more engineers to his team, and says the bike generator is just the first of many products he hopes to develop with the goal of bettering impoverished lives.

“People always say, ‘Become an engineer so you can make lots of money,’” Bond says. “I say become an engineer and you can change the world.”

To learn more and to help, check out Designs for Hope [online](#). The bike generator project is outlined in this [video](#).



Concept.



Second design.



Final design: Designs for Hope worked iteratively to perfect the bike generator’s battery holder through physical prototypes.



Designs for Hope engineers Chris Bond (left) and Matthew Michalke demonstrate a bike generator.

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