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Bringing Clean Light to Poor Nations and Moving Beyond Charity

By LISA FRIEDMAN of

Ask a developer of off-grid lighting about a solar lantern and he'll tell you about a kerosene tragedy.

A child killed in Benin. A dormitory burned to the ground in Tanzania. Countless men and woman across Asia, Africa and elsewhere suffering -- and some dying -- from respiratory ailments.

The poorest people on the planet together spent almost $40 billion last year on kerosene and other rudimentary and dangerous fuel-based lighting. Scientists say fuel-burning lanterns release 190 million tons of carbon dioxide each year: about the equivalent of 30 million cars.

Now leaders in the field of solar portable lighting believe they can push kerosene lamps out of markets in much of the developing world and make a profit while they're at it.

"If you compare what the poor spend on kerosene, it's 10,000 times more than what we pay when we use basic electricity from the grid. It's crazy when you think that the poorest people spend the most, and get so much poor light and poor health in return" said Patrick Avato, an energy specialist in Kenya with the International Finance Corp. (IFC).

Avato manages a 3-year-old program called Lighting Africa, based in Kenya, that tries to help the private sector provide clean and affordable lighting on the electricity-starved continent. The organization -- like the Lumina Project, which is based out of Lawrence Berkeley National Laboratory -- is part of a small but growing field of market-based initiatives targeting what economists call the "bottom of the pyramid" consumers.

Ned Tozun, president and co-founder of the portable solar lighting company D.Light, said nonprofit groups have done tremendous work bringing solar lighting to poor villages. But he

also argued that the charity route can't sustain the infrastructure communities need -- like maintenance education or supplies of new batteries -- if they are going to stick with the clean lighting.

"It's inherently non-scalable," Tozun said. He described visiting villages where people had been given free solar lamps, only to return to kerosene when the batteries ran out and no one in the village sold new ones.

A market reaching a tipping point

"What we're seeking to do is to create a sustainable, long-scale solution to the problem," he said. "This is a very high-tech product for people living in rural areas, so it requires a lot of education and monitoring."

Tozun said he his partner Sam Goldman have delivered solar lamps to about 1.7 million customers at an average price of $20 apiece. The company's goal is lighting the homes of 50 million people by 2015.

Avato said he's convinced it can happen. Companies already are well on their way to helping Lighting Africa meet its short-term goal of delivering 500,000 high-quality lanterns by 2012. World Bank officials note that just two years ago, there were only a handful of products available for the African market, most costing more than $50. Today, there are 79 products, a growing number of them costing less than $25.

According to a marketing trends report issued this year, the World Bank estimates that the African market for off-grid renewable lighting will double by 2015, and as many as 6 million households on the continent will own solar portable lights.

"These products have momentum and are reaching a tipping point in a number of African markets which justifies focused study and effort in commercializing their use," the authors wrote, adding: "The solar portable light market is poised for rapid growth over the next five years."

Still, the hurdles are big. Among them: a dearth of hard data on the health hazards of kerosene lighting, which experts said would help make the case to investors about why solar lighting is necessary.

Removing indoor smog and soot

Dustin Poppendieck led one recent study at Humboldt State University that found an

employee in Kenya working with a simple wick kerosene lamp -- the cheapest lighting option -- can experience levels of particulate matter smaller than 2.5 microns of 250 micrograms per cubic meter. That's seven times the EPA 24-hour limit and 17 times the annual limit. Graduate student assistants spent months in Kenya collecting data, while researchers back in California built a rooftop structure that mimicked conditions in an African market kiosk.

The study is one of just a few that try to quantify the respiratory benefits of solar lamps over kerosene, and Poppendieck said even the scant $10,000 the project obtained for the research was hard to come by.

"It's hard to get money to look at emissions from kerosene lamps in Africa," he said. But, Poppendieck added, so far, the studies do show that "if you can get people to move from a kerosene lamp to an LED lamp, they're going to have health benefits."

But the technology of portable solar lighting has advanced considerably over the past decade. From flashlights and torches to desk lamps, solar lighting has undergone a sea change due to the emergence of LED lighting. That, researchers said, has allowed for the expansion of advanced battery options that increasingly are replacing low-cost, low-energy lead acid batteries. The result: less expensive lanterns that burn brighter and last longer.

Still, Lighting Africa warned in its report, the solar lantern market has what it calls "spoilage" problems: that is, an abundance of cheap but shoddy quality lanterns that threaten to turn potential consumers away from the industry altogether. And, analysts admit, even with technology costs coming down, price remains a major barrier in selling high-quality lanterns.

A well-designed solar lantern these days costs between $25 and $90. On the lower end of the scale, it might not seem like much -- but in countries where villagers earn less than $1 a day, that's nearly a month's salary up front.

Shedding light on financing difficulties

"When you think about people spending $10 or $15 a month on kerosene, that's a running expense for them," Avato said. "When they have money, they can buy it, and when they don't, they don't. And they can buy kerosene in tiny little sachets to meet their available money." A solar lantern, on the other hand, can take up to a year to amortize.

Lighting Africa predicts a 40 percent decline in solar lantern costs by 2015. A more

optimistic scenario envisions developing countries lifting tariffs and other trade barriers as well as the introduction of a carbon offset market for solar lantern abatement. If that happens, the cost can decline even further, allowing someone in a rural village to amortize the costs of portable lighting in just two months.

Other challenges the industry is trying to overcome include lack of credit for business expansions; the high price of distributing operations in rural regions; and prohibitive tariffs on solar lanterns, particularly in Africa and other places like Bangladesh.

"Solutions are on the horizon, but will require concerted investment and coordination," authors of the Lighting Africa study said.

But Stewart Craine, co-founder of Barefoot Power, which has sold solar desk lamps and other clean lighting products to 120,000 households in Africa and elsewhere, said it's also important to remember that portable lighting can't be a permanent solution.

"We don't want the poor to be living on batteries for the rest of their lives," he said. "We still need those energy loans to scale up the energy access from 1 or 2 watts to 20 or 30 or 50 watts." Crane said he believes the portable solar lighting industry will pave the way for wider access, showing investors that there is little to fear and much to gain from investing in the rural poor.

In the meantime, he noted, the industry, while worth less than $1 billion now, is about the same size of the African mobile phone industry in the 1990s. Africa is now the fastest-growing mobile phone market in the world.

Said Crain, "We would expect precisely the same behavior from the microenergy market in the next five or 10 years, and that's what's going to reach a lot of people, even if we haven't reached a whole lot just yet."

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